

SELF-EVALUATION REPORT FOR EVALUATION OF RESEARCH ORGANISATIONS IN THE SEGMENT OF HIGHER EDUCATION INSTITUTIONS IN YEAR 2025

HIGHER EDUCATION INSTITUTION NAME:

TECHNICAL UNIVERSITY OF LIBEREC

COMPANY REGISTRATION NUMBER (CRN):

46747885

THE LIST OF EVALUATION UNITS IN MODULE 3:

Faculty of Mechanical Engineering

Faculty of Textile Engineering

Faculty of Science, Humanities and Education

Faculty of Economics

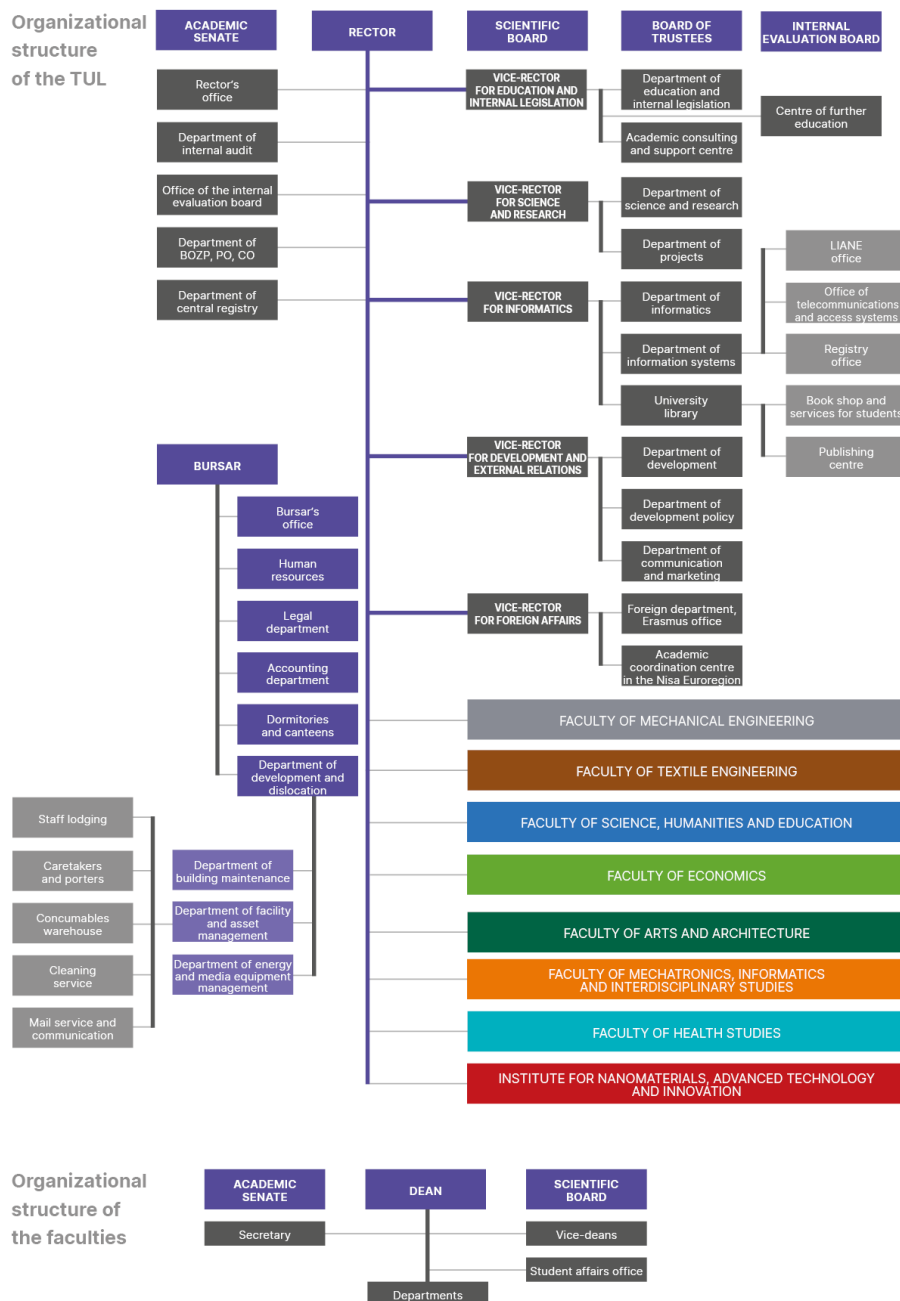
Faculty of Arts and Architecture

Faculty of Mechatronics, Informatics and Interdisciplinary Studies

Faculty of Health Studies

Institute for Nanomaterials, Advanced Technologies and Innovations

ORGANISATIONAL STRUCTURE OF THE HIGHER EDUCATION INSTITUTION



HIGHER EDUCATION INSTITUTION WEBSITE (HTML LINK): <https://www.tul.cz/en/home-page/>

THE HIGHER EDUCATION INSTITUTION CONTACT PERSON

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Miroslav Brzezina
CSc.

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Datum: 2025.05.06 13:55:17
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Signature (Rector), stamp

Introductory information about the evaluated higher education institution

The HEI briefly introduces itself. The organizational chart, the position of the HEI within the research, development and innovation system and the system of HEIs in the Czech Republic may be commented on, the mission and vision, the size of the HEI, the number and focus of the units evaluated will be briefly presented.

Maximum 500 words.

Description:

The Technical University of Liberec (TUL) is one of 26 public universities in the Czech Republic. Within the public universities in the Czech Republic, TUL is a medium-sized institutions. TUL profiles itself as an important research institution in the field of science and research in the Czech Republic, which conducts basic, pre-application, collaborative, applied and contractual R&D&I. Within the Czech Republic, TUL is recognised not only for its top results, but also for its specialised research activities that have successful application in industry and industrial practice. TUL has obtained approximately 180 patents over the last 20 years, and its patents are among the most cited in the Czech Republic.

TUL is the only university in the Liberec Region, which is one of the most industrial regions of the Czech Republic. Therefore, TUL is an indispensable organisation, providing both human potential and quality and excellent research and development not only for the Liberec Region, but also for the Czech Republic and abroad.

TUL was founded in 1953 under the name of the University of Mechanical Engineering with the aim of educating qualified engineers for the local industry, especially automotive, glass, textile and plastics processing. After the establishment of the Faculty of Textile Engineering, the school was renamed the University of Mechanical and Textile Engineering in Liberec. Gradually, the areas of education and research expanded, adding more disciplines and faculties, which in 1995 led to the renaming of the Technical University of Liberec (TUL).

TUL is built on university principles, which it develops and strengthens in its activities. The social responsibility of TUL is conditioned by the provision and performance of activities in the area of three basic university pillars: educational, scientific and research and social.

TUL currently has 7 faculties and 1 university institute:

- 1953: Faculty of Mechanical Engineering (FME)
- 1960: Faculty of Textile Engineering (FT)
- 1990: Faculty of Science, Humanities and Education (FSHE)
- 1992: Faculty of Economics (FE)
- 1994: Faculty of Arts and Architecture (FAA)
- 1995: Faculty of Mechatronics, Informatics and Interdisciplinary Studies (FM)
- 2004: Faculty of Health Studies (FHS)
- 2010: Institute for Nanomaterials, Advanced Technologies and Innovations (CXI)

TUL Mission:

The mission of TUL is to disseminate knowledge and push its boundaries, to cultivate Czech society and to contribute to social balance, well-being and sustainable development through all its activities.

TUL Vision:

In the spirit of European university traditions, TUL sets a vision for the period 2020-2030 to be an independent, internationally anchored educational and research centre of European significance and a partner in finding and solving societal challenges.

The mission and vision of TUL in the field of R&D&I are not only related to the strategic documents of TUL, but mainly to strategic national documents (National Policy on Research, Development and Innovation of the Czech Republic 2021+; Strategy for Gender Equality for the years 2021-2030; National RIS3 Strategy 2021+; RIS3 Strategy for the territory of the Liberec Region for the period 2023-2027; etc.).

SWOT ANALYSIS

Strengths

Developing new research areas and directions.
Excellent disciplinary focus and research capacity.
Significant links with industry.
Broad international cooperation.
State-of-the-art and modern infrastructure and equipment.
Multidisciplinary and interdisciplinary research.
Strong support for innovation and transfer.
Strong student involvement in R&D&I.

Opportunities

Research and personnel facilities with strong potential for development.
High quality interdisciplinary collaboration.
Growing demand for research and technical experts.
New research areas (green technologies, sustainable development, mobility, defence, ...).
Expansion of cooperation with the private sector.
Use of modern educational tools (digitisation, AI, e-learning).
Development of the region and support for the local economy.
Increasing interest in technical studies.

Weaknesses

A relatively smaller university.
Low awareness of the university abroad.
Limited coverage of potential research areas.
Dependence on public funding.
Average mobility, low staff diversity.
Outflow of graduates to other regions and abroad.
Declining number of students in doctoral programmes.
High administrative burden in terms of requirements of state authorities.

Threats

The departure of key and excellent staff.
Demographic decline, declining number of students.
Increasing competition from other national and international universities.
Financial uncertainty in relation to funding for higher education and R&D in the Czech Republic.
Stagnation and decline of the economy.
Rapid technological change and the need for adaptation.
Changes in legislation and subsidy rules.

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Mechanical Engineering

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Self-assessment:

The Faculty of Mechanical Engineering (FME) celebrated 70 years of existence in 2023. It confirmed an irreplaceable role in the field of education of mechanical engineers in the Czech Republic and a strong link to the industrial sphere. FME is a university faculty, connecting education with scientific and research activities. In the field of education, FME covers the entirety of Education Area 27 – Mechanical Engineering, Technology and Materials in the entire spectrum of study programmes, which are based on the tradition of training mechanical engineers in the region and cooperation with industry. So far, more than eleven thousand graduates have graduated from FME.

Education and scientific research activities at FME are based on the FME TUL R&D&I Strategy +2030, which is built on the research programmes of the workplaces. Traditional areas of creative activity are developed with an emphasis on the themes and needs of the 21st century.

Mission of the faculty

- Research and engineering activities fundamentally contributes to the development of teaching and to the growth of the education of society.
- Scientific research are an integral part of academic and research workers.
- FME is ranked among the most important technically oriented faculties in the Czech Republic with a significant international dimension.

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

Vision of the faculty

- FME is an independent scientific research organisation and is a respected partner within the national and international scientific space.
- FME is a clearly profiled research organisation and is a respected partner for cooperation with industrial partners.
- FME is a sought-after workplace for doctoral students from Czech and foreign universities.
- FME is a research workplace with a developed infrastructure at a standard international level.

Self-reflection on the social contribution of research

FME is increasingly emphasising its social role, which is demonstrated by collaborative cooperation supported projects and the volume of contractual research and research services. Contractual research, development and innovation are traditionally an important and highly valued segment of FME, and the demand for research services is also increasing. This is due to the ability and willingness of our academics and a high-quality research infrastructure.

New areas of R&D&I are being developed based on traditional disciplines with an emphasis on the themes and needs of the 21st century. Strategic areas are strengthened and developed by FME's research programmes in the areas of:

- Materials, nanomaterials, composites
- Advanced technologies and nanotechnologies
- Sustainable transport and mobility
- Construction of machines and equipment
- Production systems, automation and robotisation
- Energy and renewable resources

The strategic framework consists of the following research programmes

In the area of MATERIALS and TECHNOLOGY

- Polymer systems
- Metal materials and functional surfaces
- Lightweight parts and metamaterials
- Machining of classic metal and composite materials
- 3D technology
- Artificial intelligence - machine learning
- Automation and construction

In the area of CONSTRUCTION of machines and equipment

- Innovation of technical systems
- Safe and ecological means of transport
- Machines for the production of fibrous and nanofibrous structures
- Single-purpose machines and equipment
- Robotisation and automation in industry and service robotics
- Glass machines for the 21st century

In the area of MECHANICS and POWER ENGINEERING

- Mechanics of intelligent materials and their thermomechanical responses
- Vibration isolation
- Energy processes

Research activities based on type of research

Applied and experimental research prevails. Between 2019 and 2023, FME slightly increases the volume of funds from institutional support. The quality of publications and interdisciplinary research with an overlap into the FORD group Natural Sciences is increasing, which is a desirable trend, in accordance with the strategic orientation of FME.

Organisational structure

FME is made up of the following ten Departments of:

- Applied Mechanics
- Engineering Technology
- Material Science
- Engineering Technology
- Machine Parts and Mechanisms
- Machining and Assembly
- Department of Vehicles and Engines
- Department of Glass Producing Machines and Robotics
- Department of Textile Machine Design
- Department of Manufacturing Systems and Automation

Personnel structure

FME has stabilised personnel structure both in terms of the number of employees and in terms of recalculated numbers of employees, and it is saturated for education in area 27. The age structure of FME indicates a generational change of academics and is at a good level, the qualification structure has a positive growing trend. FME is relatively subtle compared to other engineering faculties. In the period under evaluation, the total number of employees decreased by approximately 5%. The greatest change in the status of employees took place between 2022/2023, which was caused by a generational change in the positions of professors and a decrease in the positions of researchers (a decrease in project funds due to the termination of large operational programme projects). The number of qualified workers, including women, has increased.

The gender issue is irrelevant at FME. The representation of female students at FME is in the range of 8-9%, which is determined by its focus and natural. The relative representation of females in the academic community, including non-academic females, is 17%. Out of the ten heads of departments, four departments were headed by females in 2023. The representation of females in DFS middle management positions and assistant positions in departments is almost absolute.

The organisation of scientific and research activities is, based on the organisational structure of FME, divided into 10 departments and the Dean's Office. The Dean's Office includes the Dean and Vice-Deans. The Dean's Office is further divided into the Secretariat of the Dean and the Secretary, the Study Department, and the Department for Development and Projects.

Long-term objectives of the faculty in the area of R&D&I

- Development and implementation of research programmes
- Involvement of research teams in international networks and strategic partnerships
- Strengthening the quality of results and outputs
- Development and offering new directions of contractual research
- Strengthening of quality indicators and transfer of applied results
- Increasing the volume of institutional support to project funds to 50:50

Table 3.1.1 - Staffing per FTE²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	12.50/2	13.29/2	12.19/2.49	10.95/1.99	9.77/1.93	58.70/10.41
Associate Professor	20.19/5.09	18.82/5.70	19.87/5.2	22.23/5.5	22.59/6.10	103.70/27.59
Assistant Professor	39.40/5.29	45.09/5.60	45.32/5.86	45.91/6.97	44.24/5.8	219.96/29.52
Assistant	4.20/1.00	3.83/0.50	6.11/0.12	6.83/0.38	6.50/0.42	27.47/2.42
R&D Personnel ³	13.91/2.90	8.75/0.65	10.36/0.5	10.33/0.60	7.29/0.30	50.64/4.95
Researchers in other categories ⁴	10.69/1.88	10.84/2.25	8.68/2.35	12.21/2.57	8.56/1.87	50.98/10.92
Technical and economic staff ⁵	19.05/16.54	21.44/18.32	20.59/18.31	18.18/15.75	16.11/13.65	95.37/82.57
Scientific, research and development staff involved in teaching activities	77.70/14.18	82.33/14.49	85.10/14.39	87.84/15.54	84.59/14.85	417.56/73.45
Early career researchers ⁶	12.66/0.38	17.24/1.53	19.38/1.00	18.31/1.49	17.64/1.20	85.23/5.60
Total ⁷	119.94/34.70	122.06/35.02	123.12/34.83	126.64/33.76	115.06/30.07	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁵ Who participates in the management and support of R&D&I in the institution.

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	2	0	3	0	6	1	4	1
Associate Professor	0	0	2	1	10	3	4	3	5	0	7	0
Assistant Professor	0	0	14	1	28	5	2	1	2	0	1	0
Assistant	0	0	4	1	1	0	0	0	0	0	0	0
R&D Personnel ⁹	2	1	5	1	1	0	1	0	2	0	0	0
Researchers in other categories ¹⁰	3	0	10	2	3	1	1	0	1	1	1	0
Technical and economic staff ¹¹	2	2	5	4	8	7	4	4	2	2	0	0
Scientific, research and development staff involved in teaching activities	0	0	20	3	41	8	9	4	14	2	13	1
Early career researcher ¹²	0	0	11	1	3	0	0	0	0	0	0	0
Total ¹³	7	3	40	10	53	16	15	8	18	4	13	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (excluding persons working on agreement on work activity or agreement on work performance).

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

¹² See Definition of Terms in Methodology HEI2025+.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	2	0	1	0	4	1	4	2
Associate Professor	0	0	0	0	10	2	8	3	4	1	3	0
Assistant Professor	0	0	16	3	21	3	9	1	1	0	1	0
Assistant	3	1	3	0	2	0	0	0	0	0	0	0
R&D Personnel ¹⁵	1	0	1	0	1	0	2	0	2	0	0	0
Researchers in other categories ¹⁶	4	0	6	0	2	1	0	0	0	0	1	1
Technical and economic staff ¹⁷	0	0	0	0	9	8	5	4	2	2	0	0
Scientific, research and development staff involved in teaching activities	3	1	19	3	36	5	18	4	9	2	9	3
Early career researcher ¹⁸	1	0	16	2	2	0	0	0	0	0	0	0
Total ¹⁹	8	1	26	3	47	14	25	8	13	4	9	3

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	524	36	504	37	462	35	459	36	425	33	2374	177
Master's ²⁰	201	19	146	11	137	15	143	12	157	16	784	73

¹⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

Doctoral	80	11	79	10	68	11	63	9	55	9	345	50
Lifelong Learning Courses												
Total	805	66	729	58	667	61	665	57	637	58	3503	300

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	2/2		2/2		2/2		2/2		2/2		10/10	
Master's	4/3		9/7		9/7		9/7		9/7		40/31	
Doctoral	6/6		6/6		6/6		6/6		6/6		30/30	
Lifelong Learning courses												
Total	12/11		17/15		17/15		17/15		17/15		80/71	

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	1	Balanced basic and applied research	13
	1.2 Computer and information sciences	2	Balanced basic and applied research	
	1.3 Physical sciences	3	Basic Research	
	1.4 Chemical sciences	5	Applied Research	
	1.5 Earth and related environmental sciences	1	Basic Research	
	1.6 Biological sciences	0	-	
	1.7 Other natural sciences	1	Applied Research	
2. Engineering and Technology	2.1 Civil engineering	2	Applied Research	85
	2.2 Electrical engineering, Electronic engineering, Information engineering	4	Applied Research	
	2.3 Mechanical engineering	28	Balanced basic and applied research	
	2.4 Chemical engineering	1	Balanced basic and applied research	

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

	2.5 Materials engineering	34	Balanced basic and applied research	
	2.6 Medical engineering	0	-	
	2.7 Environmental engineering	3	Balanced basic and applied research	
	2.8 Environmental biotechnology	0	-	
	2.9 Industrial biotechnology	1	Balanced basic and applied research	
	2.10 Nanotechnology	7	Basic Research	
	2.11 Other engineering and technologies	5	Balanced basic and applied research	
3. Medical and Health Sciences	3.1 Basic medicine	0	-	1
	3.2 Clinical medicine	0	-	
	3.3 Health sciences	1	Balanced basic and applied research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0	-	0
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	
	4.4 Other agricultural sciences	0	-	
5. Social Sciences	5.1 Psychology and cognitive sciences	0	-	1
	5.2 Economics and Business	0	-	
	5.3 Education	0	-	
	5.4 Sociology	0	-	
	5.5 Law	0	-	
	5.6 Political science	0	-	
	5.7 Social and economic geography	0	-	
	5.8 Media and communications	0	-	
	5.9 Other social sciences	1	Balanced basic and applied research	
6. Humanities and the Arts	6.1 History and Archaeology	0	-	0
	6.2 Languages and Literature	0	-	
	6.3 Philosophy, Ethics and Religion	0	-	
	6.4 Arts (arts, history of arts, performing arts, music)	0	-	
	6.5 Other Humanities and the Arts	0	-	
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

Together with other engineering faculties in the Czech and Slovak republics, FME occupies an unquestionable position in educational and scientific research activities. This is demonstrated by the interest in graduates of FME. In a survey of schools recommended by employers, organised annually by the Employers' Club, FME ranked third among technical faculties for the second time in a row.

In the period under evaluation, two significant recognitions were given, which reflect FME's global position in the field of research and development of machines for the production of nanofibers (documented in other texts of the report) and the social relevance of the research (crucial help during the COVID-19 pandemic).

Involvement in international editorial boards is increasing and confirms both a change in the behaviour of the faculty/generational shift and is also a reflection of the level of scientific research work. In the last three years, interest in cooperation in research and education on the part of foreign entities has visibly increased. See Chapter 3.7.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Jaroslav Beran, prof. Ing., CSc.	Gold medal for the fight against COVID-19	Czech Red Cross
Valtera Jan, doc. Ing., Ph.D.	Josef Hlávka award for scientific literature <i>Multidisciplinary collective of authors led by professor Lukáš.</i>	The Czech Literary Fund Foundation and the J., M. and Z. Hlávka Foundation

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Iva Petříková, prof. Ing., Ph.D. Member of the Editorial Board	European Mechanical Science, e-ISSN 2587-1110
Iva Petříková, prof. Ing., Ph.D. Member of the Editorial Board	ACC Journal, ISSN 1803-9782 (print). ISSN 1803-9790 (CD-ROM) and ISSN 2571-0613 (On-line).

Petr Lepšík, doc. Ing., Ph.D. Member of the Editorial Board (2016–to-date)	Mathematical Models in Engineering, ISSN: 2351-5279
Petr Lenfeld, prof. Dr. Ing. Member of the Editorial Board	The MM Science Journal, ISSN 1803-1269 (print), ISSN 1805-0476 (on-line)
Jaromír Moravec, doc. Ing., Ph.D. Member of the Editorial Board	The MM Science Journal, ISSN 1803-1269 (print), ISSN 1805-0476 (on-line)
Mendřický Radomír, doc. Ing., Ph.D. Member of the Editorial Board	The MM Science Journal, ISSN 1803-1269 (print), ISSN 1805-0476 (on-line)
Adam Hotař, doc. Ing., Ph.D. Reviewer	Corrosion Science, ISSN 1879-0496
Karel Fraňa, prof. Ing., Ph.D. (to 2022)	Safety and Reliability of Power Industry. ISSN 1999-5555, ISSN on-line: 2542-2057
Karel Fraňa, prof. Ing., Ph.D. (to 2022)	International Journal of Applied Science and Technology, ISSN: 2672-9156 eISSN: 2673-0421
Jan Valtera, doc. Ing., Ph.D. Member of the International Network	The International Network for Sustainable Nanotechnology (also known as “International Network4Sustainable Nanotechnology”) is a consortium of leading organisations in the field of nanotechnology, representing institutes, universities, non-profit and governmental agencies

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Michal Petrů, doc. Ing., Ph.D.	Smart agriculture with advanced IoT communication and sensing unit. The invited lecture was awarded by the FSCC 2020 scientific committee as the best lecture	World forum “Future of Information and Communication Conference (FICC) 2020”, held 5-6 March 2020 in San Francisco.	2020
Iva Petříková, doc. Ing., Ph.D.	Self-heating and dynamic compressive behaviour of magnetorheological elastomeric composite Invited lecture	15 th International Conference on Advanced computational engineering and experimenting ACEx 2022, 3-7 July 2022 Florence, Italy	2022
Iva Petříková, doc. Ing., Ph.D.	Experimental and theoretical research of Smart elastomer Invited lecture for doctoral students	Bundeswehr University München, Germany	2022
Michal Petrů, doc. Ing., Ph.D.	Approach of development of the light weight structures for modular platform for autonomous chassis of specialised electric vehicles for freight and equipment transportation	VII. International Conference on Sustainable Energy and Environmental Challenges (VII SEEC), IIT BHU, Varanasi, India	2022
Ing. Jan Valtera, doc. Ing., Ph.D.	AC electrospinning: The highly effective technology of polymeric nanofibers production	Aston University, Birmingham, UK	2022

Jan Valtera, doc. Ing., Ph.D.	AC electrospinning: The highly effective technology of polymeric nanofibers production	London Centre for Nanotechnology, Imperial College London, UK	2022
Petr Louda, prof. Ing., CSc.	Military and civilian applications of geopolymers	17 th international conference MATEDAS	2023
Michal Petrů, doc. Ing., Ph.D.	Competitive engineering in the development of ANTeTUL a utility system/demonstrator of sustainable environmental technology for zero emissions (Net Zero Cities): Approach from the Technical University of Liberec	Conference ICESTech 2023, UTM Johor Barhu, Malaysia	2023
Jan Valtera, doc. Ing., Ph.D.	Research and Development at Technical University of Liberec: Nanofibers and technology for their production	Chiang Mai University, Thailand	2023
Jan Valtera, doc. Ing., Ph.D.	Advanced technologies for production of polymeric nanofibers and specific nanofibrous structures	University of Waterloo, Canada	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Dan Hermann, Dr.	Afeka Academic College of Engineering Tel Aviv, REE Automotive, Israel	Novel platform designs ready for Autonomous Driving. Project Seminar for Research Intention N.2 in project "Modular platform for autonomous chassis of specialised electric vehicles for freight and equipment transportation.	2021
Marco Ceccarelli, prof.	University of Rome	Experiences in Leadership IFToMM: Achievements and Challenges. Plenary lecture at the XIII. International Conference on the Theory of Machines and Mechanisms. Organised by FME	2021
Vigen Arakelyan, prof.	INSA of Rennes, France France – IFToMM Technical Committee for Robotics and Mechatronics - IFToMM	Minimisation of Shaking Moment in Fully Force Balanced Planar Four-Bar Linkages. Lecture at XIII. International Conference on the Theory of Machines and Mechanisms. Organised by FM	2021
Hidetsugu Terada, Eng. prof. Dr.	University of Yamanashi, Japan	Development of a Wearable Assistive Robot for Baggage-Loading Operations. Lecture at XIII. International Conference on the Theory of Machines and Mechanisms. Organised by FM	2021

Michael Tam, prof.	University of Waterloo	Innovation in sustainable nanomaterials for advanced engineering applications	2022
Klára Loos, Dr.	Bundeswehr University München, Germany	Phenomenological Material Modelling of Polymers – Modelling elasticity and viscoelasticity by rheological models	2022
Mohd Yazid Yahya, prof.	Universiti Teknologi Malaysia UTM, Director of the Centre for Advanced Composite Materials CACM, Malaysia	Blast Protection Analysis Of Glass Fibre-Reinforced Polypropylene Aluminium Laminate/ lecture at a conference organised by FME / The 62 nd International Conference of Machine Design Departments (ICMD 2022)	2022
Sushanta Mitra, prof.	University of Waterloo, Canada	Waterloo Institute for Nanotechnology: Solving the Global Challenges	2022
Mohsen Samadi Khoshkhoo, Dr.	Leibniz Institute for Solid State and Materials Research Dresden, Germany	Extending Synchrotron X-ray Microscopy to the Laboratory X-Ray Microscopy as a correlative imaging technique	2023
Eirini Theodosiou, Dr.	Aston University, Birmingham, UK	Cultivating Innovation: The Future of Meat	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Pavel Němeček, prof. Dr. Ing.	Programme INTER-EXCELLENCE / INTER-A(CTION)	Ministry of Education, Youth and Sports	2018-to-date
Michal Petrů, doc. Ing., Ph.D.	P101 – Mechanical engineering	Grant Agency of Czech Republic	2023-2025
Michal Petrů, doc. Ing., Ph.D.	Mobility for Technology Incubation Panel	CzechInvest	2022-2024
Petr Lenfeld, prof. Dr. Ing.	2.2 Regional Innovation Programme of the Liberec Region/LR Subsidy Fund	Liberec Region	2019-2023
Martin Borůvka, Ing., Ph.D.	Operational Programme Research, Development and Education PO 02 – Improving the quality of internal grant schemes at universities/ Quality internal grants of Brno University of Technology	Brno University of Technology	2020-2023
Martin Borůvka, Ing., Ph.D.	Operational Programme Research, Development and Education, CZ.02.2.69/0.0/0.0/19_073/0016944/	Czech University of Life Sciences Prague	2020-2023

	Improving the quality of the internal grant scheme at Czech University of Life Sciences Prague		
Přemysl Pokorný, prof. Ing., CSc.	Registered as a rapporteur for project calls. 29 testimonials	Technology Agency of Czech Republic	2019-2022
Pavel Němeček, prof. Dr. Ing.	Programme calls in the areas of: BI, JB, JR, BB, JP, JS, JT	Technology Agency of Czech Republic	2019-to-date
doc. Ing. Břetislav Skrbek, CSc.	TREND	Technology Agency of Czech Republic	2023
Radomír Mendřický, doc. Ing., Ph.D.	Operational Programme Enterprise and Innovation for Competitiveness expert opinions (29 opinions for various calls)	Ministry of Industry and Trade / Agency for Business and Innovation	2019–2022
Petr Zelený, Ing., Ph.D.	Operational Programme Enterprise and Innovation for Competitiveness, Operational Programme Technologies and Applications for Competitiveness Evaluation of the progress of the project implementation, expert reviewer for the final expert review	Ministry of Industry and Trade / Agency for Business and Innovation	2021
Vlastimil Hotař, doc. Ing., Ph.D.	External member of the Operational Programme Technologies and Applications for Competitiveness selection committee	Ministry of Industry and Trade / Agency for Business and Innovation	2023–2024

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the period of 2019–2023²³. This should be done from the full list in annex tables (Table 3.3.1–3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

The strength of FME is collaborative research conducted with industrial partners as part of R&D projects and contractual research, or within the framework of institutional support. During the

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

period under evaluation, **a total of 48 projects were implemented by FME academics, of which five were international. Five proof-of-concept projects were implemented** as part of TUL's internal calls supported by the Technology Agency of the CR. Student research is also supported as part of the Student Grant Competition supported by means of specific research, with an average of 18 projects per year.

The largest number of R&D projects are application-oriented projects: Six for the Ministry of Industry and Trade TRIO programme, 13 for the Ministry of Industry and Trade Operational Programme Enterprise and Innovation for Competitiveness, 26 for the Technological Agency of the CR (NCC, EPSILON, M.ERA.Net, Theta programmes), and one for the Ministry of Education, Youth and Sports of the CR (EUREKA programme). In these cases, the principle investigators were industrial partners. FME was the principle investigator in two projects for the Ministry of Interior of the CR.

FME is also significantly involved in the implementation interdisciplinary projects. In the period under evaluation, two significant experimental research projects supported by the Operational Programme Research, Development and Education (Ministry of Education, Youth and Sports of CR) were implemented. These were the project EF16 025/0007424 3D Printing in Construction and Architecture (2018-2023), the main objective of which was to develop a robotic device capable of printing building structures without the need for an auxiliary formwork, the result is described in more detail below. The other important interdisciplinary project was the project EF16 019/0000843 Hybrid Materials for Hierarchical Structures (2018-2022), which made a significant contribution to connecting research not only at faculty workplaces, but also inter-faculty research, especially between FME, the Faculty of Textiles and the Institute of NATI. It also contributed to a significant increase in FME's publication activity. In the period under evaluation, FME completed one H2020 project as a participant, and in 2023, FME as a participant started the H2020 project Initiation of Sustainable Energy Community for the City of Liberec, which deals with an important societal theme.

FME is involved in the implementation of scientific research projects of other TUL components, which demonstrates the interdisciplinary nature of the themes and is also evident in Tab. 3.4.1., and is specifically stated in the annual reports.

Collaboration brings new ideas to FME's research themes and also constitutes an important segment of the budget. In the period under evaluation, collaborative research accounted for 38% of funds, institutional support for 29% (with a slightly increasing tendency), and specific research for 4.5-5%. A significant item in the period under evaluation was funds from Operational Programme Research, Development, and Education, the share of which was 14%. Contractual research accounts for almost 10% of FME's budget, with an increasing tendency. Funds received from contractual research exceeded 10.4 million CZK annually, and in the period under evaluation contractual research was performed for 57 companies for a total value in excess of 65 million CZK.

In addition to contractual research performed at FME, the staff of FME participate in contractual research registered under other TUL components. For example, pre-application research in cooperation between teams from FME and FSHE TUL within the NANOPROGRESS z.s. cluster, where TUL incorporates the patented alternating spinning technology into research. Thanks to presentations at international trade fairs, interest in the technology, or in other related development results, is growing. Contractual research was performed at a total volume of 16.56 million CZK.

In the period under evaluation, research works focused on:

- 2019/ Research of the processing of linear nanofibrous materials for 2-D and 3-D textile materials III and IV.
- 2019/ Development of special equipment for the production of functionalised nanofibrous

core yarns with a reduced proportion of core thread and with precise unwinding.

- 2020/ Laboratory apparatus for the experimental preparation of nanofibrous composite yarns intended for biomedical applications.
- 2020/ Functionalised single-species and composite linear nanomaterials for innovative surgical suture materials part I and part II.
- 2020/ Research of the processing of linear nanofibrous materials for 2-D and 3-D textile materials V.
- 2021/ Functionalised single-species and composite linear nanomaterials for innovative surgical suture materials.
- 2022/ Laboratory equipment for the preparation of pure nanofiber yarn, composed only of nanofibers, without core carrier yarn.
- 2023/ Technological expansion and innovation of laboratory equipment for the preparation of nanofibrous composite yarn with a rewinding, twisting, and collecting device, enabling the preparation of high quality composite nanofibrous yarn.

Another example of contractual research performed by FME academics and researchers in cooperation with NATI is classified research for Škoda Auto, a.s., performed to the amount of 13.4 million CZK and devoted to the research of the properties of power units.

Below are 10 selected research projects (activities), cross-sectionally characterising the main directions of FME's activities from the point of view of fulfilling its mission and purpose.

MATERIALS AND TECHNOLOGY

30006/ Research into the principles of micromelting of enamel and the properties of glasses obtained in this way (2020–2022, Institutional support of TUL). The project was implemented within institutional support on the border between basic and pre-application research. It also involved interdisciplinary collaboration. FME's share in the project was 100%. Research and development of manufacturing materials, nanofibers, advanced devices in the field of small batch enamel. The principle of "micro-melting" is based on the combination of a base matrix with a binder liquid system and subsequent melting at high temperatures. Small batches of enamel can then be used for additive technologies or for the production of nanofibres. As part of the project implementation, beyond the scope of the planned results, a new material with specific properties, called "Glass Porous Plasticine" by the authors, was discovered, which went through the proof-of-concept development phase. The result has been patented and shows considerable potential for commercialisation. Therefore, during 2023, preparations were made to establish a spin-off, which was officially established at FME at the beginning of 2024. See Chapter 3.5.

F16_025/0007424/ 3D printing in construction and architecture (2018–2023, Ministry of Education, Youth and Sports of CR). FME was the principle researcher of the project. The financial share in the project for FME was 25%. The project is an example of pre-application experimental multidisciplinary development with the involvement of four faculties of TUL and the Czech Technical University in Prague. The project and results are described in the publication 3D Print in Civil Engineering and Architecture ISBN 978-80-7494-632-5. The research focused on the development of robotic equipment (HW+SW) capable of printing constructions on construction sites without the need to use formwork and without transporting prefabs from the factory. New materials were researched and developed. The economic benefit lies in the mutual synergy between the robotic device and the developed production mix. Thanks to the synergy, construction costs are reduced (especially for parts with complex shapes), and energy requirements and CO₂ emissions are also reduced. The knowledge and results developed within the project (three-axis portal CNC machine) are used in

other R&D projects in cooperation with TUL and the Czech Technical University in Prague DigiBeton, and NCC for industrial 3D Printing/FME sub-project 3D printing of cement-free materials in architecture.

TH02020799/ Product development of AlSi5Mg alloy for the automotive industry (2016–2019, Technology Agency of CR)

FME's share in the project 22%. The objective of the project was to select a material, and to design and test the methodology, including the metallurgical preparation of specific aluminium alloys and the technology of the AlSi5Mg alloy product with high corrosion resistance. This project provided new and original results suitable for immediate implementation. It was possible to create a cutting-edge pilot plant for the production of structural parts using the squeeze casting method introducing a robotic workplace with the application of Industry 4.0 principles (note: Industry 4.0 is the name for the current trend of digitisation, the related automation of production and changes in the labour market). Thanks to this, TOP Alulit s.r.o. was able to significantly increase the efficiency of its production of structural parts and to reduce the scrap rate. FME continues to conduct research in the field of squeeze casting. In addition to the economic benefit (annual savings of 1.43 million CZK), there is less energy required for smelting and therefore a reduction in the carbon footprint.

FV40127/ Plasma-nitriding increasing of utility properties for welds and parts produced by means of additive technologies (2019–2022, Ministry of Industry and Trade of CR). FME's share in the project 35 %.

The project deals with a method for increasing the surface resistance and mechanical properties of parts created by additive technologies (SLM). It involves the construction of parts using the SML method, larger than the printable area, connected to each other using welding methods and with increased tribological resistance obtained using micropulse plasma nitriding. The main results are three verified and applied technologies, which significantly increase the lifespan of the parts produced in this way and the efficiency and effectiveness of the equipment, especially in the case of turbine energy equipment. The results are used by SIEMENS energy, a.s., EKOL energo s.r.o., Jmalu, s.r.o., Nexen Tire Europe, s.r.o., and Severočeské doly, a.s. In addition to economic savings of 5-6 million CZK/year, the project has an impact on the environment in the form of energy savings due to the reduction of the time required to produce the parts and the longer lifespan of the produced parts.

FW01010112/ Optimisation of acoustic panel properties made of recycled crystal glass functionalised with nanofiber additives. (2020–2022, Technology Agency of CR). FME's share in the project 36 %.

As part of the project, new unique products were developed and the production technology of acoustic panels made of recycled crystal glass was optimised. Emphasis was placed on reducing the energy consumption of production and optimising the production technology while at the same time modifying the functional properties of the final product. The results are applied and utilised by AVETON s.r.o., and PARDAM MAMO4FIBERS s.r.o. In 2023, a contract for the sale of a license for the project results was signed. Cooperation with AVETON s.r.o. continues in the framework of contractual research

FV40144/ Design and Production of Prototype Equipment for Local Repairs of Inorganic Surfaces Functionality (2019–2022, Ministry of Industry and Trade of CR). FME's share in the project 34 %.

The result of the project is a prototype device enabling local repairs of functional inorganic surfaces of storage tanks, pressure tanks, and mixers. The prototype device is based on the FME patent No. 308193 (2020). It is a unique mobile device that can be used directly at the customer's workplace, as well as in the production plant. The obtained surface repair methodologies for different shapes

and types of tanks were verified on real products. There was a significant reduction in repair costs and a reduction in energy consumption of approximately 70% at more than twice the repair speed. The prototype device, including the technological repair procedure, is used by Neufe, s.r.o. with annual financial savings exceeding 1.1 million CZK.

CONSTRUCTION OF MACHINES AND EQUIPMENT

EG17_176/0015557/ **Research and development of a new universal non-drip quick coupling** (2019-2023, Ministry of Industry and Trade of CR). FME's share in the project 11 %. The project dealt with the research and development of a new type of quick coupling for hydraulic working circuits. The new universal non-drip quick coupling is able to radically reduce the leakage of hydraulic fluid into the environment, has better technical parameters and a longer service life than the quick couplings of the previous generation. It is produced and sold by KNOMI, s.r.o. on the Czech and foreign markets. Estimated sales profits: 2023/2 million CZK/ 78895 EUR, 2024/4 million CZK/ 157790 EUR, 2025/ 5 million CZK/ 197238 EUR.

TN01000015/ **National Centre of Competence ENGINEERING** (2019–2022, Technology Agency of CR). FME's share in the project 19 %. The national centre of competence is focused on research, development and innovation necessary for increasing the competitiveness of the Czech engineering industry in the field of medium and light engineering. As part of the project, FME dealt with the development of a line for the production of flat composite nanofibrous materials using AC electrospinning. Cooperation is ongoing with the Faculty of Science, Humanities and Education. In the early stage of development in the spring of 2020, the developed technology was used for the production of material enabling the capture of viruses and bacteria, which was used for the production of protective equipment against COVID-19. The prototype line is used for further structural development and research into the structure of nanofibrous composites. See Chapter 3.5.

Contractual research for Škoda Auto a.s. (2019–2023)

A significant area of research with Škoda Auto a.s. is contractual research focused on engine designs (classified research), powertrain testing (classified research) and flexible state storage and bearing diagnostics. These areas of contractual research were implemented in the 5-year period in the amount of 22.8 million CZK. The total amount of contractual research for Škoda Auto a.s. was 31.7 million CZK.

Examples of cooperation include:

- Linear rolling guide with a modular design of the diagnostic system: there is a demonstrable benefit of early identification of damage to linear rolling guides, which makes it possible to avoid production losses. See Chapter 3.4.
- Diagnostic system for low speed bearings: a significant economic benefit consists in the elimination of line shutdown costs, which range in the tens of millions of crowns for one shutdown, see Chapter 3.4.
- Emergency support of the clamping plate of test equipment: The use of emergency supports brings significant savings not only on the costs of building structures, but they are also a prerequisite for the rational use of production and laboratory spaces, especially on the higher floors of buildings.

MECHANICS AND ENERGY

FW02020048/ **Development of compact ultrasonic gas meter with zero upstream/downstream straight pipe** (2020–2023, Technology Agency of CR). FME's share in the project 19 %.

The project developed a prototype of a new ultrasonic gas meter for natural gas flow measurement. It was tested in the accredited testing laboratory of the Czech Metrological Institute. Compared to the existing arrangements, the main advantage of the new ultrasonic gas meter will be a zero upstream/downstream straight pipe. Considering the achieved technical parameters of the prototype ultrasonic gas meter and the high commercial potential, including export, the results of the project were evaluated as excellent. The result is used by OilandGas Metering Equipment s.r.o., with which a contract was concluded in 2024 on the sale of license rights to manufacture the gas meters. Having a more accurate flow measurement enables the determination of real consumption.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Support (in thousands CZK/EUR) ²⁶				
		2019	2020	2021	2022	2023
Ministry of the Interior of Czech Republic	Application of geopolymeric composites as fire barriers (AGK). 2017-2019. VI20172019055	3 216 /127				
Ministry of the Interior of Czech Republic	Applied research in the field of the new generation of personal protective equipment for the demands of joint rescue service. 2017-2020. VI20172020052	7 454 /294	4 622 /182			
EU / Ministry of Education, Youth and Sports of Czech Republic University-wide project/ FME participation	HyHi / Hybrid Materials for Hierarchical Structures. 2018-2022. EF16_019/0000843	16 686 /658.2	21 000 /828.4	14 000 /552.3	822 /32.4	
EU / Ministry of Education,	3D STAR / 3D Print in civil engineering	5 321 /210	5 257 /207	5 638 /222	2 073 /82	

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

Youth and Sports of Czech Republic FME principle investigator /connection of other components	and architecture. 2018-2023. EF16_025/0007424					
TUL / PURE Basic research	Research on the principles of micromelting of enamel and the properties of glass obtained in this way. 2020-2021. 30006		807 /32	1 185 /47	1 202 /47	
Proof of concept projects						

Technology Agency of Czech Republic/ FME sub-projects within TUL internal competitions	PROSYKO – Proactive system of commercialisation at TUL. 2014-2019. TG01010117					
FME sub-project	Ecological combing technology for surface treatment of felt structures	345 /14				
Technology Agency of Czech Republic/ 4 FME sub-projects within TUL internal competitions	PROSYKO – Proactive system of commercialisation at TUL 2. 2020-2022. TP01010031		567 /22	1 539 /73	1 316 /53	
Specific research / Basic research						
Ministry of Education, Youth and Sports f Czech Republic/ TUL	Projects of the FME Student Grant Competition	6 083 /240	5 023 /198	5 139 /203	5 008 /198	4 945 /195

In the role of another participant						
Provider ²⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023

Ministry of Industry and Trade of Czech Republic	Development of effective fulling technology in the hat production. 2016-2019. FV10467	847 /33				

²⁷ Ibid.

Ministry of Industry and Trade of Czech Republic	Modular range of tool magazines for machine tools. 2017-2019. FV20241	450 /17				
Ministry of Industry and Trade of Czech Republic	Special transformation mechanisms in drives with electronic cams. 2017-2020. FV20547	926 /37	250 /10			
Ministry of Industry and Trade of Czech Republic	Research and development of a new generation automatic machine for the production of self-supporting bobbins. 2018-2020. FV30091	689 /27	250 /10			
Ministry of Industry and Trade of Czech Republic	Design and production of prototype equipment for local repairs of inorganic surfaces functionality. 2019-2022. FV40144	386 /15	872 /34	964 /38	1 070 /42	
Ministry of Industry and Trade of Czech Republic	Plasma-nitriding increasing of utility properties for welds and parts produced by means of additive technologies. 2019-2022. FV40127	576 /23	1 176 /46	1 228 /48	1 250 /49	
Technology Agency of Czech Republic (M-ERA.Net/international)	Antibacterial coatings containing carbon nanoparticles obtained by the Sol-Gel method. 2020-2023. TH71020001		345 /14	499 /20	507 /20	506 /14
Technology Agency of Czech Republic (M-ERA.Net/international)	Development of geopolymers composites as a material for protection of hazardous wrecks and other critical underwater structures against corrosion. 2022-2025. TH80020007				691 /27	1 838 /73
Technology Agency of Czech Republic	Research of gauge blocks in terms of thermal expansion and non-standard material composition. 2019-2021. TJ02000175	158 /6	388 /15	187 /7		
Technology Agency of Czech Republic	47/5000 Thermal nano insulation for automotive, aviation and aeronautics. 2019-2022. TH04020189	1 350 /53	1 335 /53	1 323 /52	1 397 /55	
Technology Agency of Czech Republic	Parallel-mechanism measuring robot arm as an alternative to CNC machining centres and other precision machining. 2019-2022. TH04010506	1 977 /78	1 401 /55	608 /24		
Technology Agency of Czech Republic	Product development of AlSi5Mg alloy for the automotive industry. 2016-2019. TH02020799	1 000 /39				
Technology Agency of Czech Republic	Development of a new series of fire pumps for extreme conditions. 2018-2020. TH03010378	1 000 /39	1 000 /39			
Technology Agency of Czech Republic	Optimisation of acoustic panel properties made of recycled crystal glass functionalised with nanofiber additives. 2020-2022. FW01010112		1 913 /75	2 013 /79	1 946 /77	
Technology Agency of Czech Republic	Ultrasound methods for flow rate and velocity fields measurements. 2020-2023. FW02020070		548 /22	1 569 /62	1 483 /58	245 /10

Technology Agency of Czech Republic	Development of compact ultrasonic gas meter with zero upstream/downstream straight pipe. 2020-2022. FW02020048		677 /27	1 072 /42	830 /33	
Technology Agency of Czech Republic	Josef Bozek National Centre of Competence for Surface Vehicles. 2018-2022. TN01000026	4 245 /167	4 805 /19	3 168 /125	1 358 /54	
Technology Agency of Czech Republic	National centre of competence ENGINEERING. 2019-2022. TN01000015	4 452 /176	6 348 /250	4 067 /160	1 333 /45	
Technology Agency of Czech Republic	Antibacterial Coatings Containing Carbon Nanoparticles Obtained by Sol-Gel Method. 2020-2023. TH71020001		332 /13	499 /20	506 /20	153 /6
Technology Agency of Czech Republic	Virtual control of quality and size tolerance of the construction for structural groups of bodies, cabins and chassis parts based on numerical simulation methods - virtual factory. 2021-2024. FW03010197			1 183 /47	1 214 /48	1 225 /48
Technology Agency of Czech Republic	Increasing the service life of turbine blades, overspeed devices and control parts through the synergy effect of micropulse nitriding and laser hardening. 2022-2025. TK04020148				852 /34	835 /33
Technology Agency of Czech Republic	Design and modification of surface layers for bio-applications using innovative plasma technologies. 2023-2026. FW09020103					786 /31
Technology Agency of Czech Republic	Diffusion and abfusion elements from recycled glass for interactive and smart applications. 2023-2026. FW06010700					1 698 /67
Technology Agency of Czech Republic	Simulation and design of structures from digital concrete. 2023-2025. FW06010422					1 547 /61
Technology Agency of Czech Republic	Development of energy and environmentally friendly blisters for robotic packaging and iSMART packaging using advanced modelling methods. 2023-2028. FW06010642					1 590 /63
Technology Agency of Czech Republic	Božek Vehicle Engineering National Centre of Competence. 2023-2028. TN02000054					3 784 /15
Technology Agency of Czech Republic	National Centre of Competence ENGINEERING. 2023-2028. TN02000018					7 513 /30
Ministry of Education, Youth and Sports of Czech Republic	Assessment of the damage potential of cavitation for industrial hydraulic applications. 2019-2021. 8J19FR018	77 /3				
Ministry of Education, Youth and Sports of Czech Republic (international)	ESSGIAS – Advanced European seats for global innovation in the automotive sector. 2020-2022. E120004LT		523 /21	1 193 /47	1 051 /41	

EU						
H2020 Total subsidies: 13316/337550 FME subsidies: 6983/275.5	EQUINOX / A novel process for manufacturing complex shaped Fe-Al intermetallic parts resistant to extreme environments. 2016-2019.	(being spent) 1 225 /48				
H2020 FME subsidies: 7889/311	NetZeroCities / The Initiation of Sustainable Energy Community for the City of Liberec. 2023-2025					(being spent) 1 310 /52
EU / Ministry of Industry and Trade of Czech Republic						
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 1246.5CZK/49EUR R Experimental development (thou.) 1217CZK/48EUR/ Total (thou.)2463.5CZK /97EUR FME start/January 2018 FME end/April 2020	Research and development of a new universal non-drip quick coupling. 2019-2023. EG17_176/0015557		(being spent) 410 /16	(being spent) 747 /26	(being spent) 920 /36	(being spent) 2 /1
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 8501 CZK/335EUR Experimental (thou.) 2861 CZK/113EUR/Tota	Development of textile products from non-combustible and recyclable materials. 2017-2021. EG16_084/0010282	(being spent) 5 053 /199	(being spent) 1 765 /70			

I (thou.) 11400 CZK/450EUR FME start/January 2018 FME end/April 2020						
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 1346CZK/53 EUR/ Experimental (thou.) 1346CZK/53EUR/ Total (thou.)2692CZK/1 06EUR FME start: November 2018 FME end: October 2020	Integration of microcomputers into lighting systems. 2018-2021. EG17_107/0012526	(being spent) 1 344 /53	(being spent) 797 /31			
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 3182CZK/126EUR /Experimental (thou.) 9546 CZK/377EUR Total (thou.) 12728CZK/502EU R FME start: August 2020 FME end: December 2022 The plan was not divided into stages	Research and development of textile products with a focus on the technology of knitting and the use of aqueous chemicals. 2020-2023. EG19_262/0020121			(being spent) 4 164 /164	(being spent) 3 172 /125	
Operational Programme Enterprise and	Development of an automatic device for inspection quality testing of rotational aircraft engine parts using			(being spent)	(being spent)	(being spent)

Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 751CZK/30EUR Experimental (thou.) 1395 CZK/55EUR Total (thou.) 2146CZK/8 5EUR FME start: November 2021 FME end: May 2023 The plan was not divided into stages	ultrasonic immersion method. 2021-2024. EG20_321/0024937			134 /5	974 /38	649 /26
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 4265CZK/17EUR Experimental (thou.) 4265 CZK/168EUR/Total (thou.) 8530CZK/3 36EUR FME start: October 2021 FME end: May 2023 The plan was not divided into stages	Reduction of noise from linear transport constructions using active and passive elements. 2021-2023. EG20_321/0025218				(being spent) 3 767 /149	(being spent) 10 003 /395
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid:	Application of geopolymers in fire safety of buildings. 2022-2023. EG21_374/0026819				(being spent) 3 767 /149	(being spent) 4 071 /161

Industrial research (thou.) 4305.5CZK/170EUR/ Experimental development (thou.) 4305.5CZK/170EUR/ Total (thou.)8611CZK/339EUR/ FME start: 2022 FME end: June 2023 The plan was not divided into stages						
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 2523CZK/100EUR /Experimental development (thou.) 3784CZK/149EUR / Total (thou.)6307CZK/248EUR/ FME start: January 2022 FME end: May 2023 The plan was not divided into stages	Development of a filter for capturing heavy metals in combustion processes. 2022-2023. EG21_374/0026962					(being spent) 1 003 /40
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 2145CZK/85EUR Experimental	Test station for pre-certification tests of internal combustion engines. 2015-2022. EG15_019/0004815	(being spent) 1 120 /44	(being spent) 282 /11			

development: 0 thou. CZK/EUR Total (thou.)2145 CZK/85EUR FME start: October 2016 End: December 2019 The plan was not divided into stages						
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 367 CZK/15EUR Experimental (thou.) 1467 CZK/58EUR Total (thou.) 1834CZK/72EUR FME start: June 2021 FME end: May 2023 The plan was not divided into stages	Development of a prototype of a new type of blow moulding machine. 2021-2023. EG20_321/0024941				(being spent) 835 /33	(being spent) 109 /4
Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.). 1105CZK/44EUR Experimental 0 CZK/ Total (thou.) 1105/44EUR FME start: April 2021 FME end: May 2023 The plan was not divided into stages	Development of a new generation of robotic deburring machine without the need for brushing. 2021-2024. EG20_321/0024033				(being spent) 572 /23	(being spent) 109 /4

Operational Programme Enterprise and Innovation for Competitiveness Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 909CZK/36EUR Experimental (thou.) 909CZK/39EUR Total (thou.)1818CZK/72EUR FME start: January 2022 FME end: May 2023 The plan was not divided into stages	Pretreatment, coating and protection of the substrate. 2021-2024. EG20_321/0025264				(being spent) 978 /39	(being spent) 689 /27
OP TAK Planned subsidies for FME according to the Decision on the Provision of Aid: Industrial research (thou.) 2539CZK/100EUR /5923 Experimental (thou.) 5923CZK/233EUR Total (thou.) 8462CZK/334EUR FME start: October 2023 FME end: December 2026	Flexible technology for robotic grinding and polishing of large-scale glass objects with complex shapes. 2023-2026. EI22_002/0000610					(being spent) 0
Total		65 980 /2 393.2	62 693 /2 265.4	52 119 /2 014.3	40 894 /1 532.4	44 607 /1 760

Table 3.3.2 - Contract research activities

Client ²⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
MECHANICS and ENERGY						
MEGATECH Industries Jablonec s.r.o.	Investigating the influence of technological processes on the force required to tear off the textile covering of a plastic part.	32 /1.26	27 /1.06			
CHARVÁT AXL, a.s.	Deformation and strength analysis of a hydraulic telescope.	40.8 /1.61				
RECUTECH s.r.o.	Contractual development of a new heat exchanger.	250 /9.86				250 /9.86
Texas Institute of Science (TXIS)/USA	Design of New Jet Pump. A high performance jet pump for oil production.		191 /7.34	267 /10.53		
DENSO MANUFACTURING CZECH s.r.o.	Device for measuring the torque of the entire assembly. tensile test of pipes.			7.2 /0.28	73.2 /2.89	
PRAKTIK system s.r.o.	Analysis of the transmission of vibrations during the operation of the QZ 2500 mill to the foundation of the hall of the administrative building for three different modes.					38.6 /1.52
Václav Černohorský	Numerical optimisation of the composition of the beam layers with a profile according to the supplied design to maximise bending and torsional stiffness.					30 /1.18
Škoda Auto a.s.	Analysis of the vibrations of a rear door window retractor and analysis of the effect of manufacturing processes on the shape accuracy of the front hood.					285.6 /11.27 175.9 /6.94
Sauer Žandov, a.s.	Analysis of the causes of seal damage in the DQ200 automatic transmission.					49.4 /1.95
MATERIALS and TECHNOLOGY						
TEDOM a.s.	Diagnostics of developed materials for gas combustion engines. X-ray analysis of components of manufactured and refurbished engines. Analysis and testing of engine components.	70 /2.76	74.3 /2.93	91.5 /3.61	49 /1.93	49 /1.93
SHM, s.r.o.	Material tests of delivered samples.	498 /19.64				
KNORR-BREMSE Systémy pro užitková vozidla ČR, s.r.o.	Analysis of aluminium castings.	16.5 /0.65				
Škoda Auto a.s.	Tribological analysis of supplied sheets and samples. development of display surface treatment methodology.	232 /9.15				
	Analysis of particles caught in filters.	256 /10.09				

²⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

		22.5 /0.89				
COMDES CZ s.r.o.	Design of the energy demand of the distribution chamber. Preparation of nanoprotective hydrophobic layers for application on the matrix of heritage-protected buildings.		1 050 /41.42	820 /32.35		
DORN System s.r.o.	Tests of materials for air filtration systems with bactericidal and viricidal effectiveness.		629 /2.48			
KOH-I-NOOR holding a.s.	Design of suitable antibacterial and virucidal treatment of the surfaces of consumables.		293.2 /11.57			
VICTORIA University sports centre of the Ministry of Education, Youth and Sports	Optimisation of instrumentation and equipment for equipment testing in selected sports sectors.		413.2 /16.99			
Czech Olympic Committee	Material analysis of sports equipment and optimisation. physical and chemical modification of surfaces of sports equipment.		500 /19.72			
ARROW International CR, a.s.	Modification of tool surfaces for biomedical systems.		60 /2.37	70 /2.76		
Sika CZ, s.r.o.	Evaluation of the foaming index for PUR damping compounds.	77.1 /3.04				
Henkel KG a A (Germany)	Research of the adhesion of rubber adhesives on new substrates in automotive.	226.2 /8.92	38.4 /1.51	146.5 /5.78		
Tata Steel Nederland (Netherlands)	Testing the adhesion of adhesives to various sheet metal surface treatments.	64.4 /2.54				
Chemische Werke Kluthe GmbH (Germany)	Research on the influence of additive elements on the process of seizing and the change in the size of the coefficient of friction.	162.6 /6.41				
VÚKV a.s.	Determination of transformation temperatures and mechanical properties of duplex steel.	38.3 /1.51				
Magna Exteriors GmbH, Esslingen (Germany)	Research on structural and mech. properties of parts made by MuCell technology.	97 /3.82				
Škoda Auto a.s.	Development and testing of new types of lubricants for deep-drawn sheet metal. Determination of FLC curves. definition of FEM models for traction simulations. Development of new types of adhesives for automotive. Research of degradation processes of adhesives and degradation of biopolymer mixture. Study of plastic recycling and the use of biopolymers. Shape stability tests of glued joints. Corrosion resistance tests of sheet metal protective coatings. Development and production of sustainable materials based on post-customer recycled materials.	795.8 /31.39 230 /9.07	757.6 /2988 125 /12.50	748.9 /29.54 103 /4.06 129.5 /5.11 250 /9.86	800 /31.56	799.9 /31.55 126.7 /4.99

Czech Technical University in Prague	Assessment of the effect of residual stresses during laser and EBW welding	62 /2.46				
Magna Exteriors (Bohemia) s.r.o.	Research of the effect of the CTR additive on heat sharing during the cooling phase of polypropylene injection mouldings (mechanical, thermal and structural properties). Analysis of the mechanical properties of prototype parts from regenerated material.	146.4 /5.78 581 /22.92				118 /4.65
Siemens, s.r.o.	Development of the process of welding stellites on creep-resistant Cr-Mo-V materials.		285 /11.24	493 /19.45	222 /8.76	
GR - NANO a.s.	Development of a process for thermally sealing storage of protective nanomasks.		98 /3.86			
Chemische Werke Kluthe GmbH (Germany)	Research on the influence of additive elements on the process of seizing and the change in the size of the coefficient of friction in sheets with Zn and Zn-Pb protective coatings.		130.5 /5.15			
DENSO MANUFACTURING CZECH s.r.o.	The effect of repeated mech. recycling on properties of HDP jets.		54.6 /2.15			
Zeller+Gmelin GmbH&Co.KG (Germany)	Research on the influence of additives on the tribological properties of oils.		19.1 /0.75			
KOVOLIS HEDVIKOV a.s.	Assessment of the effect of thermal load on changes in the properties of tool steels. Measurement of temperature and physical quantities.		57.2 /2.26	45.3 /1.79		
Tata Steel International (Czech Republic), s.r.o.	Testing of new sheet metal surface treatments with regard to the adhesion of welding adhesives.		233.1 /9.19	46.9 /1.85		
BOSAL ČR, spol. s r.o.	Determination of the effect of repeated mechanical recycling on the properties of HDPE extrusions.			160.5 /6.33		
MECAS s.r.o.	Measurement of material data and creation of mathematical models for material - Z3-CN20-9M.				249.6 /9.85	392.6 /15.48
GRUPO ANTOLIN BOHEMIA, a.s.	Influence of process parameters on the structural and strength characteristics of polypropylene dashboards.				76.5 /3.02	
KSM Castings CZ s.r.o.	Shear test samples.				75.5 /2.98	
SAND TEAM, spol. s r.o.	3D SANDPRINT gas formation measurement for a new inorganic binder.					63 /2.48
Siemens Energy, s.r.o., Industrial Turbomachinery	Analysis of the occurrence of defects in plasma welding of the CELSIT material.					53.7 /2.12
Technický a zkušební ústav stavební Praha, s.p.	Determination of biodegradability under controlled composting conditions - CO2 determination methodology.					70 /2.76
CONSTRUCTION						

Škoda Auto a.s.	Engine tests design and measurement (classified research)	2 873 /113.33	3 143.7 /124.01	3 716.2 /146.59	3 315.7 /130.79	4 368.2 /172.32 431.6 /17.03
Czech Technical University in Prague	Analysis of the design solution.	130 /5.13				
ABB s.r.o.	Test facilities for the development and testing of new products.		954 /37.63			
BOSCH DIESEL s.r.o.	Test site of injection systems.		56.6 /2.23			
Škoda Auto Vysoká škola o.p.s.	Study of the technical solution of flexible underpass AGVs - Study of the use of grippers for picking parts. Universal combs.	78 /3.08		148.8 /5.87	180.2 /7.11	182.3 /7.19
Rieter CZ s.r.o.	Production mandrels and technical support. Twin disc camera service.				702.7 /27.72	430 /16.96
FOR G, s.r.o.	Calibration of devices for non-contact measurement of side car windows.					60 /2.37
Škoda Auto a.s.	Proposal for the use of storage machines in logistics.					179 /7.06
O-I Czech Republic, a.s.	Design of conceptual solution and 3D model. production of test model and testing and optimisation.					225 /8.88
ENELEX spol. s r.o.	Development of a device for taking a coal sample from a levelled belt.	504 /19.88	56 /2.21			
Nano Medical, s.r.o.	Production of samples with a flat nanofibrous structure.	125 /4.93				
TONAK a.s.	Creation of drawing documentation for conveyor rollers with pertinax surface. Completing the development of webbing technology.		13.8 /0.54	482 /19.01		
Clean - air s.r.o.	research and development of structural nodes of the wool carding machine in quality and scope.				13 /0.51	
Škoda Auto a.s.	Analysis of the impact of a punch on a protective helmet.				23.4 /0.92	
Škoda Auto a.s.	Flexible storage of states	2 968.5 /117.10	1 435.3 /56.62	271.3 /10.70	2 232.4 /88.06	1 832.3 /72.28
PROF SVAR s.r.o.	Strength dynamic tests with 2-axis loading for the development of vehicle towing equipment.	336.3 /13.27	317.5 /12.52	136.6 /5.39	36.2 /1.43	224.2 /8.84
KOBIT, spol. s r.o.	Performing optimisation and calculations.	109 /4.30	43 /1.69			
LENAM, s.r.o.	Development of the wrapping device. testing of the engine cover prototype and the stiffness of the car door module. Stiffness tests of composite frame with different number of fibre layers.	42 /1.66	26.4 /2. 64	31.6 /1.25	40.6 /1.60	22 /0.87
KOBIT, spol. s r.o.	Composite frame optimization and calculations.	109 /4.29				
SKI areál Bubákov s.r.o.	Diagnostics of measurement and modelling of vibrations on the machine structure of the lift.			46 /1.81		
Total for contractual research at FME		10 592 /418	11 660 /460	8 213 /324	8 089 /319	10 457 /413

Contractual research from public funds						
NANOPROMEDICAL s.r.o., Operational Programme Prague - Growth Pole of the Czech Republic, Prague vouchers	Development of hi-tech technology of magnetron plating into substrate cavities			2 875 /113.42 (spent)		
SANS SOUCI TECH s.r.o., Operational Programme Prague - Growth Pole of the Czech Republic Prague vouchers	Development of new nano layers to protect the surfaces of glass and metal parts			3 343 /131.87 (spent)		
STI Development, s.r.o., Innovation voucher Ministry of Industry and Trade/OP, IK/ongoing call	Development of a design solution for an optimised variant of the BeatFit exercise device				396 /15.62 (spent)	
Vodní energie s.r.o. Innovation voucher Ministry of Industry and Trade/Operational Programme Enterprise and Innovation for Competitiveness/ongoing call	Continuous quality control of aeration membrane production				160 /6.31 (spent)	
Ing. Michal Kněžínek Innovation voucher, Ministry of Industry and Trade/Operational Programme Enterprise and Innovation for Competitiveness/ The Capital City of Prague	New technical solution of the air filter designed for motorcycles					(spent) 417.7 /16.48
Millenium technologies a.s., Dubá branch Liberec region innovation voucher No. OLP/3438/2021	Use of vitrified slag as a filler in geopolymer composites				200 /7.89 (spent)	
Dřevoplast Ludvík s.r.o., Liberec region / Liberec region Programme No. 2.2. – Regional innovation programme	Advanced production scheduling using Human centred AI					(subsidy 285 /11.24) spent 2 /0.79
2023/ Technological expansion and innovation of laboratory equipment for the preparation of nanofibrous composite yarn with a rewinding, twisting and collecting device, enabling the preparation of high quality composite nanofibrous yarn Pre-application research within the NANOPROGRESS, z.s. cluster Operational Programme Enterprise and Innovation for Competitiveness						1 950 /769

2022/ Laboratory equipment for the processing of flat composite nanofibrous materials, for folded filter candles. As part of the project "Technological innovation and modernisation of the research centre of the NANOPROGRESS cluster". Pre-application research and development of nanotechnologies funded by European funds within CZ.01.1.02/0.0/0.0/20_335/0023668				7 000 /27.61	
Total Contractual research from public funds			6 218 /245	7 756 /306	2 370 /940

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

Compared to the previous period, FME saw a quantitative and qualitative increase in the results of creative activity with application potential and prospective impact on society. In the period under evaluation 2019–2023, a total of 1242 results were created at FME, of which 920 were bibliometric and 322 non-bibliometric. In terms of the evaluation of the results in Module 1 and 2 of the M17+ Methodology, the results with the share of authors from FME are evaluated very well, especially by the Social Relevance criterion.

From the total number of 322 non-bibliometric results, **44 patents, 47 utility models, 26 prototypes, 25 verified technologies, and two pilot plants** were created. Furthermore, **143 functional samples** were created, which are used for testing, verification, and evaluation of functional properties with possible subsequent protection. They are often the result of contractual research and student work (with subsequent further protection and commercialisation, or use in laboratories for research work).

In the five-year period under evaluation, the number of results directly applied and used by industrial partners, or intended for application, also increased. These are primarily verified technologies and pilot plants, as well as prototypes and patents. All this indicates a healthy application cycle.

Application of the results brings economic aspects thanks to technical solutions, especially energy and material savings, environmental friendliness, and safety aspects. As a result, there are significant economic savings and benefits. Table 3.4.1 shows the results directly applied and utilised by industrial partners, or results that are realistically aimed at application.

²⁹ See Terms definition.

The aspect of the gender dimension from the perspective of the results is irrelevant. From the point of view of the benefits of the results after their application, the benefits are societal.

Selected results

TUL/PURE Plastic material for the preparation of glass-ceramic foam, glass-ceramic foam prepared from this material and methods of preparing this glass-ceramic foam

The result offers the use of waste glass that has no other application and ends up being landfilled. The material is currently being commercialised through Glassiteca s.r.o. founded as a spin-off of FME in May 2024. Commercialisation takes place in cooperation with TUC TUL s.r.o.

TH02020799/ Design and development of technology for serial production of corrosion-resistant parts from non-traditional aluminium alloy with high corrosion resistance

The pilot plant is utilised by TOP ALULIT s.r.o.

A pilot plant workplace was created for the production of parts using the squeeze casting method. This is the first such workplace in the Czech Republic. The machine's control system enables all the necessary process parameters to be monitored. The introduction of the technology created a significant increase in the quality of manufactured parts, especially in the area of porosity. After optimising the process parameters, the scrap rate was reduced to below 1%. Thanks to this, production became more efficient by 18% with annual savings of 1.3 million CZK/51282 EUR.

FV40127/ Plasma-nitriding increasing of utility properties for welds and parts produced by means of additive technologies (Inconel 718)

The technology was verified and is used by EKOL energo, s.r.o., Jimalu, s.r.o., and Severočeské doly, a.s. It defines the optimal process parameters for 3D printing (SLM) of a complex-shape part made of Inconel 718 material, welded to dimensions larger than the printable area and subsequently nitrided with microplasma to increase the tribological resistance at elevated temperatures.

The technology has led to annual savings of 2.6 million CZK/102564 EUR in the three above-mentioned enterprises.

FW01010112/ GLASIO 2G sound absorption panel with pigments

The prototype is linked to the utility model sound absorption material based on glass with an optical photoluminescence effect. Aveton, s.r.o. (funding recipient) signed an agreement on the use of results with the obligation to pay TUL according to the meters squared sold. Economic parameters cannot yet be evaluated. The new range of GLASIO 2G panels has the potential to increase annual profit due to the originality of the unique design.

FV40144/ Prototype device for local repairs of inorganic coatings

The prototype is used together with a verified technology and inductors by Neufe.

The application of the prototype together with the verified technology leads to savings in direct costs for electricity, which ranges from 60-80 thousand CZK/tank compared to re-glassing in a classic electric furnace at NEUFE. The time saving is significant, amounting to 50%. The second level of savings refers to local repairs performed at the customer's premise on equipment built into production lines, which brings significant energy savings in the range of 70-85 thousand CZK/tank. The secondary savings much more significant, the calculation of which consists in the costs of dismantling, but above all in significantly higher costs for the time when the equipment cannot be operated. These savings are many times higher than the direct savings. In 2024, the savings amounted to 1.34 million CZK/52860 EUR.

TN01000015/ Technology for the production of flat nanofibrous material

Functional sample of a new production line implements a new original technology for the production of flat composite material containing nanofibers by the method of spinning polymer solutions with the effect of an alternating electric current (AC electrospinning). It is used by Nano Medical s.r.o. for experimental work and by ELMARCO, s.r.o. for testing.

In the early stage of development, the technology was used in the spring of 2020 for the production of material enabling the capture of viruses and bacteria, which was used for the production of protective equipment against COVID-19. The produced material was used by the Liberec Region for the production of masks and filters. Link to Chapters 3.2, 3.5, and 3.7.

Automated line for the production of micro- and nanofibrous materials with a precisely prescribed structure / The result of a doctoral thesis was created with the support of specific research

Functional sample of automated laboratory testing equipment, with which it is possible to prepare linear nanofiber samples of various macroscopic and microscopic morphologies. The samples are intended for testing fluid transport, electrical properties, as well as mechanical and biological properties. It is used for research and study of the creation of micro- and nanofibers and for expanding the areas of use of structures made using this line.

Use: the device is used for research of small-diameter vessels below 6 mm as part of the Operational Programme Johannes Amos Comenius Centre of Excellence in Regenerative Medicine project (Faculty of Science, Humanities and Education as a project participant, AV ČR, v.v.i. as the principal investigator). FME cooperates with the Faculty of Science, Humanities and Education and AV ČR, v.v.i. The research results within the Operational Programme Johannes Amos Comenius will bring new materials for medical devices in the field of tissue engineering.

FW02020048/ Ultrasonic gas meter

The usability of the prototype is based on the innovative design arrangement of the gas meter's internal channels with a zero upstream/downstream straight pipe. TUL's ownership share is 40%. The result is used by OilandGas Metering Equipment s.r.o., with which a contract was concluded in 2024 on the sale of license rights to manufacture gas meters.

Contractual research/ Verified technology Linear rolling guide with a modular design of the diagnostic system

The principle of the diagnostic system for linear rolling guides is the creation of an unloaded diagnostic component in the space of the body, which shares the rolling bodies and the guide profile as a loaded part with the attached transported object. The principle of linear rolling guide damage diagnostics, based on extensive theoretical calculations, was subsequently comprehensively tested in the laboratory and under the operating conditions of the customer, Škoda Auto a.s., with the cooperation of Hager Sondermaschinenbau GmbH. The demonstrable benefit of early identification of damage to the linear rolling guide is the prevention of production losses. In the case of the Framer manipulator, which is a central part of the body welding line at Škoda Auto a.s., an unexpected accident caused by damage to the linear rolling guide represents an almost two-day outage with damages calculated at 17 million EUR (425 million CZK). The result was created as part of a dissertation.

Contractual research/ Prototype Diagnostic System for Low Speed Bearings

The result of scientific research activity is based on completely new principles of rolling bearing damage diagnostics. A significant economic benefit lies in the elimination of costs for line shutdowns, which range in the tens of millions of crowns for a single shutdown. Further technical applications of the unique diagnostic system of low speed rolling bearings can be expected in the field of transmission systems of wind power plants, roller tracks of industrial transport systems, conveyor

belts, etc. This is the case, for example, when solving repeated issues with the lifting systems of transport lines in the new Škoda Auto a.s. paint shop. The result was created as part of a dissertation.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ³⁰	Year of application	Name
Patent	2019–2023	
Application submitted/already published: EP4337618 FME's share of the result: 50 %	2023	Plastic material for the preparation of glass-ceramic foam, glass-ceramic foam prepared from this material and methods of preparing this glass-ceramic foam
Functional sample		
Functional sample Created as part of a FME doctoral thesis	2021	Automated line for the production of micro- and nanofibrous materials with a precisely prescribed structure
Verified technology		Contracts concluded with users.
Verified technology FME's share of the result: 66 %	2022	Plasma-nitridation enhancement of useful properties of welds and parts created by SLM technology from Ni alloy (Inconel 718)
Verified technology FME's share of the result: 70 %	2022	Production technology of flat nanofibrous material
Prototype		
prototype FME's share of the result: 100 %	2021	Prototype device for local repairs of inorganic coatings
Prototype FME's share of the result: 100 % Principles protected by patents: EP3225967A1 EP3531100B1	2019	Diagnostic system for low speed bearings
Prototype FME's share of the result: 66.7 %	2021	GLASIO 2G sound-absorbing panel with Prototype pigment is bound to utility models: Glass-based sound-absorbing material with an optical photoluminescence effect
Prototype FME's share of the result: 60 %	2023	TwinDisk camera quality control system
Pilot plant		
Pilot plant Result of project TH02020799 FME co-investigator of the project FME's share of the result: 60 %	2019	Design and development of technology for serial production of corrosion-resistant parts from non-traditional aluminium alloy with high corrosion resistance
Contractual research results		
Selected examples / Link to Tab. 3.3.2		
Contractual Research/Functional Sample, Verified Technology, EP3702632B1 FME principle investigator /as part of a dissertation	2023	Linear rolling guide with a modular design of the diagnostic system

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

³⁰ Specify the specific type of result. Add rows as needed.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³²

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

Transfer of technology, know-how and services is a strong point of FME. FME identifies itself with the European context of responsible research and innovations with an emphasis on the third role of universities. A significant part of the application-oriented results was created during the implementation of R&D&I projects and contractual research conducted with industrial partners and is thereby used directly for application. Contracts are also concluded with enterprises for further industrial use of the achieved results.

The volume of funds from non-grant sources (sale of licenses, donations, research services and training of industrial partners) exceeded the amount of 5.4 million CZK annually and in the period under evaluation the value reached 30.6 million CZK.

FME TUL carries out a wide portfolio of activities with industry, including promotional and presentational publicity events – see the Annual reports on FME activities, Chapter 6. Partnership and cooperation.

FORMS OF EVALUATION and TRANSFER of research results into practice implemented by the faculty

Transfer of results into the teaching process

Implemented through key profile courses, professional courses, semester and qualification papers, seminars, excursions to enterprises and several other activities. See the Annual reports on FME activities, Chapter 6. Partnership and cooperation.

Collaboration/project cooperation – link to Text 3.3, Text 3.4, Tab. 3.3.1, Tab. 3.4.1

This is the most important segment of the transfer of results into practice with the support of public funds. Typical users of the results of collaboration are enterprises that use the results in production technologies and procedures. Ultimately, it is the customer, i.e., an enterprise or individual using the products, services, etc.

³¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³² If the commercialisation of R&D&I results is carried out in this way.

Training and educational seminars for industrial partners

Transfer of know-how is also implemented within the framework of specifically focused training courses and seminars for industrial partners. FME offers professionally orientated courses in all its major areas. Despite the restrictions imposed by the COVID-19 pandemic, FME held 75 professional training courses for 701 participants in the period under evaluation to a total amount of 2.47 million CZK.

Contractual research and Research services – link to Tab. 3.4.1

The volume of CR accounts on average for approximately 11% of the volume of funds for the FME's R&D activities and 4% of the volume of research services. In the 2019-2023, FME conducted research services in the amount of 15.18 million CZK. The portfolio of enterprises and research tasks underlines the role of FME in the industrial sector not only in the Czech Republic, i.e. due to the representation of multinationals.

- Preparation form embrane analysis/Functional sample
Vodní energie s.r.o. exports aeration membranes to 18 countries in Europe, Asia, America.
- Brake for rolling stock/Prototype/FME patent commercialization
The electromechanical brake is part of a brake system solution that has brought DAKO-CZ, a.s.
- Fully automated robotic storage system/Functional sample
The "SysLogeum 3000" are currently being equipped in two large warehouses in the CR. Client: Systematic a.s.
- Device for marking defects in flat fire-resistant glass/Prototype
Currently, the prototype is part of the production line that Benteler Maschinenbau CZ, s.r.o. manufactures and sells.
- Vibration-insulating storage of base plates of machines and equipment in higher floors of buildings using emergency supports
Clients: Škoda Auto a.s.; ABB s.r.o., JUTA a.s. Dvůr Králové; Ammann CR s.r.o.

Pre-application research

- In the field of research and development of machines for the production of nanofibers,
TUL invests in research the patented technology of alternating spinning. Pre-application contractual research and development of nanotechnology financed from European funds within the NANOPROGRESS cluster, z.s. Pre-application collaborative research within NCC ENGINEERING. Example: Technology for the production of flat nanofibrous material: A functional sample of a new production line implements a new original technology for the production of flat composite material containing nanofibers by the method of AC electrospinning. It is used by Nano Medical s.r.o. for experimental work and by ELMARCO, s.r.o. for testing.
- Proof of concept projects
During the TUL/PURE project/Research into the principles of micromelting of enamel and the properties of glass obtained in this way (basic research), a new material with specific properties was discovered beyond the scope of the planned results, called "Glass Porous Plasticine" by the authors. The material subsequently went through the proof-of-concept development phase as part of the Glass Porous Plasticine project (Technology Agency of the CR. GAMA. Prosyko/TUL project within an internal competition. 2021–2022). The achieved results and their application potential led to the decision to establish a spin-off in 2023. See below.

COMMERCIALISATION of research results

Sale of licences 2019–2023 – See Tab. 3.5.1

- Protective breathing mask with common inhalation and exhalation opening/licence fees
- Method for production of polymeric nanofibers by spinning of solution or melt of polymer in an electric field, and a linear formation from polymeric nanofibers prepared by this method/license fees
- Low specific gravity refractory geopolymers composite for fire barrier structural elements/sale of utility model
- Brake arrangement, especially for rolling stock/sale of patent

Donations to support scientific and research activities – See Tab. 3.5.1

Spin-off (FME) TUL– Glassiteca s.r.o.

- Glass Porous Plasticine project, decision to establish a spin-off made in March 2023.
- Preparation of the project to establish a spin-off and negotiations with TUC TUL s.r.o.
- Preparation of a business plan. Crystallisation of a team of people, marketing, business plan, etc.
- Development of material and technology for recycling.
- Establishment of the enterprise on 26 May 2024.

Technological incubation/CzechInvest support for start-up environments – from 1 January 2025.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
License fees			39/1.5	506.4/20	
Sale of utility models			1000/39		
Patent sale					584/23
Total sales of licenses	0	0	1039/40.5	506.4/20	584/23
Donations	2567/101	4570/180	1777/70	1354/54	550/22
Training of industrial partners	683/26.9	231/9.1	479/18.9	655/25.8	418/16.5
Total research services	2223/88	1821/72	3082/122	3863/152	4192/161
of which					
Mechanics and Energy	122.7/4.8	172.4/6.8	173.4/6.8	442.3/17.5	955.6/37.7
Materials and Technology	1742/68.7	1349/53.2	2668/105.3	3291.5/129.8	2901.3
Construction of machines and equipment	481.2/19.1	318.6/12.6	287/11.3	140.8/5.6	297.9/11.8
Total revenues from non-public sources	5 473/216	6 622/261	6 377/252	6 378/252	5 744/227

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

FME traditionally organises a range of events, several of which are organised regularly. However, there was a slowdown in 2019-2020 due to the COVID-19 pandemic.

FME popularises R&D through the organisation of lectures, workshops, open days, science festivals and articles in the press. Emphasis is placed on themes related to FME's creative activity.

FME cooperates with secondary schools, offers excursions, project days for pupils and students, organises a secondary school competition in 3D printing, creates multimedia shorts of students and R&D teams for the general public.

FME publishes creative activities, makes current knowledge available, and inspires interest in science through networks and the Internet, creates multimedia shorts of students and R&D teams for the general public.

All of the events listed below are documented in the columns EVENTS/overview, FME–UNI, and in annual reports on FME activities.

1/ Professional events

- T-Forum: Career fair, organised by FME in cooperation with IAEST (since 1994).
- FME open days: 2x a year for those interested in studying.
- MSV in Brno 2019: Exhibition focused on geopolymers, biopolymers and the use of nanomaterials in medical applications.
- ITMA International trade fair for textile machinery
- Premiere of the first semi-operational line for the production of pure nanofiber yarn in the world (2019).
- Presentation of a line for the production of a linear composite system containing nanofibers (2023).
- Circular economy of plastic parts: Webinar for students from Czech-Saxony and the general public (2022).
- CroBoPlast: meeting of the academic, industrial and research spheres from Czech-Saxony in the fields of plastic processing technology (2019).
- Professional lectures and seminars of partners from the industrial sphere at FME.

2/ Creative activity of students

- StudentFormulaTUL: construction of single-seaters and participation in international competitions/from 2015 - to-date.

3/ Popularly oriented events

- VědaFest at TUL: Examples of the scientific research of FME (annually since 2021).
- Public diplomacy of the NW EU before the European Parliament: FME/TUL Presentation of the development of an autonomous utility vehicle within an accompanying program for cultural (2022).
- 3D concrete printing: Presentation of the results of interdisciplinary cooperation at the Festival of Architecture (2023).
- Škoda EDU.Lab: Co-organisation of a mobile educational laboratory project with examples of TUL's creative activities in the field of virtual/mixed reality (two-month tour, 2022).

- Series of 5400 seconds of inspiration: Popularisation-oriented lectures from the field of technology: Return of people to the Moon under the wings of Artemis (Dušan Majer, 2023); Automotive design (Jan Dědek, 2022); Sarcophagus for the Queen (Zdeněk Lhotský, 2022).

4/ Events for secondary school students

- 3D printing competition: To support the creative activities of secondary school students in the field of technology or natural sciences (2022, 2023, 2024).
- Project days and workshops for those interested in technology: For secondary schools based on an offered format or based on interest in a specific area (2020-2023).

5/ Events for graduates

- Presentation of FME and tours of the laboratories as part of a meeting organised by graduates.
- Diamond graduations arranged for the classes of 1961, 1962, 1962, 1964.

6/ 2023 Events to mark the 70th anniversary of the founding of FME– University of Engineering in 1953

- Series of popularisation lectures
- As part of the main day of TUL celebrations: Combustion engines and sustainable transport for the 21st century, Technologies that realise our visions-3D printing, Community energy for Liberec and Nanotechnology from Liberec (September/2023).
- Seven decades of technology
- Lectures giving inspiring stories of creative, research and development activities for the public in the Pecha Kucha Night format, which are linked in various ways to FME (2023).
- Day of motoring at TUL
- An event for the public with a demonstration of what we are working on at FME in projects related to the construction of the Formula Student racing car, motoring and internal combustion engines, electromobility and the development of autonomous vehicles (2023).
- FME expert symposium to mark 70 years of FME

Acknowledgment of partners for cooperation and support: to present collaborative research and industrially used results in the field of materials and technologies, machine and equipment design, mechanics and energy (2023).

7/ Popularisation and communication

www.fs.tul.cz/en new website of FME (2021)

EN [FME -UNI](#)

EN [EVENTS/overview](#)

YouTube: Shorts, Videos

Social networks: Instagram, Facebook, LinkedIn, X

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Recommendations:

No prestigious individual R&D awards were awarded. Consideration could be given to creating an award for students by the Faculty's Industrial Council.

In 2021, the period under evaluation was fundamentally affected by the COVID-19-pandemic associated. The covid-crisis clearly demonstrated the TUL potential in solving societal issues, and as a result confirmed the potential of TUL research and the applicability of research results.

The most prestigious award in 2019-2023 was the social recognition of FME/TUL, for the absolutely crucial help to the Liberec region in managing, in particular, the initial crisis situation associated with the lack of masks for the protection of the population. FME, together with the Faculty of SHE, participated in the production of protective masks and nanofiber filters, from the beginning of the pandemic.

In the period under evaluation, two significant awards were awarded, which reflect FME's global position in the field of research and development of machines for the production of nanofibers and the social relevance of the research COVID-19 pandemic). This activity was socially highly valued (see Chapter 3.2, 3.4).

In 2023, the FME Industrial Council awarded the Industrial Council Award for the contribution to the application of knowledge to industrial practice to a student's graduate thesis. Enterprises sponsor the TUL StudentFormula project and support other events.

Focus on implementing interdisciplinary projects

During the period under evaluation, FME implemented and involved in, projects supported by the Operational Programme R&D&I, 2018-2023/4, MEYS CR. The following projects brought new themes, connected inter-faculty and inter university Teams:

EF16_019/0000843 Hybrid materials for hierarchical structures/leader FME

EF16_025/0007424 3D printing in construction and architecture/leader FME

EF16_025/0007293 Modular platform for autonomous chassis of specialised electric vehicles for transporting cargo and equipment/leader NATI

Maintain a leading position in the region in the field of technology

Since its establishment in 1953, FME has held the position of leader in the region.

From the point of view of the demand for contractual research and research services, an increase in interest in cooperation can be observed in the last three years. It should be emphasised that FME perceives this activity as a service to society.

FME is involved in long-term cooperation with the application sphere. Participation in two projects of the National Centres of Competence in the period 2018-2022 and 2023-2028 testifies to its good position. This cooperation is based on the principle of strengthening the institutional base of the applied industry. Participation in the research activities of the NANOPROGRESS cluster s.z. is also significant.

The demand for graduates of all study programmes greatly exceeds the number of graduates at FME. In the “School Recommended by Employers” poll, FME was ranked third in 2023 and 2024. Almost 1500 business respondents took part in the evaluation.

Expand the research focus of the faculty

The strategic steps of FME include an evaluation and discussion of FME research programmes consisting in research activities for the years 2025-2030. In 2025, the FME R&D&I Strategy +2030 will be updated. Currently, three new activities are being discussed in the fields of hydrogen in engineering applications, interdisciplinary materials research, and energy.

Strengthen the international dimension of the faculty

The two-year slowdown as a result of the COVID-pandemic, especially in the field of international mobility, led to the development of user competencies and forms in the field of international virtual cooperation, which significantly shifted SME towards openness (international activities such as on-line seminars, meetings, summer schools). At the level of R&D&I cooperation, three-four projects with international participation are implemented continuously. Since 2023, FME has implemented a range of internationalisation activities.

See the Annual reports on FME activities

FME has developed a system of offering foreign internships to academic staff, administrative support for academics and students is provided by the Department of Foreign Relations/under the Study Department of FME. The FME strategy is openness to all forms of international cooperation. For this purpose, among other things, the FME workplace evaluation system has been updated. In 2022, the FME Mobility Fund was set up and approved with an annual contribution of 1 million CZK/39448 EUR. In the last three years, there has been a growing interest in cooperation from foreign institutions (Spain, Israel, Scandinavia, Germany, Canada, and Asia).

See the website [EVENTS/overview](#)

An important aspect of internationalisation is the three-month foreign internships of doctoral study programme students as part of their studies and the role of supervisors during the introduction to the workplace, a seminar at the TUL training workplace upon return. There are currently seven PhD students studying in English at FME. The possibility to study in the doctoral study programme under dual supervision/Cotutelle was institutionalised at TUL.

FME provides studies in the follow-up Master’s study programme in the English language. As part of the internationalisation and promotion of FME abroad, emphasis is placed on regular visits to foreign student and university trade fairs with the aim of promoting the study offered at FME. From 2025, studies in the Bachelor’s study programme will be offered/opened in the English.

At the strategic level of FME, the Principles of FME’s Personnel Policy were defined and career standards, including internationalisation standards.

Set a ratio between applied and basic research

It may be stated that FME is slightly strengthening the volume of funds from institutional funding and the number and quality of publications is increasing. In the period under evaluation, the themes of basic and experimental research were significantly supported by the excellent research project from the Operational Programme Research, Development and Education/Hybrid Materials for Hierarchical Structures.

Cooperation with AV ČR, v.v.i. is a strategic step towards strengthening the basic research of FME.

Specific collaborations have been initiated and joint projects have already been submitted. The membership of colleagues from AV ČR in the Scientific Council of FME was strengthened. Another example is the cooperation between FME/FSHE/FME and AV ČR, Centre of Excellence in Regenerative Medicine project (Operational programme, AV ČR as the principal). See 3.4 Use of equipment for research of small-diameter vessels below 6 mm.

Support the establishment of spin-off companies

See Chapter 3.5 Spin-off FME/TUL– Glassiteca s.r.o.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Annual reports on FME TUL activities	3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7	https://www.fs.tul.cz/en/annual-reports-fme-tul
Strategic Plan of the FME TUL 2021–2023	3.1	https://www.fs.tul.cz/en/strategics-and-policies-fme-tul
Strategy RDI of the FME TUL +2030	3.1, 3.7	https://www.fs.tul.cz/en/strategics-and-policies-fme-tul
Personnel policy principles of the FME TUL	3.1, 3.7	https://www.fs.tul.cz/en/strategics-and-policies-fme-tul
Organisational structure	3.1, 3.7	https://www.fs.tul.cz/en/organizational-structure
Legislation of the FME TUL	3.1	https://www.fs.tul.cz/en/legislation-fme-tul
COVID-19 Story	3.2	https://www.fs.tul.cz/en/covid-9-story
EVENTS/overview	3.2.3, 3.2.4, 3.6	https://www.fs.tul.cz/en/ohlednuti
FME Projects	3.3	https://www.fs.tul.cz/en/projects-current-research https://www.fs.tul.cz/en/projects-archive-research https://www.fs.tul.cz/en/grant-programs-research
FME–UNI	3.6	https://www.fs.tul.cz/en/strojar-uni
Dean's Directive no. 1/2019 Mobility Fund of the FME	3.7	https://www.fs.tul.cz/en/legislation-fme-tul

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Textile Engineering

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Self-assessment:

Faculty of Textile Engineering Technical University of Liberec (FT) is a unique institution in the Czech Republic with a rich history and tradition. Its focus combines technological research, artistic creation, and an environmentally responsible approach. FT is a pioneer in areas such as nanotechnologies, the development of advanced materials, sustainability in textile production, and design focused on the modern needs of society.

Mission and vision of the faculty

- **Mission:** To provide high level of education, to conduct research and development with a direct social impact, and to support ecological and technological innovations in the textile industry. FT strives to educate experts who will be able to face current and future challenges in their professional practice.
- **Vision:** To become a recognised international centre of excellence in textile engineering and innovation. FT plans to expand cooperation with industrial and academic partners on a global level and contribute to solving current challenges such as sustainability, the circular economy, and the integration of technology into everyday life.

Self-reflection of the social contribution of the faculty

FT has long-term significant social contribution, which is reflected in various areas. FT contributes to the development of the textile industry, improving the quality of life and protecting the environment. Key contributions of FT include:

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

1. **Healthcare:** Development of nanofiber textiles and medical materials, such as protective masks, antibacterial clothing, and biodegradable implants.
2. **Ecology:** Innovation in the field of textile waste recycling, development of ecological materials, and application of textile structures in wastewater treatment.
3. **Safety:** Smart textiles improving protection and safety, for example in transport (reflective materials), industry (protective clothing), and crisis situations (protection against CBRN agents).
4. **Art and design:** FT connects creativity and technology, which brings unique results in the fields of fashion design, textile art, and exhibition projects.

A significant contribution is FT's role as a leader in the field of nanofibers, which is reflected in applications in healthcare (e.g., medical textiles), ecology (removal of waste substances), and safety technologies (protective clothing).

FT also participates in educational activities that connect science with the public. It organises events such as Researcher's Night, workshops, excursions and lectures, raising awareness of current themes in textile research.

Distribution of research activities according to the type of research

FT performs a wide range of research activities, which can be divided into three basic types:

1. **Basic research:** Aimed at understanding the physical, chemical, and mechanical properties of textile materials. This research forms the basis for advanced applications.
2. **Applied research:** Development of technologies and materials with the aim of immediate use in industrial practice, for example smart textiles, medical and protective materials.
3. **Experimental development:** Putting innovations into practice in the form of pilot projects, prototypes, and cooperation with industrial partners. These developments are focused on specific applications, such as the production of ecological textiles or special composites.

FT focuses on strategic areas of research: advanced materials, innovative products, advanced technologies, nanomaterials and nanotechnologies, metrology and quality assessment, artistic creative activity.

Branch capacities are mainly focused on outputs in FORD group 2. Engineering and Technology 85% (Materials engineering 63% and Nano-technology 115%). Due to the wide applicability of textiles, the research results are also represented in FORD group 1. Natural Sciences 13% (mainly Chemical Sciences 8% – this is due to research in the field of fibres and final treatments). Another area of application of hi-tech fibre structures leads the research FORD group 3. Medical and Health Sciences 2%.

Organisational structure of the faculty

FT consists of the following specialised departments that cover key areas of textile engineering and design:

- **Department of Design:** Focuses on textile and clothing design, connecting creativity and technology.
- **Department of Textile Evaluation:** Specialises in testing and analysing the properties of textile materials.
- **Department of Materials Engineering:** Research of advanced materials, including finishing and composites.
- **Department of Nonwovens and Nanofibrous Materials:** Leader in research into nonwovens and nanofibrous technologies and structures.
- **Department of Clothing:** Deals with the development and production of clothing and smart products with regard to their functionality.

- **Department of Technologies and Structures:** Focuses on technologies for the production of both clothing and technical textiles, their innovation and the development of highly functional textile applications

The management of FT consists of the Dean and Vice-Deans responsible for research, education, and development. Administrative and organisational support is provided by the Office of the Dean, which ensures the efficient running of FT, communication with partners and students, and project coordination. This structure enables FT to respond flexibly to challenges and opportunities in the field of textile industry and innovation.

FT staff consists of more than 100 academic workers who actively connect teaching with research. FT implements nine accredited study programmes in Czech and six in English at the Bachelor's, Master's and doctoral level. In the period under evaluation, FT had approximately 3400 students, which proves its significant educational capacity.

Long-term objectives of the faculty

1. Strengthen international cooperation in the field of research and education, especially in projects financed by EU programmes.
2. Increase the commercialisation of R&D results and expand cooperation with industrial partners.
3. Develop sustainable and ecological solutions in the textile industry that contribute to the circular economy.
4. Support innovative approaches in education connecting technological knowledge with creativity.

FT is aware of its dual role in education: on the one hand, it is responsible for the quality training of experts for light industry, on the other hand, it fulfils the role of a university workplace responsible for the highest education of a person in the general sense of the word.

FT has long been regarded as a key institution for the development of the textile industry and as an innovator responding to current challenges. By combining scientific research, practical applications, and a sustainable approach, FT contributes to positive changes in society and industry.

Table 3.1.1 - Staffing per FTE²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	5.61/0.00	5.95/0.00	5.50/0.00	5.25/0.00	5.10/0.00	27.41/0.00
Associate Professor	11.76/4.13	11.05/4.47	11.67/4.9	11.84/5.00	12.29/5.43	58.61/23.93
Assistant Professor	29.30/21.98	28.63/23.38	30.48/24.65	31.75/25.35	27.78/21.54	147.94/116.90
Assistant	3.67/2.84	3.95/2.50	3.99/2.32	2.86/1.36	3.05/1.55	17.52/10.57

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

R&D Personnel ³	19.83/10.73	20.60/12.00	20.87/12.88	19.34/11.89	18.94/11.69	99.58/59.19
Researchers in other categories ⁴	25.35/17.15	23.52/17.61	21.55/17.32	20.21/15.14	21.63/8.75	112.26/75.97
Technical and economic staff ⁵	16.49/14.39	17.11/15.04	17.26/15.35	17.40/15.57	16.45/14.55	84.71/74.90
Scientific, research and development staff involved in teaching activities	67.94/43.00	66.40/44.47	67.52/45.40	66.77/43.78	63.64/40.43	332.27/217.08
Early career researchers ⁶	9.60/5.80	7.86/5.06	8.13/5.07	8.87/5.31	7.71/4.18	42.17/25.42
Total ⁷	112.01/71.22	110.81/75.00	111.32/77.42	108.65/74.31	105.24/63.51	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	1	0	1	0	1	0	5	0
Associate Professor	0	0	0	0	2	0	5	3	2	2	2	0
Assistant Professor	0	0	7	3	17	15	2	2	4	3	0	0
Assistant	0	0	3	2	1	1	0	0	0	0	0	0
R&D Personnel ⁹	3	3	4	2	6	2	2	2	4	2	1	1
Researchers in other categories ¹⁰	1	1	9	6	7	7	6	5	1	1	1	0
Technical and economic staff ¹¹	0	0	1	1	7	7	5	5	3	2	1	0

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁵ Who participates in the management and support of R&D&I in the institution.

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (excluding persons working on agreement on work activity or agreement on work performance).

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

Scientific, research and development staff involved in teaching activities	0	0	13	7	28	23	14	10	8	6	8	0
Early career researcher ¹²	0	0	7	3	2	2	0	0	0	0	0	0
Total ¹³	4	4	24	14	41	32	21	17	15	10	10	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	0	0	1	0	2	0	4	0
Associate Professor	0	0	1	1	3	0	3	2	5	3	2	0
Assistant Professor	0	0	3	0	18	15	8	8	1	1	0	0
Assistant	0	0	4	2	0	0	0	0	0	0	0	0
R&D Personnel ¹⁵	4	4	5	4	3	0	5	3	2	1	1	1
Researchers in other categories ¹⁶	1	0	7	1	8	7	5	5	3	2	0	0
Technical and economic staff ¹⁷	0	0	1	1	4	4	7	7	2	2	2	0
Scientific, research and development staff involved in teaching activities	1	0	9	3	28	21	17	15	11	6	6	0
Early career researcher ¹⁸	0	0	4	1	3	2	1	1	0	0	0	0
Total ¹⁹	5	4	21	9	36	26	29	25	15	9	9	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported

¹² See Definition of Terms in Methodology HEI2025+.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

¹⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	526	387	502	344	471	352	470	359	456	343	2425	1785
Master's ²⁰	166	122	166	130	141	101	122	82	129	89	724	524
Doctoral	67	27	60	26	58	30	61	30	45	21	291	134
Lifelong Learning Courses											0	0
Total	759	536	728	500	670	483	653	471	630	453	3440	2443

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	4/2	0/0	4/2	0/0	4/2	0/0	4/2	0/0	4/2	0/0	20/10	0/0
Master's	2/1	0/0	2/1	0/0	3/1	0/0	3/2	0/0	3/2	0/0	13/7	0/0
Doctoral	2/1	0/0	2/1	0/0	2/1	0/0	2/1	0/0	2/2	0/0	10/6	0/0
Lifelong Learning courses	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Total	8/4	0/0	8/4	0/0	9/4	0/0	9/5	0/0	9/6	0/0	43/23	0/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	0	Applied Research	13
	1.2 Computer and information sciences	0	Applied Research	
	1.3 Physical sciences	2	Applied Research	
	1.4 Chemical sciences	8	Applied Research	
	1.5 Earth and related environmental sciences	1	Applied Research	
	1.6 Biological sciences	1	Applied Research	

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

	1.7 Other natural sciences	1	Applied Research	
2. Engineering and Technology	2.1 Civil engineering	1	Applied Research	85
	2.2 Electrical engineering, Electronic engineering, Information engineering	3	Balanced basic and applied research	
	2.3 Mechanical engineering	2	Balanced basic and applied research	
	2.4 Chemical engineering	2	Balanced basic and applied research	
	2.5 Materials engineering	63	Balanced basic and applied research	
	2.6 Medical engineering	1	Balanced basic and applied research	
	2.7 Environmental engineering	1	Balanced basic and applied research	
	2.8 Environmental biotechnology	0	-	
	2.9 Industrial biotechnology	0	-	
	2.10 Nanotechnology	11	Balanced basic and applied research	
	2.11 Other engineering and technologies	1	Balanced basic and applied research	
3. Medical and Health Sciences	3.1 Basic medicine	1	Applied Research	2
	3.2 Clinical medicine	0	-	
	3.3 Health sciences	1	Applied Research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0	-	0
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	
	4.4 Other agricultural sciences	0	-	
5. Social Sciences	5.1 Psychology and cognitive sciences	0	-	0
	5.2 Economics and Business	0	-	
	5.3 Education	0	-	
	5.4 Sociology	0	-	
	5.5 Law	0	-	
	5.6 Political science	0	-	
	5.7 Social and economic geography	0	-	
	5.8 Media and communications	0	-	
	5.9 Other social sciences	0	-	
6. Humanities and the Arts	6.1 History and Archaeology	0	-	0
	6.2 Languages and Literature	0	-	
	6.3 Philosophy, Ethics and Religion	0	-	

	6.4 Arts (arts, history of arts, performing arts, music)	0	-	
	6.5 Other Humanities and the Arts	0	-	
	Total	100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

Position in the research community

FT is a full member of the International Association of Textile Faculties (AUTEX). The FT representative is a member of the committee for the revision of the accreditation of the joint study programme of the Autex association, the so-called WE-Team NMSP "Textile Engineering" accredited in Ghent, Belgium. As a member of the Textile - Clothing - Leather Association (ATOK), it participates in European Apparel and Textile Confederation (EURATEX) meetings. FT participates in activities with the EU "European Technology Platform – Fibers Textiles Clothing". FT has been accepted into the New European Bauhaus.

All FT study programmes are accredited by the European Federation of National Engineering Associations (FEANI). The professional organisation "The Textile Institute Manchester" accredits the study programmes BSP "Textile", NMSP "Textile Engineering" and DSP "Textile Engineering" until 2026.

FT detailed evaluation of the results in international rankings through the analytical tool InCites from Clarivate (<https://incites.clarivate.com>) based on the citations of publications indexed on (WoS). 2019-2023, TUL in the Materials Science – Textiles research subfield, ranked 20th compared to other (approximately 3978) world organisations (of which 32.0% of documents in Q1 and 45.1% in Q2 according to JIF).

Individual and other prestigious R&D awards

FT monitors important awards won by both its staff and students.

Employee awards highlight their lifelong contribution to textile research and education at an international level. Among the most important are the Order of Laurel awarded by Prof. RNDr. Oldřich Jirsák, CSc., for his essential contribution in the field of science and research, and the honorary title of Doctor honoris causa for prof. Ing. Luboš Hese, DrSc., from the National Institute of Technology in Jalandhar. The younger generation is represented by Mohanapriya. Venkataraman, M.Tech., M.F.Tech., Ph.D.

Student awards testify to their talent, creativity, and ability to compete on prestigious international platforms. For example, Ing. Jakub Erben, Ph.D., won 1st place in the international Théophile Legrand

Textile Innovation Award competition, and his scientific achievements were also recognised by the Minister of Education, Youth and Sports of the Czech Republic.

The Werner von Siemens Award (2022) (1st place for the best diploma thesis) was won by Senta Müllerová and Ing. Markéta Klíčová. The Werner von Siemens (WvS) award returned to the Technical University of Liberec after ten years. The diploma thesis from the University of Liberec was awarded after 17 long years, and for the first time ever, a female scientific couple was awarded.

Exceptional results were also achieved by BSP Design students. Ondřej Kábele won the Stanislav Libenský Award, Josefína Váchová, awarded for her glass design in the Master of Crystal competition.

Participation of academic staff in the editorial boards of international scientific journals

Materials Science – Textiles is one of the Web of Science research subfields in which FT is active and is pivotal for the faculty in the area of R&D. In the Journal Citation Reports for the year 2023, 30 specialist journals are indexed in the Materials Science – Textiles subfield. In eight journals, FT is represented on the editorial board (according to JIF 2×Q1 2×Q2 1×Q3 1×Q4 2×N/A), i.e., FT is represented by academic staff on the editorial boards of prestigious international textile journals, which cover the entire breadth of the textile field. Since 1994, FT has been a co-publisher of the specialist journal *Vlákna a textil* (Slovakia), ISSN: 1335-0617 (<http://vat.ft.tul.cz>), indexed in the SCOPUS database (<https://www.scopus.com/sourceid/17198>). Table 3.2.2 shows the involvement of academics of different age categories.

Elected memberships in professional societies

The membership of FT academic staff in professional societies includes several important functions and involvements that support the FT's international prestige and contribute to its involvement in R&DI. A summary of the most important memberships follows:

1. International and European organisations:
 - FEANI (European Federation of National Engineering Associations): Prof. Jiří Militký holds the position of President of the Czech Monitoring Committee in Brussels.
 - Textile Bioengineering and Informatics Society: Prof. Jiří Militký is the Vice-Chairman of the International Executive Committee
2. National involvement:
 - CLUTEX – klastr technické textilie o.s.: Ing. Gabriela Krupincová works as a member of the administrative committee.
 - Czech Technology Platform for Textiles (ČTPT): Prof. Zdeněk Kůs is a member of the administrative committee.
3. Specialised professional organisations:
 - Membership in organisations focussing on colour and lighting and such as CIE (Commission Internationale de l'Eclairage), where doc. Michal Vik holds various positions.

The most important invited lectures of academic staff abroad

The most significant can be considered the long-term work of prof. Jakub Wienera and doc. Dr. Ing. Dana Křemenáková teaching a course at MSP WETEM Textile Engineering Ghent University, Belgium (more in table 3.2.3, where younger colleagues are more represented).

The most important lectures by foreign scientists and other guests

In the period under evaluation, 31 invited lectures by foreign experts took place. The examples in Table 3.2.4 represent both the geographic and thematic breadth of professional contacts.

Involvement in the evaluation of national or European project/programme calls is lower. The reason is the specific focus of FT: research activities target specific areas that may have lower representation in European priorities, which may affect the relevance of project proposals to the challenges. Prioritisation of national projects: the historically close cooperation with Czech industry

has led to a preference for calls focused on applied research with a direct impact on the national level.

Other services to the scientific community

Art exhibition activity: FT guarantees the activity of the university Gallery N (Czech and foreign works and the presentation of well-known authors and student works. Employees of the Department of Design participate as exhibitors in other exhibition, competition, or presentation activities, (e.g. 21 in the Czech Republic and 10 abroad per year)

Organisation of seminars, webinars, summer schools, and conferences (see chapter 3.7 FT traditionally organises international conferences (International Conference STRUTEX – 23rd year) and summer schools (e.g., Fabric patterning – 6th year) and seminars or webinars focused on textiles (e.g., in cooperation with Thai and Indian institutions).

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Employees		
Oldřich JIRSÁK, prof. RNDr. CSc.	Order of Laurel for lifelong contribution in the field of science and research (2019)	Chamber of Commerce of the Czech Republic
Luboš HES, prof. Ing. DrSc., Dr.h.c	Doctor honoris causa form NITJ (2019)	National Institute of Technology in Jalandhar
Mohanapriya. VENKATARAMAN, M.Tech., M.F.Tech., Ph.D.	Outstanding presentation award (2020)	The Textile Bioengineering and Informatics Society (TBIS)
Students		
Jakub ERBEN, Ing. Ph.D.	1 st Prize of The International Théophile Legrand Textile Innovation Award (2019)	Théophile Legrand Foundation
Jakub ERBEN, Ing. Ph.D.	Award for extraordinary results in scientific activity (2022)	Minister of Education, Youth and Sports
Senta MULLEROVÁ	1 st Place for Best Thesis 2021 Werner von Siemens Prize (2022) Incorporation of Antibiotics into Biodegradable Nanofibrous Layers for New Medical Applications	Siemens, s. r. o.
Markéta KLÍČOVÁ, Ing.	1 st Place for Best Thesis 2021 Werner von Siemens Prize (2022) Incorporation of Antibiotics into Biodegradable Nanofibrous Layers for New Medical Applications	Siemens, s. r. o.
Ondřej KÁBELE	1 st place, Stanislav Libensky Award (2023)	Stanislav Libensky Award
Anežka KOTKOVÁ	Good student design, Award of the Dean of the Faculty of Design and Art Ladislav Sutnar, Award for Ecology (2023)	National Award for Student Design 2023
Josefína VÁCHOVÁ	Master of Crystal Competition and Exhibition 1 st place (2023)	Museum of Glass and Jewellery in Jablonec n. N

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Luboš HES, prof. Ing. DrSc., Dr. h. c.	Editorial Board <i>Journal of Industrial Textiles</i> , ISSN: 1528-0837 (WoS, Materials Science – Textiles, Q1, JIF RANK 7/30), https://journals.sagepub.com/editorial-board/JIT
Luboš HES, prof. Ing. DrSc., Dr. h. c..	Editorial Advisory Board <i>Textile Research Journal</i> , ISSN: 0040-5157, (WoS, Materials Science – Textiles, Q2, JIF RANK 13/30) https://journals.sagepub.com/editorial-board/TRJ
Jiří MILITKÝ, prof. Ing. CSc.	Scientific Board, <i>Fibers and Textiles in Eastern Europe</i> , ISSN 2300-7354 (WoS, Materials Science – Textiles, Q3, JIF RANK 20/30), http://www.fibtex.lodz.pl/en4/scientific_board.html
Petra KOMÁRKOVÁ, Ing. Ph.D.	International Editorial Board, <i>Tekstilec</i> , ISSN 0351-3386 (WoS, Materials Science – Textiles, Q3, JIF RANK 20/30), http://www.tekstlec.si/?page_id=14&lang=en
Maroš TUNÁK, doc. Ing. Ph.D.	Editor in Chief, <i>Vlákna a textil</i> , ISSN: 1335-0617, SCOPUS http://vat.ft.tul.cz/Office/office.html
Adnan Ahmed MAZARI, Ing. Ph.D.	Editorial Board Member, <i>Industria Textila</i> , ISSN 1222-5347 (WoS, Materials Science – Textiles, Q3, JIF RANK 17/30), http://revistaindustriatextila.ro/editorialboard.html
Pavla TĚŠINOVÁ, Ing. Ph.D.	Editorial Advisory Board <i>Textile & Leather Review</i> ISSN 2623-6281, SCOPUS https://www.tlr-journal.com/editorial-board/
Blanka TOMKOVÁ, Ing. Ph.D.	Editorial Board Member, <i>Journal of Testing and Evaluation</i> ISSN 0090-3973 (WoS, Materials Science – Characterisation and Testing, Q4, JIF RANK 31/38), https://www.astm.org/journal-of-testing-and-evaluation.html#editorial-board
Lukáš ČÁPEK, doc. Ing. Ph.D.	Associate Editor, <i>Journal of Engineered Fibers and Fabrics</i> , ISSN 1558-9250, (WoS, Materials Science – Textiles, Q1, JIF RANK 7/30), https://journals.sagepub.com/editorial-board/JEF
Mohanapriya VENKATARAMAN, M.Tech., M.F.Tech., Ph.D	Associate Editor <i>Journal of Fiber Bioengineering and Informatics</i> , ISSN 1940-8676, SCOPUS https://www.global-sci.org/jfbi

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Jakub WIENER, prof. Ing. Ph.D.	"Dyeing of textiles, printing, textile chemistry, finishing of textiles", teaching of course in MSP WETEM Textile Engineering	Ghent University, Belgium within the activities of the Autex association	2019 2020 2021 2022 2023
Dana KŘEMENÁKOVÁ, doc. Dr. Ing.	"Nanotechnology in textile branch: Basic of nanotechnology, Nanophysics, Nanoparticles, Nanofluids, Nanostructures" teaching of course in MSP WETEM Textile Engineering	Ghent University, Belgium within the activities of the Autex association	2020 2021 2022 2023

Luboš HES, prof. Ing. DrSc., Dr. h. c.	"Principles of Clothing Comfort"	ITB Dresden	2019
Jiří MILITKÝ, prof. Ing. CSc.	Characterisation and Ultimate Strength of Hybrid Glass Tapes.	14 th Textile Bioengineering and Informatics Symposium (TBIS)	2021
Luboš HES, prof. Ing. DrSc., Dr. h. c.	The Effect of Surface Structure of Cotton Knits on Their Water Vapour Permeability, Effusivity and Thermal Resistance	International Conference on Sustainability in Technical Textiles ICTS 2021. Bannari Amman Institute of Technology in South India. India	2021
Michal VIK, prof. Ing. Ph.D.	Series of lectures on Lighting Engineering within Programa de Pós-Graduação em Engenharia Elétrica (Online)	UFSM (Federal University of Santa Maria) in Brazil	2021
Mohanapriya VENKATARAMAN, M.Tech., M.F.Tech., Ph.D	Keynote medal lecture (Online): Application of Porous Activated Carbon Structures for Deactivation of SARS-CoV-2 - Outstanding Reviewer Award	15 th Textile Bioengineering and Informatics Symposium (TBIS), Liberec, Czech Republic	2022
Mohanapriya VENKATARAMAN, M.Tech., M.F.Tech., Ph.D	Keynote speaker (Online): Fly Ash Fillers and Impact Resistance of Epoxy matrices	The 2 nd China-CEECs Symposium on Advanced Fiber Material, China	2022
Mohanapriya VENKATARAMAN, M.Tech., M.F.Tech., Ph.D	Keynote medal lecture (Online): Advanced Fibrous Structures for Enhanced Thermal Insulation	16 th Textile Bioengineering and Informatics Symposium (TBIS), Poznan, Poland	2023
Mohanapriya VENKATARAMAN, M.Tech., M.F.Tech., Ph.D	Invited speaker (In-person): Recent Research in Textile Material Engineering Invited speaker (In-person): Multilayered Fibrous Structures for High- Performance Thermal Application	Wuhan Textile University, China 2023 International Conference on the Cooperation and Integration of Industry, Education, Research, and Application, Zhejiang Sci-Tech University, Hangzhou, China	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Alan GONCA, res. assist. Dr.	Usak University, Türkiye	Nonwovens and Recycling in Textiles, Novel approaches in management of solid textile wastes, Alternative usage areas for sustainable recycled textile structures	2019
Klara KOSTAJNŠEK, doc. dr.	University of Ljubljana, Slovenia	Weaving on a laboratory scale, planning new woven products development	2019
Javed SHEIKH, assoc. Prof. Dr.	Indian Institute of Technology New Delhi, India	Sustainable Textile Chemical Processing, Natural Dyeing, Eco-Friendly Functionalisation Of Textile Materials	2019
Carmen VISCONTRE, assoc. Prof. Dr.	Bergamo University, Italy	Advanced and Specialised Textile Processing – Mechanical	2020

Sofien Ben LTOUFA, prof. Dr.	University Monastir, Tunisia	Heat and Mass transfer in real conditions of its use	2020
Yordanka ANGELOVAa, PhD	University Gabrovo, Bulgaria	Advanced and Specialised Textile Processing – Knitting	2020
Alain BOURMAUD, Dr. Hab.	University of South Brittany, Dupuy de Lôme Research Institute (IRDL)	Multi-scale impact of flax fibres specificity on textile preforms and biocomposite properties	2022
Yiska GOLDFELD, assoc. prof.	Faculty of Civil and Environmental Engineering TECHNION – Israel Institute of Technology	Smart self-sensory Textile Reinforced Concrete Structures - Achievements & Challenges	2022
Monica GOMEZ, prof.	Science Faculty, Universidad Nacional de Ingenieria, Lima, Peru	Textiles functionalised with metal oxides	2023
Hideo YASUNAGA, prof.	Kyoto Institute of Technology	Dyeing and functional finishing by using biobased materials	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Roman KNÍŽEK, Ing. Ph.D.	Technological incubation	CzechInvest	2023
Veronika TUNÁKOVÁ, Doc. Ing. Ph.D.	CL - Programme to support applied research and innovation in the field of transport - TRANSPORT 2030 (2023 - 2030)	Technology Agency of the Czech Republic	2022 2023
Veronika TUNÁKOVÁ, Doc. Ing. Ph.D.	TM - DELTA 2 Applied Research, Experimental Development and Innovation Support Programme (2020 - 2025)	Technology Agency of the Czech Republic	2022 2023
Veronika TUNÁKOVÁ, Doc. Ing. Ph.D.	FW - TREND (2020 - 2027)	Technology Agency of the Czech Republic	2022 2023
Dana KŘEMENÁKOVÁ, doc. Dr. Ing.	MOBILITY programme Calls: Czech - Germany Czech - France Czech - Austria	Technology Agency of the Czech Republic	2020 2021 2022 2023
Jiří Militký, Prof. Ing. CSc.	Areas: #563 Materials Science and Engineering #372 Composite Material #420 Sustainability	Top Scholar at ScholarGPS	2022
Zdeněk KUS, prof. Dr. Ing.	Member of the Control Board	Technology Agency of the Czech Republic	2023
Zdeněk KUS, prof. Dr. Ing.	Member of the Presidium - Vice-Chairman	Technology Agency of the Czech Republic	2019 2020 2021 2022

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the period of 2019–2023²³. This should be done from the full list in annex tables (Table 3.3.1–3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

FT implements (mostly in cooperation with enterprises) applied research projects of various providers (most often the Ministry of Industry and Trade, the Technology Agency of the Czech Republic, the Ministry of Health, the Ministry of the Interior Ministry of Education, Youth and Sports). The projects presented here were selected in order to document the extent of applications of textile fibre formations, which corresponds to the social and knowledge contribution of FT. For each project, the R&D area implemented at FT, which the project represents, is indicated. Social relevance is demonstrated through the specific results (a complete overview in the appendix, tables 3.3.1 and 3.3.2 with regard to the achieved results or the application potential of the projects).

A) Projects supported by public funds – FT as the main beneficiary:

1. Hybrid materials for hierarchical structures (2018–2023, EF16_019/0000843)

The research involved the connection of textile engineering, materials research, and applied sciences, with interdisciplinary cooperation between TUL workplaces playing a key role. Another objective of the project was to connect research capacities across the Faculty of Textiles (FT), the Faculty of Mechanical Engineering (FME), and the Institute for Nanomaterials, Advanced Technologies and Innovations (Cxl) in the development of hybrid materials with hierarchical structures. The results of the project contributed to the development of materials with unique mechanical, thermal, and biological properties, which are used, for example, in building composites, medical implants, or functionalised textiles. The project significantly strengthened the connection between basic and applied research at FT and contributed to its position as an excellent centre for materials research. The results also reflect FT's strategic objective, i.e., to support innovations with a high social and industrial impact.

2. R-DETI: Improving the quality of care for children suffering from dermatological troubles (2020–2022, TL04000150)

This project explored the social, ethical, and health aspects of caring for children suffering from dermatological troubles, with an emphasis on the development of functional textiles. The result was innovative clothing with antibacterial properties that improve comfort and hygiene. The project had a strong social impact, especially in the area of healthcare and childcare. Co-investigators: VÚB a.s., Charles University / Faculty of Medicine in Hradec Králové. The project

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

involved cooperation with experts from the fields of medicine and social sciences, which ensured an interdisciplinary approach and the application of results in practice. R-DETI contributed to expanding the possibilities of personalised care for children with special needs and strengthened the role of FT as a centre of innovation with a direct social impact. The project also raised awareness of the importance of connecting research and practical applications in the field of medical textiles.

3. Eco-clothing collection (2023 – 2026, TQ01000450)

The project focuses on the development of sustainable clothing products that combine innovative technologies, ecological materials, and timeless design. The aim is to create clothing with a minimal ecological footprint, which at the same time meet the requirements for functional, aesthetic and psychological comfort. The project supports the circular economy by using recycled and biodegradable materials. The resulting collection reflects the interdisciplinary collaboration between materials engineering and textile design. This project contributes to the fulfilment of FT's mission of innovation for sustainability and the transformation of the textile industry towards environmental responsibility. It connects scientific research with creative practice and represents an important step towards the development of sustainable fashion.

4. Prevention of intestinal anastomotic leakage (2020–2023, NU20J-08-00009)

The project focused on the development of nanofibrous biodegradable materials for the prevention of postoperative complications, especially intestinal anastomotic leakage and postoperative adhesions. The aim was to create innovative medical materials that improve the healing process and reduce the risk of complications in patients after surgical procedures. The research resulted in biodegradable layers with targeted drug release, which were tested in collaboration with clinical partners. The materials have demonstrated the ability to improve functional tissue regeneration and reduce post-operative infection rates, representing a significant benefit to healthcare. The project partner was Charles University Faculty of Medicine in Pilsen. The project emphasised the interdisciplinarity between textile engineering and biomedicine, thereby strengthening the ability of FT to transfer research results into practice in the field of health technology. The results also the strategy of FT, i.e., to support innovations with a direct impact on improving the quality of life of patients.

B) Projects supported by public funds - FT in the role of other participant

5. Smart textile against CBRN agents (2017–2020, VI20172020059)

The project focused on the development of smart textiles that provide protection against chemical, biological, radiological, and nuclear (CBRN) agents. The aim was to create materials with high barrier efficiency, long-term stability, and the ability to respond to specific hazards. The research led to the development of advanced nanocomposite textiles that were tested for resistance to a wide range of CBRN agents. The resulting materials have found application in protective clothing for emergency services, industrial workers, and other groups exposed to the risk of contact with dangerous substances. The project leader was National Institute for NBC Protection. The project highlighted the importance of interdisciplinary collaboration between textile engineering, chemical research, and safety technologies. The results significantly contributed to strengthening the ability of FT to implement research with high social and industrial value and to respond to current security challenges.

6. Texderm – Textiles and clothing showing increased comfort intended for specific needs of children suffering from dermatological troubles (2017–2021, FV20287)

The project focused on the development of textiles and clothing intended for children with sensitive skin who need special care. The aim was to create materials with increased comfort

and antibacterial properties that reduce skin irritation and improve the quality of life of users. Principal investigator: VÚB a.s., co-investigator Charles University Faculty of Medicine in Hradec Králové. FT contributed to the development of functional textiles, which were tested in terms of mechanical and health properties. The project involved working with medical professionals to ensure that the resulting products met the specific needs of the target group. The project showed the potential of textile research in personalised healthcare and strengthened the role of FT in the field of textiles aimed at health and social needs.

7. VIDTEX – Smart textiles for increased safety in transport (2019–2022, FV40323)

The objective of the VIDTEX project was to increase the safety of road users through the development of smart textiles and clothing with reflective and luminescent properties. Principal investigator: VÚB a.s. FT focused on the development of advanced materials that ensure visibility under various lighting conditions. The project brought new materials with a long service life and high resistance to external influences. These materials have found application in clothing for pedestrians, cyclists, and workers in the transport sector. VIDTEX promoted the use of smart textiles in practice and contributed to greater road safety, demonstrating the practical benefit of FT research for society.

8. Complete removal of nitrogen and phosphorus from wastewater (2019–2022, TH04030390)

The project focused on the development of textile biomass carriers for efficient wastewater treatment, specifically on the removal of nitrogen and phosphorus. The result was textile structures that support biological treatment processes and increase treatment efficiency in industrial and municipal treatment plants. Principal investigator: Technical University of Liberec / Institute for Nanomaterials, Advanced Technologies and Innovations. FT played a key role in the development and optimisation of textile materials, which were successfully tested in real operation. The project contributed to expanding the possibilities of using textile materials outside of traditional areas, with an emphasis on environmental protection. The project underlined the applicability of FT research in ecological innovations and demonstrated FT's ability to respond to current environmental challenges.

9. Antifibrotic fibre material for reducing intraocular pressure in glaucoma (2023–2026, NU23-08-00586)

The project focuses on the development of an innovative fibre material designed to prevent fibrotisation and effectively reduce intraocular pressure in patients with glaucoma. The aim is to create a medical material that supports tissue regeneration, minimises post-operative complications, and improves the effectiveness of surgical interventions. Principal investigator: Charles University 3rd Faculty of Medicine. Research links textile engineering with medicine, with advanced fibre processing technologies and the application of biologically active substances playing a key role. Materials developed at FT are tested in collaboration with clinical partners to meet requirements for biocompatibility and functional properties. The project significantly contributes to the field of health innovations, especially ophthalmology, and strengthens the ability of FT to transfer research results into practice. It also contributes to the development of interdisciplinary solutions with a direct impact on improving the quality of life of glaucoma patients.

C) Contractual research

10. SaYu, a.s. Czech Republic – Development and innovation of a special absorbent layer

In the framework of the cooperation with SaYu, a.s., FT participated in the development of a special absorbent layer designed for innovative hygiene products. The aim was to create a material with high absorbency, fast absorption, and a long service life. FT conducted research focused on the optimisation of textile structures and properties, which led to a significant improvement in the utility properties of the final products. The project brought a commercially applicable result that was successfully established on the market. This cooperation underlined the role of FT as a reliable partner in the field of contractual research and contributed to the practical application of innovations in the industrial sphere.

Evaluation of effectiveness and impacts

The selected projects represent the wide range of FT research activities with clear application potential. A key aspect is their interdisciplinarity and the ability to connect academic research with practice, whereby FT contributes to fulfilling its mission and solving societal challenges.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Support (in thousands CZK/EUR) ²⁶				
		2019	2020	2021	2022	2023
Technology Agency of the Czech Republic	Sophisticated hybrid tapes for fabrication of composites (2017 – 2019, TJ01000292)	1 058 /41.7				
Minister of Education, Youth and Sports	Development and research of modified fabrics by nanoparticles for the protection of human health and electronic equipment (2019 – 2021, 8J19UA011)	89 /3.5		89 /3.5		
Minister of Education, Youth and Sports	Design of multi-layer micro/nano fibrous structures for air filters applications (2019 – 2021, 8JCH1064)	147 /5.8				
Minister of Education, Youth and Sports	Hybrid materials for hierarchical structures, (EF16_019/0000843, 2018-2023) – FM, FT, CxI	16 686 /658.2	21 000 /828.4	14 000 /552.3	822 /32.4	

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

Technology Agency of the Czech Republic	R-DETI Improving the quality of care for children suffering from dermatological troubles from the point of view of ethics, social and health care in times of pandemic crises (2020 – 2022, TL04000150)		642 /25.3	1 655 /65.3	1 426 /56.3	
MZO	Prevention of intestinal anastomotic leak and postoperative adhesions using nanofibrous biodegradable materials (2020 – 2023, NU20J-08-00009)		1 316 /51.9	2 188 /86.3	2 194 /86.5	1 897 /74.8
Grant Agency of the Czech Republic	Advanced structures for thermal insulation in extreme conditions (2021 – 2025, GM21-32510M)			2 425 /95.7	2 497 /98.5	2 497 /98.5
Technology Agency of the Czech Republic	Eco-clothing collection (2023 – 2026, TQ01000450)					1 400 /55.2
MEYS	Student Grant Competition (SGS)	5 081 /200.4	3 948 /155.7	3 539 /139.6	3 637 /143.5	3 411 /134.6
Total		23 061 /909.7	26 906 /1 061.4	23 896 /942.6	10 576 /417.2	9 205 /363.1
In the role of another participant						
Provider ²⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Ministry of Industry and Trade	MEDITEX - Research and development of new types of advanced textile materials with high potential for application in special textiles intended for health and aftercare. (2016- 2019. FV10098)	1 421 /56.2				
Ministry of the Interior	Smart textiles against CBRN substances (2017 – 2020. VI20172020059)	2 401 /94.9	2 311 /91.3			

²⁷ Ibid.

Ministry of Industry and Trade	Hybrid security element (2016-2019. FV10356)	1 025 /40.5				
Ministry of Industry and Trade	Nanofiber covers for skin defects (2016-2019. FV10416)	1 571 /62.1				
Ministry of Industry and Trade	Special clothing and textile products with high utility properties based on a new generation of intelligent materials, which will increase the efficiency of health and social care for the elderly (2015 – 2020. EG15_019/0004528)	260 /10.3				
Ministry of Industry and Trade	SeniorTex – smart modular clothing and special textile products with integrated electronic microsystems for improving the quality of health care for the aging population and disabled people (2016 – 2020. FV10111)	1 491 /58.9	984 /38.9			
Ministry of Industry and Trade	Sky Paragliders a.s. – research and development of new technical fabric for air rescue systems (2015 – 2020. EG15_019/0004588)	1 411 /55.8	249 /9.8			
Minister of Education, Youth and Sports	Wearable IoT (2017 – 2020. LTE217018)	259 /10.2	172 /6.8			
Technology Agency of the Czech Republic	SMARTTHERM – Intelligent thermoregulating fibres and functional coating of textiles based on heat-resistant encapsulated PCM (2019 – 2021. TF06000048)	730 /28.9	750 /29.6	740 /29.2		
Ministry of Industry and Trade	Texderm – textiles and clothes with increased comfort for the specific needs of children suffering from dermatological	1 034 /40.9	1 034 /40.9	534 /21.1		

	troubles. (2017 – 2021. FV20287)					
Technology Agency of the Czech Republic	Heat exchangers with hollow polymer fibres for the automotive industry (2019 – 2022. TH04010031)	400 /15.8	400 /15.8	400 /15.8	400 /15.8	
Ministry of Industry and Trade	VIDTEX - Smart textiles and clothing with high utility properties to increase safety in transport. especially visibility (2019 – 2022. FV40323)	252 /10	1 293 /51.1	1 212 /47.9	1 212 /47.9	
Ministry of Industry and Trade	Processing of waste and recycled textile fibres (2019 – 2022. FV40025)	448 /17.7	698 /27.6	698 /27.6	632 /25	
Technology Agency of the Czech Republic	PROSYKO – Pro-Active System of Commercialisation at TU Liberec (TG01010117): CxI-FT sub-projects – TUL. FT	703 /27.8	1 138 /45	1 605 /63.4	441 /17.4	
Technology Agency of the Czech Republic	Complete removal of nitrogen and phosphorus from wastewater using purpose-made textile biomass carriers (2019 – 2022. TH04030390) – CxI. FT	265 /10.5	232 /9.2	228 /9	104 /4.1	
Grant Agency of the Czech Republic	Nanofibrous polymers with the functionality of restricted access materials for on-line chromatographic extractions of complex matrices (2020 – 2022. GA20-19297S)		1 171 /46.3	1 171 /46.3	1 158 /45.8	
Ministry of Industry and Trade	Textile structures combining protection against viruses and comfort (2021 – 2023. EG20_321/0024467)				715 /28.3	1 401 /55.4
Technology Agency of the Czech Republic	MultiTex – Advanced smart textiles with multifunctional effects for improving the quality of professional and functional clothing in a risky environment (2021 – 2024. FW03010095)			1 794 /70.9	1 798 /71.1	1 818 /71.9
Ministry of the Interior	Modular multisensory professional clothing				1 977 /78.1	1 977 /78.1

	for risk management, health protection and safety of IRS members using artificial intelligence methods. (2022 – 2025. VJ02010031)					
Technology Agency of the Czech Republic	Research and development of special textiles for protection in emergency and crisis situations “TexPrevent”. (2023 – 2026. FW06010021)					1 135 /44.9
Technology Agency of the Czech Republic	Nanofibrous extraction sorbents for chromatographic analyses. (2023 – 2026. FW06010698)					1 371 /54.2
Ministry of Health	Antifibrotic fibre material for reducing intraocular pressure in glaucoma. (2023 – 2026. NU23-08-00586)					982 /38.8
Total		13 671 /540.4	10 432 /412.3	8 382 /331.3	8 437 /333.5	8 684 /343.2

Table 3.3.2 - Contract research activities

Client ²⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Večerník s.r.o Czech Republic	Verification of electromagnetic shielding efficiency, thermal reflection and transmittance in the IR region	660 /26.1				
Sintex a.s. Czech Republic	Research, development and evaluation of extremely shielding textile structures for special applications	660 /26.1				
Dekonta a.s. Czech Republic	Technical solutions for personal protective clothing using nanocomposite barrier materials against industrial and CBRN agents	200 /7.9	550 /21.7	309 /12.2	310 /12.3	
Pardam Nano4fibers s.r.o. Czech Republic	Development of biodegradable textiles using spunbond technology		100 /4			
Riocath Research	Development of a mixture of suitable materials for the construction of a fibrous structure		49 /1.9			

²⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

Institute, a.s. Czech Republic						
Procter & Gamble Service GmbH NĚMECKO	Production of non-woven textiles from staple fibres by needling process, optimisation of the process			150 /5.9		
KOH-I-NOOR HARDTMUTH a.s. Czech Republic	Conversion of the limits of the colorimetric triangle to the CIELAB colorimetric system			47 /1.9		
Healthy Apparel, Ltd. CANADA	Optimisation of spun-blown filter media				672.6 /26.5	223 /8.8
Procter & Gamble Service GmbH NĚMECKO	Campaing Nonwoven – parameter tests for machine settings				150 /5.9	
Deva-FM s.r.o. Czech Republic	Development of a new suit for firefighters					490 /19.4
SaYu, a.s. Czech Republic	Development and innovation of a special absorbent layer					890 /35.2
CitiZen s.r.o. Czech Republic	Innovation of quick-drying swimwear					475 /18.8
Faramugo, s.r.o. Czech Republic	The design of the construction of the hybrid jacket, including the cutting solution					490 /19.4
Dimatex CS, s.r.o. Czech Republic	The development of a garden kitchen from recycled materials with an emphasis on sustainability					280 /11.1
TykvaNet, s.r.o. Czech Republic	Design and development of prototypes of the so-called anti-flood bags					405 /16
Direct Alpine, s.r.o. Czech Republic	Finding a suitable way to reuse non-functional products					490 /19.4
Direct Alpine, s.r.o. Czech Republic	Finding suitable materials from recycled raw materials and developing a new hydrophobic treatment					100 /4
Nil Textilie Czech Republic	Development of an ecological skin substitute					650 /25.7
Grund a.s.	Development of the company's product recycling technology				438 /17.3	
Jihočeský vědecký park	Development of a new highly absorbent knitted fabric for optimal moisture distribution with subsequent use for incontinence aids and menstrual panties				100 /4	
TryMee Clothing s.r.o.	Verification of the influence of laundry detergent on the properties of textile functional materials				248 /9.8	
benaSONET, s.r.o.	Evaluation of the properties of circular textile products					372 /14.7

Total	1520 /60.1	699 /27.6	506 /20	1 313 /51.9	4 865 /192.3

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

FT has a long-term focus on research with a practical overlap, which brings positive impacts for society, industry, and the environment. In the period under evaluation (2019–2023), FT implemented and supported several key research results that have either already found practical application or are headed for it in the near future. These results are based on implemented projects and collaborations (chapter 3.3) and were designed with regard to current societal challenges such as sustainability, technological innovation, and improving the quality of life.

The presented results include applications in the fields of healthcare, security, textile industry, and environmental protection. FT places emphasis on taking the gender dimension into account when creating inclusive and diversity solutions that reflect the needs of a wide range of users. A sustainable approach is an integral part of research projects, either through the use of environmentally friendly materials, recycling, or reducing negative environmental impacts.

In the period under evaluation (2019-2023), the following results of applied research are recorded in the authorship/co-authorship of FT employees:

- 30 patents (of which five are co-owned with another organisation / enterprise as a result of a joint project), in 14 cases these include international (4 EU, 2 China, 2 Spain, 2 Japan, 1 Poland, 1 Russia, 2 USA) and 16 national involvement. Evidence of interdisciplinary cooperation is that 48% of the originators are from FT, 48% are from other parts of TUL, and 4% are from other organisations;
- 40 utility models - 25 co-owned with an enterprise (the result of a joint project), 62% of the originators are from FT, 8.4% are from other parts of TUL, and 29.6% are from other organisations;
- Others include two verified technologies, five prototypes, and 43 functional samples

The following text provides an overview of the **10** most significant research results that contribute to solving societal needs and have real potential to improve the lives of individuals, support innovation in industry, and contribute to environmental protection. Each result is supplemented with specific examples of its use, target groups, and expected impacts.

²⁹ See Terms definition.

A) Results claimed under co-ownership agreement

1. Textile composite for the production of personal hygiene aids and a personal hygiene aid based on this composite (utility model, 2021)

A solution for the production of hygiene aids mainly for menstruating women or patients with incontinence. Unlike single-use hygiene products, which are often non-recyclable and waste that is difficult to decompose, the utility model makes it possible to create products that can be washed and therefore reused. This ensures comfort, reduces the burden on the environment (compared to disposable aids) and helps fight against menstrual poverty for women.

The textile composite consists of a supporting and covering layer of fabric, between which a functional vapor-permeable membrane is inserted, which prevents the passage of water and which is laminated to the base layer. The covering layer of the functional composite is made of natural material, i.e., merino wool. This composite material with the trade name SAYUtech (and subsequently SAYUpro) was successfully applied by SAYU in the production of menstrual underwear. The underwear is made with the least possible impact on the environment with the responsible use of human resources and do not contain any harmful substances. The utility model was created based on consumer (societal) demand, and has been put into production and successfully sold, i.e., economically evaluated. The utility model is co-owned by TUL and SaYu s.r.o. The rights to use the result were granted to SaYu s.r.o. through the signed Cooperation Agreement. The contracting parties agreed that SaYu s.r.o. will provide TUL with a share of the use of intellectual property for each product sold for the production of which intellectual property will be used. Based on the company's accounting data, in the last quarter of 2021, approximately 6000 pieces were produced and sold, and in 2022, approximately 11,000 pieces. In 2023, approximately 6000 products were sold by the end of August. The initial phase of expansion to Slovakia and Germany is underway.

B) The most significant results leading to application

2. Textile-based composite material (utility model, 2023)

This is a composite with textile reinforcement, which is created by processing discarded textiles and clothing with the smallest possible need for their pre-sorting. The resulting material has a wide range of uses and contributes to solving issues with the reuse of textiles that would otherwise be landfilled or incinerated. The utility model is co-owned by TUL and Diakonie Broumov sociální družstvo based on a co-ownership agreement (2023), which states the percentage of annual turnover the manufacturer pays TUL. The material is in production, and payments are expected to be made in 2024.

3. Textile composite containing feathers (utility model, 2023)

This is a composite material composed of textile, a nanofiber vapor-permeable but waterproof membrane, and feathers. The material concept is suitable for outdoor clothing and combines thermal insulation and waterproofing. The utility model is co-owned by TUL and OutdoorKWAK s.r.o. based on a co-ownership agreement (2023), which states the percentage of annual turnover the manufacturer pays TU. The material is in production, and payments are expected to be made in 2024.

4. Textile biomass carrier (Utility model 2022); Technology for the complete removal of nitrogen and phosphorus from wastewater using purposefully produced textile biomass carriers (verified technology 2022)

Two results were created as part of interdisciplinary interfaculty research (project: TH04030390 – Complete removal of nitrogen and phosphorus from wastewater using purpose-made textile biomass carriers): utility model and verified technology. Pilot operation is underway in the wastewater treatment plant (WWTP) for the Dobrovíz commercial zone (Amazon WWTP). The pilot reactor models the degree of post-nitrification, i.e., the situation where most of the decomposable organic substances are removed, and also the concentration of NH_4^+-N is in mg/l.

Pilot testing confirmed the use of the microfiber carrier for a WWTP. Negotiations are currently underway with TEBO on cooperation in the production of carriers and their supply to WWTPs.

5. Flat textile, especially for thermal protection of seniors in winter (utility model 2019), Prototype clothing collection (Prototype, 2019)

The outputs were created in cooperation with VUB a.s. as part of the project EG15_019/0004528 – Special clothing and textile products with high utility properties based on a new generation of intelligent materials that will increase the efficiency of health and social care for the elderly. The knitwear is made of yarn, which consists of a mixture of modified polyester fibre with antibacterial effects with a small proportion of standard polyester fibre and modified viscose with a flat cross-section of fibres and a serrated surface. The reason for using modified polyester is its antibacterial properties, which add silver ions to the fibre. It is particularly effective against the *Staphylococcus aureus* and *Klebsiella pneumoniae*. The additive used ensures a permanent antimicrobial effect that does not affect the wearing or washing of finished products throughout their lifetime. These properties prevent the multiplication of bacteria in the fibre or on the fibres and therefore improve the hygiene of the products. The viscose fibre has been developed for maximum thermal comfort with improved moisture permeability. The intellectual property is co-owned (TUL/VUB a.s.) and negotiations are currently underway regarding the use with Clinitex s.r.o.

6. Clothing with an emphasis on easy maintenance, especially for children suffering from dermatological troubles (Utility model, 2021), Flat textile in the form of knitwear, especially for dressing children suffering from dermatological troubles (utility model, 2021)

The outputs were created in cooperation with VUB a.s. as part of the project FV20287 – TEXDERM; Textiles and clothing showing increased comfort intended for specific needs of children suffering from dermatological troubles. Special flat textile in the form of knitwear for dressing children suffering from dermatological troubles is made from advanced functional textile materials, which form yarns from mixtures of micromodal and viscose fibres. The main and effective ingredient is a viscose fibre containing chitosan, which gives the produced textiles antibacterial properties, which represents for the user a limitation of the reproduction of microorganisms, prevents skin irritation and eliminates odour. Another component of the final product is micromodal fibre. A characteristic feature of micromodal fibre is a very fine, smooth texture and ability to absorb moisture. The fabric is made as a double-sided knit in a double-sided or ribbed knit. The technical solution of special clothing, especially for children suffering from dermatological troubles, is aimed at easy maintenance of this clothing, made from advanced textile materials with a focus on sensory, ergonomic and physiological comfort of the target group of wearers of the clothing, that is, children with dermatitis to eliminate skin irritation. The intellectual property is co-owned (TUL/VUB a.s.) and negotiations are currently underway with the ethics committee of the Charles University Faculty of Medicine in Hradec Králové regarding the approval of clinical tests.

7. Clothing with active and passive light signalling for unprotected road users (functional sample, 2021)

The output was created in cooperation with VUB a.s. as part of the project FV40323 – VIDTEX - Smart textiles and clothing with high utility properties to increase safety in transport, especially visibility. This garment has the potential to increase the protection of cyclists and pedestrians by increasing visibility. The intellectual property is co-owned (TUL/VUB a.s.) and the first samples are currently being produced to verify the marketing strategy. In the event of success on the market, the revenues for TUL are outlined in the project implementation agreement.

C) Research results with a long-term time horizon of application potential

8. R&D outputs with a direct impact on the sustainability of production and products

In addition to sustainability being considered in all FT activities and projects, FT has several research directions that are directly focused on the sustainability of fibre-based production and products. Two outputs are mentioned here, for which a commercialisation partner is being sought.

Patent: A method of producing concentrated organic fertilizer from raw sheep's wool, created as part of the project EF16_019/0000843 – Hybrid materials for hierarchical structures solves the processing of waste sheep's wool, which is still incinerated or landfilled and is currently being negotiated with a potential manufacturer.

Utility model: Visual indicator of washing a textile product proposes a simple indicator that will allow retailers to quickly check if the returned product has/has not been washed when clothing products are returned, which is against the product return conditions and has the potential to reduce costs for retailers in unauthorised clothing returns. We are currently negotiating with potential users - clothing retailers.

9. R&D outputs intended for protection against viral infection

In the period of the COVID-19 pandemic, research teams focused on R&D applications for protection against viral infection. Several solutions were created that are in the FT portfolio for commercialisation. Created as part of project VI20172020059 – Intelligent textiles against CBRN agents:

- **Surface ozone generator (Patent, 2020)** The new solution includes a flat perforated supporting structure made of electrically non-conductive material, which is made of textile. The output is offered for commercialisation through the university spinoff "The University Company TUL.
- **Portable device for measuring high ozone concentrations (utility model, 2020).** Small and simple electrochemical detectors are currently commonly used to protect the health of workers who work for long periods of time in an environment with an increased probability of higher concentrations of ozone gas. Their disadvantage is their short service life. The result is offered for commercialisation through the university spinoff "The University Company TUL.
- **Mouth mask for children with skin diseases (utility model, 2020)**, created as part of the project TL04000150 – R-DETI Improving the quality of care for children suffering from dermatological troubles from the point of view of ethics, social, and health care in times of pandemic crises and offers sophisticated multifunctional mouth masks for children suffering from dermatological troubles. We are currently negotiating with Clinitex a.s.
- Several functional samples were created as part of the project EG20_321/0024467 – Textile structures combining protection against viruses and comfort: protective face mask, set of sweatshirt, elastic pants – clothes that, thanks to the material used, have very good physical-mechanical properties (abrasion resistance, strength...), meet the thermal and physiological comfort values for the 1st and 2nd clothing layers and are also equipped with a special VIRATEX ST/L antiviral treatment. The solutions have the potential to protect and ensure quality life in crisis situations.

10. Nanofiber technologies and materials

Research in the field of nanofibrous materials and technologies, in which FT is a world leader, leads to outputs with a long-term time horizon, where already existing results have a great potential of impact on improving the quality of life. Therefore, it is crucial for the entire university to protect outputs with international patents. The following were applied in the period under evaluation:

- **Method for producing polymeric nanofibers by electrospinning a polymer solution or melt, a spinning electrode for performing the method and a device for producing polymeric nanofibers equipped with at least one such spinning electrode [EU] [ES] [RU] [US].**
- **A linear fibre forming body having a coating of polymer nanofibers covering the supporting linear forming body constituting the core, a manufacturing method thereof, and a manufacturing apparatus [JP] [US] [CN]**

The patents are owned by TUL, the originators are from 3 faculties (FT, FS, FP), i.e. interdisciplinary collaboration. These patents are essential for the protection of unique know-how, which is further developed by teams of various TUL faculties both in materials applications and in technological devices.

For FT, the current development is represented, for example, by the following outputs:

- **Micro / nanofibrous scaffold for tissue engineering (Functional sample, 2019)** - specific structure of a mixture of meltblown micro and nanofibers in animal surgery, a promising at applications in medicine, e.g., in vitro testing of a thymic organoid.
- **Device for incorporating particles into a flat textile containing nanofibers (Functional sample, 2022)** - technology for incorporating particles into a flat textile containing nanofibers has a potential in medical applications.
- **Biodegradable composite nanofibrous layer with anti-adhesive treatment for the prevention of postoperative adhesions (Functional sample, 2023)** – research output from the project NU20J-08-00009 – Prevention of intestinal anastomotic leakage and postoperative adhesions using nanofibrous biodegradable materials, which is an ongoing research project, in vivo tests of the new structures on animal models are currently underway.

These results illustrate the practical impact of FT's research on society and industry, many of which involve sustainability, either by reducing waste, protecting health, or promoting green practices. In some cases, aspects of the gender dimension are also taken into account, especially in the field of health applications, where products are designed for a wide range of users regardless of gender.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ³⁰	Year of application	Name
Utility model	2021	Textile composite for the production of personal hygiene aids and a personal hygiene aid based on this composite
Utility model	2023	Textile-based composite material
Utility model	2023	Textile composite containing feathers
Utility model	2022	Textile biomass carrier
Utility model	2019	Flat textile, especially for thermal protection of seniors in winter
Utility model	2021	Flat textile in the form of knitwear, especially for dressing children suffering from dermatological troubles 2021
Functional sample	2021	Clothing with active and passive light signalling for unprotected road users
Patent	2021	A method of producing concentrated organic fertilizer from raw sheep's wool
Patent	2020	Surface ozone generator
Patent	2020	Method for producing polymeric nanofibers by electrospinning a polymer solution or melt, a spinning electrode for performing the method and a device for producing polymeric nanofibers equipped with at least one such spinning electrode [EU][ES] [RU] [US]

³⁰ Specify the specific type of result. Add rows as needed.

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³²

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

FT systematically supports the transfer of R&D results into practice through cooperation with industrial partners, public institutions, and the community sector and, of course, through teaching in accredited study programmes. The main aim is to ensure that research results find real use, contribute to the development of innovations, and respond to current social challenges.

FT has a clearly defined system for the transfer of results, which includes:

1. Strategic partnerships with the application sphere

FT systematically cooperates with industrial enterprises, public institutions, and non-profit organisations. This cooperation includes:

- Joint projects focused on applied R&D (e.g., development of smart textiles for security applications, or medical use).
- Contractual research and development, adapted to the needs of specific partners

2. Support of the application of research through technology and know-how

Direct application of research results through the production of experimental materials (e.g., meltblown textiles during the COVID-19 pandemic). Technology transfer in the form of the sale of licenses for innovations that are the result of research activities.

3. Commercialisation of results through:

- University spinoff “The University Company TUL”
- Student participation in the Student Business Club
- Consulting services provided to enterprises.

³¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³² If the commercialisation of R&D&I results is carried out in this way.

4. **Finding and engaging new users**
5. **Innovation support system**, infrastructural and organisational support for the transfer of results includes:
 - Laboratories where direct development and verification of results takes place
 - Popularisation of R&D results, which increases awareness of the possibilities of their application
 - A system of services related to the transfer of technology to TUL (consultation and advice for creating contracts and negotiating contractual terms)
6. **Consideration of sustainability and the gender dimension**
 - FT emphasises sustainable development and inclusivity, which is reflected in the focus of results on ecological materials, the circular economy, and the wider applicability of innovations.

The most typical users of FT results

1. **Industrial enterprises – implementation of joint project** Example: joint projects with VUB a.s. (five projects of the Ministry of Industry and Trade for the period under evaluation)
2. **Industrial enterprises - works contracts** Example: SaYU a.s., the initial work contract grew into joint research that led to an R&D result applied under a co-ownership agreement.
3. **State Administration** Example: Liberec Region - as part of solving the crisis situation in the first wave of the COVID-19 pandemic, FT produced non-woven textiles, which it provided to the regional crisis staff, more than 40 km of material was produced.
4. **Research organisations** Example: 3rd Faculty of Medicine/ Charles University cooperation in implementing the project Antifibrotic Fibre Material for Reducing Intraocular Pressure in Glaucoma, (2023 – 2026, NU23-08-00586), the provider was the Ministry of Health
5. **Association of companies.** FT is actively involved in the creation of national strategies for the textile and clothing industry. FT is a member of the Association of the Textile-Clothing-Leather Industry (ATOK), Czech Technological Platform for Textiles, the Technické Textilie Clutex o.s. cluster. It has cooperated with other members of these groups for a long time.

Searching for new users of results

FT actively searches for new users at the following events:

1. **Industrial trade fairs** (e.g., ITMA, ISPO, IDET)
2. **International conferences** (e.g., STRUTEX)
3. **Networking events** (e.g., CLUTEX o.s. committee for R&D, ATOK annual general meeting...)
4. **Popularisation events** (e.g., Mercedes Benz Fashion Week, press conference)
5. **Individual consultation with enterprises** (e.g., cooperation with OutdoorKWAK s.r.o. began on the basis of personal contacts between FT scientists and company employees)

Commercialisation of R&D results

FT actively commercialises and evaluates its research results through the procedures given below. This enables the effective transfer of results into practice and their application in the industrial environment, healthcare, and other areas.

- **Co-ownership of intellectual property** (Research results are often protected by utility models, patents, or functional samples, which are subsequently licensed to commercial partners. Co-ownership agreements with enterprises include, for example, a share of the revenue for each product sold or a percentage of the production turnover (e.g. SAYUtech menstrual underwear and textiles containing feathers for outdoor clothing from the company OutdoorKWAK a.s.)
- **Support of spin-off and start-up companies** (FT cooperates on technology transfer with a university spin-off company (e.g., ozone measuring device and ozone generator for disinfection)

- **Direct application of the results in industry** (pilot projects, such as the use of textile biomass carriers in wastewater treatment plants, demonstrate direct involvement in addressing specific technical issues. Another example involves the processing of discarded textiles into composite materials that find application in environmental applications.)

Professional consulting activity (FT provides consulting services to enterprises, which expands the possibilities of using R&D and supports effective application in practice).

Evaluation of effectiveness of the transfer of results and commercialisation:

As revenue from non-public sources (other than grants or contractual research), FT registers revenue from the following activities (in order of frequency): expert analyses, consultations, testing, donations to R&D and license fees. The sum of the funds obtained is constant and, in accordance with the FT development strategy, proportional to the size and capacity of the evaluated unit. The most significant benefit of this cooperation is the possibility of establishing new contacts with potential contractors of contractual research and subsequently planning joint projects (a full overview is concluded in the Appendix, Tab. 3.5.1). Although FT has been achieving significant results in research and innovation for a long time, the volume of revenue from the direct commercialisation of these results is relatively limited. This situation is mainly influenced by the preference of corporate partners to engage in joint research projects that are partially or fully financed from public sources. Joint projects allow partners to share the risks and costs associated with the development of innovations, while at the same time exploiting the synergies between academic research and the application sphere. However, these projects often do not provide FT with the possibility of direct economic evaluation of the results, which is reflected in the lower share of revenue from licenses or patent sales. Therefore, FT focuses on finding ways to improve the commercialisation of its results, for example by expanding the portfolio of protected results, targeted support of spin-off companies, and searching for partners who are ready to invest in the direct use of innovations on a commercial basis. This approach reflects not only the needs of industry, but also FT's strategic objective of achieving a greater evaluation of its research for sustainable development and further investments in R&DI.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Measurement, training, analysis, pattern design	2090/82.4	4692/185.1	1634/64.5	2385/94.1	2016/79.5
Donations (Gity a.s., Preciosa Foundation, Statutory City of Jablonec)	530/20.9	135/5.3	150/5.9	620/24.9	165/6.5
Licences				5/0.2	10/0.4
Measurement, training, analysis, pattern design	2090/82.4	4692/185.1	1634/64.5	2385/94.1	2016/79.5
Total	2620/103.4	4827/190.4	1784/70.4	3010/118.7	2191/86.4

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

The strategy of FT is to focus its popularisation activities on the general public and potential students. Examples are given according to the type of promotion with an emphasis on the synergistic effect of these activities.

A) Presentation of R&D results in a popular form in various media

Successes in R&D are presented in the form of a “story” at press conferences, through the TUL press spokesperson and promotional department, and through social networks. Examples of interesting themes are given below.

1. *ITMA 2019 international trade fair in Barcelona*, presentation of equipment for the production of nanocomposite yarn. The presentation of the production line for alternating spinning is also an example of interdisciplinary cooperation within TUL with the faculties of mechanical engineering and natural sciences, humanities and pedagogy. (2019)
2. Ing. Markéta Klíčová and Ing. Jakub Erben were accepted for an *internship at Harvard* (Wyss Institute for Biologically Inspired Engineering at Harvard University) in 2020. They worked there on the development of organs on a chip with a nanofibrous membrane. FT benefited from further promotion from the information about their research, i.e., 11 independent articles on the website, one session in CRo Plus, and four articles in print media. The following articles can be regarded as the most interesting in terms of promotion: Jakub Erben - Award: Reflex weekly star, for scientific achievements, Markéta Klíčová - Forbes: 30 under 30, interview for Visegrad Female Leaders. (2019, 2020)
3. Presentation of *cooperation in crisis situations*. As part of the solution to the crisis situation in the first wave of the COVID-19 pandemic (16 March 2020, the Government of the Czech Republic declared a state of emergency and the obligation to wear face masks), FT produced non-woven textiles, which it provided to the regional crisis personnel, who dealt with sterilisation and distribution exclusively and preferentially to medical and other staff at this time of urgent operations. Production on laboratory equipment (meltblown) began in March 2020 and ended on 7 May 2020, more than 40 km of material were produced. FT also conducted an analysis answering questions about the quality of materials that are gradually flooding the market. (2020)
4. In 2022, six articles were published in the periodical *Technický týdeník*, which dealt with presentations of professional themes solved by FT research teams, a presentation of student awards took place (Minister of Education Award - Jakub Erben, Verner von Siemens Award - Senta Müllerová, Ing. Jana Horáková), TV broadcast of the program *Touring the Czech Republic of the Future*, Friday 29 July 2022, 10:00 a.m., theme: FT cooperation with companies.
5. The reach and attractiveness of the themes can be shown in the evaluation *from 2023*, when FT was presented in various types of media 271 times (radio, television, print and online news), the total advertising value equivalent (AVE) of these themes was 48.68 million CZK. The themes covered by the media the most were: Recycled Textile Board, Markéta Klíčová, advisor to the Minister; Nanofibrous Sorbents by Jakub Erben; TUL = cradle of nanofibers / celebrates 70 years; Student participation in MBPF 2023

B) Presentation of textile materials and structures in artistic work

6. *Organisation of exhibitions and presentations for the public (Gallery N, G3P).* FT guarantees the activities of the university's Gallery N in Jablonec nad Nisou, where it prepares exhibitions entitled Personalities of the Artistic Platform, as well as its own creations by employees, student creations, and presentations of other activities (11 exhibitions per year). G3P (Third Floor Gallery) is a student project. The aim is to provide students with the experience of holding their own exhibition and to bring the work of the young generation closer to the public.
7. *Participation in exhibitions:* creations from the fields of design were applied by academic staff and students of BSP Design and NMSP Design – textiles, clothing, glass, jewellery at an average of 25 activities per year (in the Czech Republic and abroad). The most important are the fashion shows of student creations: *Mercedes Benz Fashion week Prague (2019, 2020, 2021, 2022, 2023)* and presentations at *Paris Design Week (2022, 2023)*.

C) Long-term work with talented individuals in primary and tertiary education

Periodically recurring activities between 2019 and 2023 (in 2020 some were cancelled, others took place online). The most interesting examples are as follows:

8. *Clothing and textiles competition for primary and secondary schools;* ten primary schools from the Liberec region and thirty secondary schools from the whole Czech Republic regularly participate (in total, approximately 500 primary and secondary school students). The agenda includes a combination of technical and artistic direction in the field of textiles and clothing, familiarisation of students with the activities of textile companies, textile workshops, presentations of student creations. One day to one week events for interested primary and secondary school students (250 students per year): *project days, holiday courses, Children's University, consultation of student works* and support for competitions (e.g., secondary school professional activity), internships of secondary school students.

D) Open days, excursions, workshops, lectures, competitions

9. FT is regularly involved in the following activities: *Open Days* (face-to-face and online, February and November), *Researchers' Night*, and *Maker Faire* - a festival of innovators, excursions to laboratories for primary and secondary schools, *popularisation lectures* (e.g., *Girls belong at TUL*), *European Cultural Heritage Days*.

E) International cooperation and promotion of science

10. The aim is to make FT viable on a global scale and strengthen its international reputation. In addition to professional events (conferences, seminars, summer schools) presentation for foreign students and applicants are held:
 - 2019: event "Study in Czech Republic", Alumi group, Czechia (M. Venkataraman, M.Tech., M.F.Tech., Ph.D.)
 - 2019: webinar on "Insights into Textile Material Research" - K.S. Rangasamy College of Technology, Coimbatore, India (M. Venkataraman, M. Tech., M.F. Tech., Ph.D.)
 - 2021: presentation for students from Ukraine - at KNUTD Kyiv
 - promotion of textile innovations at foreign exhibitions (e.g., 2021: World Expo in Dubai 2020) *cooperation with embassies and support of cultural diplomacy* (2021: presentation for the Indian embassy entitled History and Present of Textiles - doc. Dr. Ing. Dana Křemenáková).

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Self-assessment:

Based on the IEP 2018 report, FT paid increased attention to the involvement of employees in international activities. Connection with the international community was both incoming and outgoing. On the one hand, the activities of employee trips and their involvement in international institutions and events (outgoing) were supported, as well as the organisation of foreign visits, seminars, summer schools, and international conferences at FT (incoming). In that period, special emphasis was placed on the motivation and involvement of younger colleagues.

Support of international cooperation of junior employees, Support of the creation of new partnerships of faculty employees and junior faculty employees with foreign research teams

FT supports the travel of all employees as part of the Erasmus+ project and similar projects. Junior staff are actively involved in scientific research projects and encouraged to submit their own projects. In relation to the TUL Career Rules, it is necessary to complete an internship abroad once every three years, which will create another opportunity to establish cooperation. Younger colleagues have the opportunity to present their results at conferences.

Involvement of younger employees in editorial work

FT enables employees to perform editorial activities. In 2021, one employee became an editor-in-chief of a journal and another became an executive editor. A total of nine employees are editors (not of retirement age), special editors or associate editors of various journals. Membership of editorial boards can be obtained based on the professional community becoming aware of an academic and he or she is recommended or offered to become an editor based on their professional activity. Therefore, FT supports personal contact within the framework of international cooperation (conferences), and supports publication activities in renowned journals, etc.

In its annual reports, FT also monitors other indicators of connection with the international community, i.e., employee mobility, international seminars, summer schools, conferences organised by FT, participation of FT employees in the organising committees of international conferences, and participation in international network projects. Below are several cross-sectional indicators:

Employee mobility (number of people/number of days of mobility)

	2019	2020	2021	2022	2023
Incoming	18/141	2/16	1/5	5/34	8/37
Outgoing	32/226	1/5	3/9	13/116	11/55

Comment: In 2020, due to the COVID-19 pandemic, mobility was significantly reduced compared to previous years. Only stays in the first quarter took place, the others were cancelled. Many activities (seminars, bilateral meetings) have since been transferred to an online form.

International conferences held by FT

2019: *Textile Research Symposium* 17-19/06/2019 - International conference organised based on Czech-Japanese cooperation with international participation co-organised by the Textile Machinery Society of Japan; (<http://trs2019.ft.tul.cz>); 123 participants from 10 countries;
2022: *15th International Conference on Textile Bioengineering and Information* (TBIS 2022) (online 05-08/09/2022,

<https://tbisociety.org/index.php?thispage=subpage&c=news&s=news&p=2022news1>), 125 participants from 15 countries

2022: 23rd International Conference STRUTEX (Structure and Structural Mechanics of Textiles) (30/11-02/10/2022 in Liberec, with physical participation) focused on the presentation of textile structures and building mechanics (<http://strutex.ft.tul.cz>); 85 participants from 10 countries.

International summer schools

2019, 2021, 2022, 2023: Summer School Fabric Patterning – 14-day international summer school of patterning (weaving, knitting); www.ft.tul.cz/fabric_patterning

2019: Summer school of composites with textile reinforcement

2020, 2021, 2023: Winter school Course on Finite Element Method in textile Engineering, <http://www.ft.tul.cz/veda-a-vyzkum/course-on-fem/schedule>

2021, 2023: Summer School of Textile Structures – first year, <https://www.ft.tul.cz/veda-design/summer-school-of-textile-structures>

International network projects - Erasmus+ KA220 Programmes

Sustainable Design and Process in Textiles for Higher Education (Reg. No. 2021-1-PL01-KA220-HED-000032201) – – main coordinator: POLITECHNIKA LODZKA; project manager from FT: Ing. Pavla Těšínová, Ph.D. (2022-2023)

European Digital Readiness Strategy for Clothing Studies (Reg. No 2021-1-DE01-KA220-HED-000023124) – main coordinator: TECHNISCHE UNIVERSITAET DRESDEN; project manager from FT: Ing. Adnan Ahmed Mazari, Ph.D. (2022-2023).

Evaluation:

In the period under evaluation, it was possible to support more active involvement of younger colleagues in shaping international relations and internationalisation (although this period was disrupted by the COVID-19 pandemic). The result is greater involvement in editorial activities in international journals, active organisation of international summer schools and conferences at FT (both physically and online), which are attractive to foreign students and invited lecturers, participation in international network projects and, of course, active staff trips.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
FT website	3.1-3.7	http://www.ft.tul.cz/en/
FT Self-Evaluation Report 2019-2023	3.1-3.7	https://www.ft.tul.cz/en/faculty/reports/reports
R&DI strategy 2030+	3.3, 3.4	https://www.ft.tul.cz/en/faculty/mission-vision-strategy
FT Annual Report	3.1-3.7	https://www.ft.tul.cz/en/faculty/reports/reports
FT projects	3.3	http://www.ft.tul.cz/en/research/projects/projects
FT Lists of partners	3.2, 3.3	http://www.ft.tul.cz/en/research/cooperation/national-activities
FT R&D&I Cooperation	3.2, 3.3	http://www.ft.tul.cz/en/research
FT Laboratories	3.3	http://www.ft.tul.cz/en/labs
FT Organised Conferences	3.2	http://www.ft.tul.cz/en/research/conferences/conferences
FT List of Individual Awards	3.2	https://www.ft.tul.cz/en/faculty/publicity/awards
FT Media	3.6	https://www.ft.tul.cz/en/faculty/publicity/media

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Science, Humanities and Education

FORD: 5 - Social sciences

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2–3.7.

Self-assessment:

The Faculty of Science, Humanities and Education (FSHE) mainly provides higher education to future teachers and other staff for various types of kindergartens, primary and secondary schools, and extra-curricular educational, educational and leisure facilities.

Mission and vision of the faculty

- **Mission:** The mission of FSHE is to expand knowledge, cultivate Czech society and contribute to social balance and sustainable development through scientific and artistic activity, quality education of students, and social action.
- **Vision:**
 - **In educational activities,** inspire students to develop knowledge, lead them to critical thinking, social responsibility, adherence to ethical principles and creativity. Focus on the training of qualified teachers and other teaching staff, and on the professional training of experts in the fields developed at FSHE. Contribute to the expansion of knowledge and to the practical application of new knowledge in the development of society in scientific, research, artistic, and other activities. Strive to provide a professional and innovative contribution leading to the improvement of

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

the quality of the work of teachers, the activities of schools, and other educational and educational facilities.

- **In the area of internationalisation**, cooperate in a broad international environment including students, academic staff, the research community, and foreign partner institutions.
- **In the area of the third role** (social activity) promote democratic principles, cultural diversity, humanistic values, and contribute significantly to the development of the Liberec region.

In terms of scientific, research and artistic activity, FSHE mainly focuses on activities that are primarily connected with the mission and activities of the faculty: research in pedagogical disciplines and didactics of fields in which FSHE provides teacher qualifications. This is the usual diverse breadth of natural sciences, social sciences and humanities at faculties of education. In addition to this research, it also focuses on basic and applied research in these fields, as they form the theoretical basis for the preparation of future teachers. Due to the breadth of fields offered and the emphasis on the primary mission of FSHE, the research cannot correspond to the usual performance of natural science, philosophy and similar specialised faculties (size of research teams, specialised equipment of workplaces, range of themes, etc.).

Organisational structure

FSHE was established in 1990 as the Faculty of Education of the University of Mechanical and Textile Engineering. This influenced its basic character and the professional profile of individual departments. In contrast to several other faculties of education, some of whose departments became embryos after 1990 and later became parts of newly emerging science and philosophy faculties. During its existence, FSHE maintained all its workplaces, developed them, and several new workplaces were created. The name of FSHE may seem complicated, however it is very descriptive. It is based on the coexistence of workplaces typical for science and humanities-oriented faculties. Nevertheless, FSHE implements mainly education-oriented programmes. The structure of FSHE does not completely correspond to other faculties of education, where significant parts are made up of the departments of education, pedagogy, psychology, special and social pedagogy. But the Ministry of Education, Youth and Sports of the Czech Republic and other universities consider FSHE to be primarily faculty of education.

FSHE consists of sixteen mainly branch-oriented departments, two divisions and two centres:

- Department of Primary and Preprimary Pedagogy
- Department of Pedagogy and Psychology
 - Psychology Division
- Department of Social Work and Special Pedagogy
- Department of Physical Education and Sports
- Centre for Pedagogical Practice
- Centre for Lifelong Learning

Workplaces with a significant science orientation:

- Department of Biology and Ecology
- Department of Physics
- Department of Geoinformatics and Didactics of Informatics
- Department of Chemistry
 - Bioengineering Division
- Department of Mathematics

- Department of Geography

Workplaces with a significant humanities orientation:

- Department of English
- Department of Czech Language and Literature
- Department of Philosophy
- Department of History
- Department of German
- Department of Romance Languages

Self-reflection of the social contribution

The role understood in this way is particularly important for the Liberec region. The many data obtained show that the presence of the regional faculty of education is decisive for ensuring a sufficient number of qualified teaching staff in various types of schools and in other teaching establishments in the given region. Thus it is necessary to further support the aforementioned character of the faculty, including the focus on the development of branch didactics and other pedagogical and psychological disciplines.

TUL is the only university in the Liberec region. Although the character of the region and historical development place an emphasis on technical fields, it is natural to also cultivate fields oriented towards natural sciences, society, and humanities. Since TUL is one of the smallest Czech universities and FSHE among the smallest faculties of education in terms of number of students, it makes a very good long-term sense for FSHE to have a broader focus than just an education orientation.

Breakdown of research activities

Since its inception, FSHE has also played an important role in research and development and innovation (R&DI) at the TUL. Workplaces and experts primarily in natural sciences (mathematics, physics, chemistry, biology), social sciences (pedagogy and psychology special pedagogy, physical education), and humanities (philosophy, history, languages) are concentrated at FSHE. Therefore, the university did not have to build the necessary specialised workplaces within each faculty, but on the contrary, its intention was to use the potential of FSHE for scientific and research work that goes beyond the focus of the individual faculties and the creation of professional teams across TUL.

Long-term objectives

The long-term objective of FSHE include, in particular, to strengthen in the field of social science, i.e., in the fields of pedagogy and psychology. Specifically, obtaining a doctoral study programme, or institutional accreditation in the field of pedagogy (which is also related to the development of personnel, publication and grant activities in this area).

In general, the objective and vision of FSHE is to be an independent educational and research centre supporting the development of the region.

Table 3.1.1 – Staffing per FTE²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	6.75/0.00	6.06/0.00	5.69/0.00	6.20/0.00	7.36/0.00	32.06/0.00
Associate Professor	29.41/9.09	28.89/8.10	30.30/7.55	30.80/6.80	31.47/8.02	150.87/39.56
Assistant Professor	93.71/53.01	97.58/54.12	103.92/56.40	102.61/56.8	103.17/57.06	500.99/277.39
Assistant	12.97/4.87	11.19/4.34	11.45/4.53	13.56/5.17	13.20/4.80	62.37/23.81
R&D Personnel ³	4.54/2.35	3.87/2.18	2.84/1.62	2.19/1.00	3.86/1.75	17.30/8.90
Researchers in other categories ⁴	16.32/7.95	14.95/7.26	13.39/6.74	14.06/6.14	18.57/8.75	77.29/36.84
Technical and economic staff ⁵	24.26/20.89	22.15/19.08	21.15/18.21	20.51/17.96	22.30/19.97	110.37/96.11
Scientific, research and development staff involved in teaching activities	156.24/73.96	157.35/73.65	164.51/75.23	165.54/74.45	168.15/76.10	811.79/373.39
Early career researchers ⁶	32.52/20.99	29.96/19.75	28.75/18.62	26.82/18.17	26.13/17.13	144.18/94.66
Total ⁷	187.96/98.16	184.69/95.08	188.74/95.05	189.93/93.87	199.93/100.35	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.2 – Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years & older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	0	0	3	0	3	0	2	0
Associate Professor	0	0	0	0	9	2	7	2	11	2	5	3
Assistant Professor	0	0	27	11	40	25	19	13	15	10	2	1
Assistant	1	1	8	4	4	1	1	0	0	0	0	0
R&D Personnel ⁹	0	0	1	0	1	0	1	1	1	1	0	0

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁵ Who participates in the management and support of R&D&I in the institution.

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁸ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

Researchers in other categories ¹⁰	0	0	3	0	3	1	7	5	5	3	0	0
Technical and economic staff ¹¹	0	0	4	3	5	5	9	8	3	3	1	1
Scientific, research and development staff involved in teaching activities	1	1	37	15	56	29	37	20	34	15	9	4
Early career researcher ¹²	0	0	15	9	11	6	7	6	2	2	0	0
Total ¹³	1	1	43	18	62	34	47	29	38	19	10	5

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.3 – Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years & older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	0	0	5	0	4	0	1	0
Associate Professor	0	0	0	0	12	4	11	4	7	2	5	0
Assistant Professor	0	0	21	12	57	31	27	14	11	9	2	1
Assistant	3	0	10	5	4	3	2	0	0	0	0	0
R&D Personnel ¹⁵	1	0	0	0	2	0	0	0	1	1	0	0
Researchers in other categories ¹⁶	3	2	3	1	6	4	5	3	5	2	1	0
Technical and economic staff ¹⁷	0	0	2	2	8	7	10	10	3	2	2	2
Scientific, research and development staff involved in teaching activities	5	2	32	18	79	42	50	21	27	13	9	1
Early career researcher ¹⁸	0	0	15	9	11	8	5	2	1	1	0	0
Total ¹⁹	7	2	36	20	89	49	60	31	31	16	11	3

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

¹² See Definition of Terms in Methodology HEI2025+.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

¹⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	791	446	762	409	795	444	827	429	890	461	4065	2189
Master's ²⁰	367	231	414	246	445	261	423	247	421	231	2070	1216
Doctoral	21	10	23	13	28	14	40	16	30	11	142	64
Lifelong Learning Courses	189	171	158	136	115	101	195	165	194	169	851	742
Total	1368	858	1357	804	1383	820	1485	857	1535	872	7128	4211

Table 3.1.5 – Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	23/0	1/0	23/0	1/0	23/0	2/0	23/0	2/0	24/0	2/0	116/0	7/0
Master's	7/0	0/0	7/0	0/0	8/1	0/0	8/0	0/0	8/1	0/0	38/2	0/0
Doctoral	2/0	0/0	2/0	0/0	0/0	0/0	0/0	0/0	3/1	0/0	7/1	0/0
Lifelong Learning courses	12/0	12/0	7/0	7/0	11/0	11/0	12/0	12/0	10/0	10/0	52/0	52/0
Total	44/0	12/0	39/0	8/0	42/1	13/0	43/0	14/0	45/2	12/0	213/3	59/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

Table 3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	9	Basic Research	22
	1.2 Computer and information sciences	1	Basic Research	
	1.3 Physical sciences	5	Basic Research	
	1.4 Chemical sciences	2	Balanced basic and applied research	
	1.5 Earth and related environmental sciences	3	Balanced basic and applied research	
	1.6 Biological sciences	1	Basic Research	
	1.7 Other natural sciences	1	Basic Research	

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

2. Engineering and Technology	2.1 Civil engineering	1	Balanced basic and applied research	15
	2.2 Electrical engineering, Electronic engineering, Information engineering	1	Balanced basic and applied research	
	2.3 Mechanical engineering	1	Balanced basic and applied research	
	2.4 Chemical engineering	0	-	
	2.5 Materials engineering	3	Balanced basic and applied research	
	2.6 Medical engineering	1	Balanced basic and applied research	
	2.7 Environmental engineering	1	Balanced basic and applied research	
	2.8 Environmental biotechnology	0	-	
	2.9 Industrial biotechnology	0	-	
3. Medical and Health Sciences	2.10 Nanotechnology	7	Balanced basic and applied research	47
	2.11 Other engineering and technologies	0	-	
	3.1 Basic medicine	1	Balanced basic and applied research	
4. Agricultural and veterinary sciences	3.2 Clinical medicine	1	Balanced basic and applied research	1
	3.3 Health sciences	2	Balanced basic and applied research	
	4.1 Agriculture, Forestry, and Fisheries	1	Basic Research	
	4.2 Animal and Dairy science	0	-	
5. Social Sciences	4.3 Veterinary science	0	-	33
	4.4 Other agricultural sciences	0	-	
	5.1 Psychology and cognitive sciences	1	Basic Research	
	5.2 Economics and Business	1	Basic Research	
	5.3 Education	17	Basic Research	
	5.4 Sociology	3	Basic Research	
	5.5 Law	1	Basic Research	
	5.6 Political science	1	Basic Research	
	5.7 Social and economic geography	6	Basic Research	
	5.8 Media and communications	1	Basic Research	25
	5.9 Other social sciences	2	Basic Research	
	6.1 History and Archaeology	4	Basic Research	

6. Humanities and the Arts	6.2 Languages and Literature	14	Basic Research	
	6.3 Philosophy, Ethics and Religion	4	Basic Research	
	6.4 Arts (arts, history of arts, performing arts, music)	2	Basic Research	
	6.5 Other Humanities and the Arts	1	Basic Research	
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

The status of the evaluated unit in the research community (2019–2023)

The evaluated unit is profiled as an important actor in the field of science and research, both at the national and international level. Its contribution is evident from a wide range of activities and results, which cover basic and applied research, education and support for the development of the scientific community. The following evaluation presents a selection of the most significant examples of its activity and achievements in terms of prestigious awards, editorial and professional roles, invited lectures, and evaluation of research projects for the period 2019–2023. This selection also shows that the mentioned activities are part of a wider framework of cooperation, creative activity and the support of scientific excellence, which the evaluated unit has been promoting for a long time.

Prestigious R&D awards

The evaluated unit is the holder of several prestigious awards that recognise the professional, pedagogical, and societal contribution of its employees. Key achievements include the honorary doctorate of assoc. prof. Miroslav Brzezina (2023), awarded by Rajamangala University of Technology in Thailand, which recognises his long-term contribution in the field of science and international cooperation. In 2023, prof. David Lukáš received the First Class Medal of Merit from the President of the Czech Republic, Petr Pavel, for significant services to the state in the field of science.

Other awards reflect specific achievements in the professional and literary fields. Prof. Tomáš Kasper and assoc. prof. Dana Kasperová received the Miroslav Ivanov Main Prize for the publication *Velké dějiny zemí Koruny české – Školství a vzdělanost* [in English: The Great History of the Lands of the Czech Crown: Education], which comprehensively maps the history of education in the Czech lands. Equally important is the Extraordinary Creative Award of the Czech Literary Translators' Guild, which was won by Pavel Novotný and Nikola Mizerová for the translation of Hans Magnus Enzensberger's work. These awards emphasise not only the professional but also the cultural commitment of the evaluated unit.

Participation in the editorial boards of scientific journals

The evaluated unit significantly participates in the creation and development of scientific discussions through participation in the editorial boards and expert committees of international journals. This activity underlines the high professional level of employees and their international scientific influence.

For example, prof. Tomáš Kasper works as the Chief Editor of the journal *Historia scholastica* and is also a member of the advisory committee of *Paedagogica Historica*, which are key periodicals in the field of the history of education. Similarly important is the role of assoc. prof. Hynek Böhm as Editor of the journal *Border and Regional Studies*, which focuses on the interdisciplinary study of border areas and regional cooperation.

The evaluated unit is also involved in natural science and technical fields. Assoc. prof. Eva Kuželová Košťáková works as a member of the international advisory board of *Express Polymer Letters*, an important periodical in the field of materials research. This diversity reflects the multidisciplinary nature of the evaluated unit's research activities.

Invited lectures at foreign institutions

The international scientific influence of the evaluated unit is also evidenced by numerous invited lectures at prestigious foreign universities and conferences. These lectures make it possible to present the results of the evaluated unit's research on a global scale and also establish new contacts for future cooperation.

The most significant examples include Ondřej Lánský's lecture at Columbia University in New York (2019) on the theme of the transformation of elites in the Czech Republic after 1989. Another example is assoc. prof. Hynek Böhm, who presented an analysis of the impact of the COVID-19 pandemic on borders and nationalism at the University of Strasbourg in 2021. These contributions illustrate the evaluated unit's ability to respond to current global issues and contribute to their professional understanding.

Excelling in technical fields, prof. David Lukáš presented advanced applications of electrospinning at the Fibre Society Spring Conference in China (2022). This contributed to the strengthening of international cooperation in the field of nanotechnology materials research.

Lectures by foreign guests

The evaluated unit regularly organises lectures by prominent foreign experts, which enables the sharing of knowledge and innovations within the international scientific community. Among the most notable guests was Nobel laureate Jean-Marie Lehn, who gave the lecture *Steps Towards Life: Chemistry!* in 2019 on the theme of chemistry and the origin of life.

Another example is the lecture by Dr. Vera Ferreira from the University of London, who presented research of minority languages in Europe in 2021. These activities promote interdisciplinarity and demonstrate the evaluated unit's ability to attract leading scientific capacities.

Involvement in the evaluation of research projects

The employees of the evaluated unit significantly participate in the evaluation of national and European research projects, which confirms their professional reputation. Assoc. prof. Hynek Böhm worked as an evaluator within the programmes of the Polish agency NCN (2021–2022) and the Luxembourg Research Fund (2022).

Since 2023, assoc. prof. Dana Kasperová has participated in heading the evaluation panel of the Grant Agency of the Czech Republic for pedagogy, psychology and kinanthropology, whereby significantly

contributing to the development of these fields at the national level. In the field of European research, Dr. Tomáš Vitvar plays a key role, and has been evaluating projects in the Horizon Europe and H2020 programmes for a long time.

Other services for the scientific community

The evaluated unit is also actively involved in the popularisation of science and research. Through workshops, conferences, and professional publications, it contributes to the dissemination of scientific knowledge among the wider public and the professional community. Involvement in regional initiatives such as educational activities and the support of talented students underline its comprehensive approach to the educational mission.

Table 3.2.1 – Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Miroslav Brzezina, assoc. prof. . RNDr., CSc., dr. h. c.	Honorary doctorate, 2023	Rajamangala University of Technology in Thanyaburi, Thailand
Ondřej Havelka, Ing.	Award of the Minister of Education, Youth and Sports in the category of excellent educational activity at a university, 2023	Ministry of Education, Youth and Sports of the Czech Republic
Tomáš Kasper, prof. PhDr., Ph.D.; Dana Kasperová, assoc. prof. PhDr. Ph.D.	The main prize of the Miroslav Ivanov collective of authors for the book Great History of the Czech Crown - Education (Paseka 2020), shared by prof. Kasper and assoc. prof. Kasperová, 2021	Club of non-fiction authors
David Lukáš, prof. et prof. RNDr., CSc.	Medal of the Statutory city of Liberec for contribution in the field of education, science and research, 2023	Statutory City of Liberec
David Lukáš, prof. et prof. RNDr., CSc.	Medal of Merit, 1 st degree, for services to the state in the field of science, 2023	State award from the President of the Czech Republic, Petr Pavel
Pavel Novotný, Dr. phil. habil., Ph.D.; Nikola Mizerová, Mgr. Ph.D.	Extraordinary creative award of the Czech Literary Translators' Guild as part of the Josef Jungmann Award 2021 for the translation of Hans Magnus Enzensberger's Mausoleum, 2021	Czech Literary Translators' Guild
Josef Šedlbauer, prof. Ing., Ph.D.	Award in the Hero of Philanthropy 2020 category for societal contribution in the field of nanotechnology development during the COVID-19 crisis, awarded as part of the Forum of Donors for Philanthropy Personalities Award, 2020	Forum of donors for philanthropy personalities
Miroslav Valeš, assoc. prof. Mgr., Ph.D.	Jury prize for a dictionary, third place for the dictionary of Miroslav Valeš: Dicionariu de A Fala: lagarteiru, mañegu, valverdeñu.	Interpreters and translators' union

	Centro Interdisciplinar de Documentação Linguística e Social, Minde 2021. Dictionary of the year 2022–2023	

Note: Provide up to 10 examples.

Table 3.2.2 – Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Hynek Böhm, assoc. prof. Mgr., Ph.D.	Border and Regional Studies, ISSN 2719-6577, editor
Zdeňka Braumová, Mgr., Ph.D.	Pedagogika. Studia i Rozprawy, ISSN 2658-1213, member of the Scientific Board
Tomáš Kasper, prof. PhDr., Ph.D.	Historia scholastica, ISSN 1804-4913, chief editor
Tomáš Kasper, prof. PhDr., Ph.D.	Paedagogica Historica, ISSN 0030-9230, member of the International Advisory Board
Dana Kasperová, assoc. prof. PhDr., Ph.D.	Polska Myśl Pedagogiczna – Polish Pedagogical Thought, ISSN 2450-4572, member of the International Editorial Board
Eva Kuželová Košťáková, assoc. prof. Ing., Ph.D.	Express Polymer Letters, ISSN 1788–618X, member of the International Advisory Board
Jaroslav Pažout, assoc. prof. PhDr., Ph.D.	Česko-slovenská historická ročenka, ISSN 1214-8334, member of the Executive Editorial Board
Aleš Suchomel, assoc. prof. PaedDr., Ph.D.	Acta Gymnica, ISSN 2336-4912, member of the Editorial Board
Zénó Vernyik, Mgr., Ph.D.	Americana: E-Journal of American Studies in Hungary, ISSN 1787-4637, member of the Advisory Board
Kamil Zágoršek, assoc. prof. RNDr., Ph.D.	Bulletin of Geoscience, ISSN: 1802-8225, co-editor on the Editorial Board

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 – The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Tomáš Kasper, prof. PhDr., Ph.D.	Philanthropismus und die Pädagogik in Böhmen im 18. Jahrhundert	Universität des Saarlandes, Philosophischen Fakultät der Universität des Saarlandes und der Universität Luxemburg, Lucembursko; Bildung und Aufklärung(en) Ideale und Realitäten	2019
Ondřej Lánský, PhDr., Ph.D.	Elites or Oligarchy? Czech Republic 30 years after 1989	Columbia University in the City of New York, Department of Sociology, USA	2019
Magda Nišpanská, PhDr. Ph.D.	Creative narrativity of teachers: Healing Stories for children,	University of Maine at Augusta, USA	2019
Kamil Zágoršek, assoc. prof. RNDr., Ph.D.	Geology of Czech Republic	Isfahan University, Iran	2019

Hynek Böhm, assoc. prof. Mgr., Ph.D.	The effects of COVID-19 on nationalism and borders, Strasbourg	University of Strasbourg, France; Castle Talks on Cross-Border Cooperation Borders, Security and Nationhood Towards a Transnational Approach to Sovereignty	2021
Martin Plešinger, assoc. prof. Ing., Ph.D.	Core reduction: Necessary and sufficient information in linear approximation problems	University of Primorska, Slovenia; Matrix Computations and Numerical (Multi)Linear Algebra with Applications conference, 8th European Congress of Mathematics	2021
David Lukáš, prof. et prof. RNDr., CSc.	AC Electrospinning: Theory and Applications	The Fiber Society Spring conference, China	2022
Zuzana Pechová, Mgr., Ph.D.	Make Art not Faces – Visual Art during the Pandemics	Utah State University, USA	2022
Miroslav Valeš, assoc. prof. Mgr., Ph.D.	Diccionariu de A Fala: ixperiencia sociolingüística	Universitat de Barcelona, Spain; Joves i revitalització de llengües a la Península Ibèrica	2022
Hynek Böhm, assoc. prof. Mgr., Ph.D.	Group of high-level specialists on the future of Cohesion Policy, , Brussels, lecture “Reinforcing territorial cooperation and addressing challenges on European integration”	Group of high-level specialists on the future of Cohesion Policy, European Commission, Brussels, Belgium	2023

Note: Provide up to 10 examples.

Table 3.2.4 – The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Jean-Marie Lehn, Nobel prize winner	Institut de Science et d'Ingénierie Supramoléculaires-ISIS, Strasbourg, France	Steps Towards Life: Chemistry!	2019
Oksana Afitska	University of Lancaster, UK	Content and Language Integrated Learning: Theory, Research, Practice and Future Directions; Analysis and Evaluation of Language Teaching Materials	2019
Benjamin Frommer	Northwestern University Chicago, USA	Retribution - prosecution of war crimes and collaboration in post-war Europe	2019
Dennise Gackstetter	Utah State University, USA	Positive Habits of Mind	2019
Klaus-Peter Eichler	NORD University, Norway	Mathematik – A website to develop students' spatial ability	2021
Vera Ferreira	University of London, UK	Minority languages in Europe	2021
Laura Castor	University of Tromsø, Norway	Life Narratives as Bridges between Personal and	2022

		Collective Memory in Zones of Shifting Geographical Borders	
James Cheon	University of Waterloo, Canada	Cellulose nanocrystals incorporation into electrospun nanofibers	2022
Jeffrey Cayaban Pagaduan	University of Tasmania, Australia	Jump testing	2023
Daniel Toepper	Humboldt UNI Berlin, Germany	Between Prevention and Preparation – The GDR Sex Education and its Preparation for Love, Marriage and Family as Mixture of Danger Management and Pedagogisation	2023

Note: Provide up to 10 examples.

Table 3.2.5 – Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Hynek Böhm, assoc. prof. Mgr., Ph.D.	Member of the international evaluation panel	NCN (National Science Centre of Poland), programmes Opus HS and Preudium HS	2021–2022
Hynek Böhm, assoc. prof. Mgr., Ph.D.	Project evaluation– Multi-annual research programme scheme CORE	Luxembourg national research fund (FNR)	2022
Tomáš Kasper, prof. PhDr., Ph.D.	Methodology M17+, evaluator (education and psychology)	Council for Research, Development and Innovation	2019–2022
Dana Kasperová, assoc. prof. PhDr., Ph.D.	Member and since 2023 Chairperson of the evaluation panel Pedagogy, Psychology, Kinanthropology P407. From 2023 Member of the Subject Committee of Social Sciences and Humanities OK4	Grant Agency of the Czech Republic	Since 2021
Tatiana Matulayová, assoc. prof. PaedDr., Ph.D.	Evaluator of basic research projects	Agency for the support of science and research (https://www.apvv.sk/)	2019–2023
Jan Pícek, prof. RNDr., CSc.	Member of panel 201 Grant Agency of the Czech Republic for its calls	Grant Agency of the Czech Republic	2016–2020
Michal Řezanka, assoc. prof. RNDr., Ph.D.	Methodology M17+, evaluator (chemistry)	Council for Research, Development and Innovation	2023
Tomáš Vitvar, RNDr., Ph.D.	Horizon Europe (HORIZON)	REA / European Research Executive Agency	Since 2019
Tomáš Vitvar, RNDr., Ph.D.	H2020	EASME / Executive Agency for Small & Medium-sized Enterprises	Since 2015
Kamil Zágoršek, assoc. prof. RNDr., Ph.D.	Standard projects, Lead agency and International projects	Grant Agency of the Czech Republic	Since 2023

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the period of 2019–2023²³. This should be done from the full list in annex tables (Table 3.3.1–3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

The following selection of projects illustrates the broad range of FSHE's scope, from natural sciences (FORD 1) to the humanities (FORD 6) with a focus on the social sciences (FORD 5). These are basic research (Grant Agency of the Czech Republic) and applied projects (Technology Agency of the Czech Republic), as well as Czech and international projects (EC REA). FSHE is also marginally involved in contractual research.

Selected projects (1–3 primarily social sciences, 4 and 5 interdisciplinary, 6–9 primarily humanities, 10 primarily natural sciences):

1. **Technology Agency of the Czech Republic: Quality of the Social Climate of Czech Basic and Secondary Schools and Possible Interventions (TL03000035, 2020–2023):** The aim of the project was to create a systemic model of diagnostics and interventions related to relationships within the teaching staff and the leadership quality for a network of Czech primary and secondary schools in the Liberec Region. The purpose was to support and help the schools and teachers in their relationships within the schools. The steps towards the main objective of the project were: A) to use the outputs of basic research of the Grant Agency of the Czech Republic project GA16-10057S "Stability and changes of primary school teaching staff" in the creation of a methodology for diagnosing the social climate of teaching staff. B) to create a methodology of general and specific interventions to support the development of individual schools in the area of relationships and school leadership. C) to diagnose the teaching staff climate of primary and secondary schools in Liberec and the Liberec region. D) to use the data provided by the diagnostic phases to verify the effectiveness of interventions, i.e., applied research using experimental methods.
2. **Contractual research: Didactic incubator – set of activities:** The activities take place in a creative workshop of the Didactic Incubator, which is held in the classrooms of schools that shows interest in it. For this reason, it is a set of activities supported by a number of different entities, not a single activity. The overall financial benefit for FSHE is not key; on the contrary, the transfer of modern didactic methods into the practice of ordinary schools is what is most important. During the week of the incubator, the staff of the FSHE Didactic Workshop (the

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

guarantor and its team) meet with the school management and with individual teachers or teaching teams, incubate existing teacher ideas and propose possible changes in the concept of SEP. The school receives a “Didactic Incubator” certificate, and individual teacher-innovators receive a specific certificate that can be thematically classified into a certain type of template according to Operational Programme Johannes Amos Comenius. The types of cooperation need to be negotiated with the Didactic Workshop guarantor in advance and the needs of the school defined, which may be different. A five-day visit to the school includes: 50 hours, setting up a modern workshop classroom, evaluation of the school’s spatial conditions, evaluation of the potential of the teaching staff, methodical and mentoring of teachers, elaboration of the concept of a modern school, guidance of a pedagogical leader, development of a programme of active teaching and peer learning – practical examples of working with student groups.

3. **EC REA: Borders shaping perceptions of European societies (Grant agreement ID: 101095186, 2023–2026):** The project “Borders shaping perceptions of European societies’ (B-SHAPES) explores and analyses how borders continue to be a key factor in how we understand societies. The project brought together nine European universities, one research institute, a national museum, a foundation, a political association, a consulting company and an artistic collective for a period of three years. Working with Europeans living in border regions, the role of borders was explored from three perspectives: 1) Euroscepticism in border regions, 2) minorities in border regions, and 3) border landscape as heritage. The potential of targeting border regions lies in new insights into how borders shape societal perceptions, but also into how the story of borders can be told other than from a purely national perspective.
4. **Technology Agency of the Czech Republic: Support for Ethical Decision-Making in the Field of Research and Development of Nanotechnologies (TL04000023, 2020–2022):** The project focused on the creation of a support system for ethical decision-making in emergency situations in the field of nanotechnology research and development. The objective was achieved in three steps: 1) Creation of case and overview studies addressing ethical challenges in the crisis associated with the COVID-19 pandemic and other emergency situations. 2) Creation of an expert system to support ethical decision-making. 3) Presentation of a set of recommended tools and measures for effective decision-making during emergency situations in accordance with the ethical standards of scientific research. The outputs of the project may be used in the field of nanotechnology research and development, teaching, or the functioning of ethics committees.
5. **EC REA: Molecular design of polymers for biomedical applications (Grant agreement ID: 871650, 2020–2024):** The project “Molecular design of polymers for biomedical applications” (MEDIPOL) funded by the EU is an integrated four-year knowledge transfer and networking programme between six partners with complementary expertise to design and develop new polymer-based materials for advanced biomedical applications targeting soft tissues, especially for eye and skin injuries. There are certain similarities between the eyes and other places on the skin. Understanding these similarities facilitates the design of, for example, corneal dressings, ophthalmic therapies for dry eye syndrome, and effective burn and wound dressings with increased efficacy. MEDIPOL’s knowledge transfer programme aimed to train 49 professionals as future leaders in academia and industry. The specific core issues it focuses on are vision and mobility, which are increasingly critical issues in healthcare worldwide that address the socio-economic aspects of an aging population.

6. **Grant Agency of the Czech Republic: Uncertain Mandates. Legitimisation of Elections in the Bohemian Lands and Czechoslovakia 1848–1939 (GA18-02843S, 2018–2020):** The project is dedicated to researching election fraud and procedures legitimising the winning of parliamentary mandates on the territory of the Czech lands and Czechoslovakia. Chronologically, it is defined by the period 1848–1939. Thematically, it is divided into two key segments: the first focuses on the characteristics and typology of electoral fraud applied in parliamentary elections and on possible changes in the perception of the term electoral fraud in the continuous ninety-year development. The second part of the research is aimed at clarifying the role of institutions that had the right to legitimise (confirm or annul) the winning of the parliamentary mandate. The project examines the way these institutions were constituted, the content of their agenda and the potential influence on the political development in the country at the time. The main output of the project is a comprehensive monograph. Results are published in a collective monograph and in journals in the Czech Republic and abroad.
7. **Grant Agency of the Czech Republic: The Impact of Post-war Population Transfers on the Czech-Polish Cross-border Cooperation (GF23-04226L, 2023–2025):** The project examines the impact of both forced and voluntary population movements that occurred after the Second World War on Czech-Polish cross-border cooperation. These movements caused a significant change in the composition of the population of the Czech-Polish border area and caused the emergence of a double border area: the original German-speaking population was forced to leave the territory of Czechoslovakia and Poland in the western part of the mutual border, along its entire length from Bohumín/Chalupka to the Czech-Polish-German triple border. The situation in individual parts of the border also differs significantly. In particular, the rate of population change differed. In the eastern part of the border, it was not as great as in the triangular border area. The project studied the effect of these changes on mutual cooperation.
8. **Grant Agency of the Czech Republic: A Fala Grammar Based on Primary Data and Community Engagement (GA23-04988S, 2023–2025):** A Fala is an extremely endangered and insufficiently described language, in an unfavourable sociolinguistic situation, so this is considered emergency research. The project uses an adequate methodology to describe the grammatical structure of the A Fala language, which is a minority language used in the north of Extremadura in Spain. The results of the project will facilitate revitalisation, emancipate it as a language of written communication, create conditions for its implementation in education and contribute to the preservation of European cultural diversity. The project is followed by other work performed as part of the Operational Programme Research, Development and Innovation – Mobility MSCA TUL project with the aim of confirming that the methodology based on primary data is more suitable for the compilation of language materials than the one based on translation from the dominant language. The primary data sources are a database, augmented by a new set of interviews and collaborations with the language speaking community. Community members are interested in the results of the project because they have already actively participated in a previous project focused on the lexicographic description of their mother tongue. The nature of the project is multidisciplinary, combining linguistics, informatics, and language policy.
9. **Grant Agency of the Czech Republic: New Realisms of the Visual Art Scene in Czechoslovakia, 1918–1945 (GA17-06031S, 2017–2019):** This project deals with the definition and interpretation of artistic manifestations corresponding to the label new objectivity on the Czechoslovak art scene defined by the years 1918–1945. Methodologically,

it is based on a revision of the existing terminology and a comparison of approaches to the monitored range of works that fluctuate depending on the viewpoint of individual national schools and theorists. Works oriented towards modern German realism of the 1920s are examined, which until recently were largely excluded from the mainly Francophone-oriented interpretation of the development of the history of art in Czechoslovakia. The subject of interest is both the work of German-speaking artists from Bohemia, Moravia, Silesia, and Slovakia, as well as progressive interwar realism on the part of their Czech and Slovak-speaking counterparts. Regional and national specificities are reflected, while the critical definition of the monitored works is decisive. Attention is paid to the misuse of iconographic prototypes by propaganda. The research focuses on works created in traditional media and photography, which played a key role in the acceptance of modern visuality by the wider public. In this project, FSHE acted only on the part of other participant with a (financial) share of 25%, other participating entities were the National Institute of Monuments and the Faculty of Philosophy of Masaryk University.

10. Grant Agency of the Czech Republic: Random Processes of Regression Quantiles in the Financial Risk Analysis (GA18-01137S, 2018–2020): The project used and further developed deep mathematical methods to study the behaviour of financial risk under the most general conditions. It focused on the situation where losses are influenced by external factors. They are only partially under our control, but even a partial knowledge of their behaviour helps to have the right system structure strategy. The developed specific methods are based on averaged regression quantiles, introduced by the project team, and on generalised L-moments. These methods and concepts were extended to autoregressive time series, and the results were used to analyse coherent risk measures proposed in the literature. The outputs of the project have the potential to contribute to solving issues of the financial market, insurance, and social statistics, as well as similar issues occurring in other areas.

Table 3.3.1 – Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Provider ²⁶				
		2019	2020	2021	2022	2023
Technology Agency of the Czech Republic	PROSYKO – Proactive system of commercialisation at TUL	370 /15	0 /0	0 /0	0 /0	0 /0
Technology Agency of the Czech Republic	Hydrophobic UV varnishes and nanolayers to protect substrates against biological attack	800 /32	410 /16	0 /0	0 /0	0 /0
Grant Agency of the Czech Republic	Random processes of regression quantiles in financial risk analysis	1 521 /60	1 486 /59	23 /1	0 /0	0 /0
Technology Agency of the Czech Republic	Solving epidemic and emergency events by including the aspect of spatiality with a focus on interaction with citizens and other partners	1 256 /50	1 450 /57	1 973 /78	556 /22	0 /0

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

In the role of beneficiary						
Provider ²⁵	Project name	Provider ²⁶				
		2019	2020	2021	2022	2023
Grant Agency of the Czech Republic	Uncertain mandates. Elections and their legitimisation in the Czech lands and Czechoslovakia 1848–1939	1 335 /53	1 230 /49	121 /5	0 /0	0 /0
Technology Agency of the Czech Republic	Support for ethical decision-making in the field of nanotechnology research and development	0 /0	255 /10	1 527 /60	1 208 /48	0 /0
Technology Agency of the Czech Republic	Quality of the social climate of basic and secondary school teachers and possible interventions	0 /0	389 /15	586 /23	569 /22	511 /20
TUL Grant Programme	New numerical approaches to the valuation of complex option contracts	0 /0	518 /20	658 /26	0 /0	0 /0
Technology Agency of the Czech Republic	Use of nanofibers to apply bioactive substances using dental floss	0 /0	449 /18	1 588 /63	1 593 /63	1 164 /46
TUL Grant Programme	Study of physical networks in polymeric materials	0 /0	898 /35	1 178 /46	1 160 /46	0 /0
Technology Agency of the Czech Republic	Proactive solution to the negative effects of overtourism	0 /0	705 /28	817 /32	616 /24	383 /15
Technology Agency of the Czech Republic	Diagnostics of motor competence in pedagogical practice: identification of children of younger school age who are at risk of dyspraxia	0 /0	671 /26	1 092 /43	891 /35	714 /28
Technology Agency of the Czech Republic	Innovation of crisis management of residential social services for the elderly	0 /0	0 /0	641 /25	919 /36	352 /14
Technology Agency of the Czech Republic	Chemically homogeneous ionex membrane for effective moisture transfer in recuperative exchangers and air conditioning devices	0 /0	0 /0	761 /30	293 /12	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Electrostatic spinning and carbonisation of lignin for electrochemical applications	0 /0	0 /0	38 /1	150 /6	0 /0
Grant Agency of the Czech Republic	Flexible tools for strategic investment and decision-making: analysis, valuation and implementation	0 /0	0 /0	0 /0	546 /22	552 /22
Technology Agency of the Czech Republic	Nanofibrous materials with antimicrobial function activated by visible light	0 /0	0 /0	0 /0	1 418 /56	1 443 /57
EUROPEAN COMMISSION Research Executive Agency	Molecular design of polymers for biomedical applications	0 /0	35 /1	0 /0	257 /10	1 625 /64
Grant Agency of the Czech Republic	Aggregation of methodologies based on economic data	0 /0	0 /0	0 /0	673 /27	702 /28
Grant Agency of the Czech Republic	The impact of post-war population movements on	0 /0	0 /0	0 /0	0 /0	696 /27

In the role of beneficiary						
Provider ²⁵	Project name	Provider ²⁶				
		2019	2020	2021	2022	2023
	Czech-Polish cross-border cooperation					
EUROPEAN COMMISSION Research Executive Agency	Borders shaping perceptions of European societies	0 /0	0 /0	0 /0	0 /0	357 /14
Grant Agency of the Czech Republic	Interaction of prokaryotic and eukaryotic cells with nanofibers of different morphology and structure	0 /0	0 /0	0 /0	0 /0	1 514 /60
Ministry of Education, Youth and Sports of the Czech Republic	Excellent research in regenerative medicine	0 /0	0 /0	0 /0	0 /0	756 /30
Technology Agency of the Czech Republic	Research and development of new applications of fibre materials with functional properties	0 /0	0 /0	0 /0	0 /0	540 /21
Grant Agency of the Czech Republic	A Fala grammar based on primary data and community collaboration	0 /0	0 /0	0 /0	0 /0	708 /28
Ministry of Education, Youth and Sports of the Czech Republic	Expressive and artistic-creative procedures for conveying and grasping the stories of evacuated children of Bohemia and England during the Second World War as a starting point for mapping the existence of educational and didactic models, programs of the same type on the soil of our and international universities	215 /8	0 /0	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Interval estimates of parameters of selected distributions using L-moments and the bootstrap method	86 /3	0 /0	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Mathematical model for determining the mechanical properties of soft tissues of the human locomotor apparatus by the indentation method in vivo, in situ	125 /5	0 /0	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Geometric exercises in GeoGebra	317 /13	0 /0	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Numerical methods in matrix and tensor calculations	182 /7	0 /0	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Translation of terms from the field of education and research for websites	56 /2	0 /0	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Chemical modifications of selected polymeric materials used in healthcare	207 /8	0 /0	0 /0	0 /0	0 /0

In the role of beneficiary						
Provider ²⁵	Project name	Provider ²⁶				
		2019	2020	2021	2022	2023
Ministry of Education, Youth and Sports of the Czech Republic	Methods of Krylov subspaces in the theory of core problems	0 /0	190 /7	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	The energy demand of riding an electric bicycle: possibilities of use in health promotion	0 /0	200 /8	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Association between physical activity, sleep and body composition in children and young people	353 /14	165 /7	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	FEMTO-MEMBRANE: Preparation of nanoalloys using femtosecond laser pulses to enhance oil/water separation membranes	0 /0	304 /12	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Evaluation of the tourist potential of secondary geodiversity in northern Bohemia	0 /0	151 /6	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Geography of religion in the Liberec region	73 /3	61 /2	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Krylov methods in tensor problems	0 /0	0 /0	145 /6	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	"Places of memory" - in the footsteps of former fellow citizens of Liberec II.	183 /7	227 /9	302 /12	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Preparation of functionalised cyclodextrin nanosponges for targeted drug delivery	0 /0	0 /0	232 /9	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Optimal control of a parallel system of components with continuous wear	140 /6	151 /6	160 /6	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Development of advanced nanofibrous materials for tissue engineering	228 /9	345 /14	376 /15	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Mathematics as an effective tool to develop the logical thinking of primary school pupils.	0 /0	167 /7	183 /7	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Study of the integration of selected bioactive substances into nanofibrous structures	0 /0	343 /14	348 /14	298 /12	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Antonín Friedl: Georges Kars – Man and creation	0 /0	0 /0	206 /8	193 /8	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Mathematical modelling and data processing	0 /0	0 /0	0 /0	266 /10	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Study of cellular interaction with polymeric fibrous material	0 /0	0 /0	0 /0	335 /13	366 /14

In the role of beneficiary						
Provider ²⁵	Project name	Provider ²⁶				
		2019	2020	2021	2022	2023
Ministry of Education, Youth and Sports of the Czech Republic	Cyclodextrin polymer fibres	0 /0	0 /0	0 /0	207 /8	234 /9
Ministry of Education, Youth and Sports of the Czech Republic	Preparation of new types of hybrid organosilane nanofibers with specific properties for tissue engineering	0 /0	0 /0	0 /0	243 /10	246 /10
Ministry of Education, Youth and Sports of the Czech Republic	Development of a nanofibrous system for drug release in the vaginal environment	0 /0	0 /0	0 /0	0 /0	339 /13
Ministry of Education, Youth and Sports of the Czech Republic	Secular trends in physical fitness among youth: 100 years anniversary of the first nationwide testing in the territory of Czechoslovakia	0 /0	0 /0	0 /0	0 /0	298 /12
Ministry of Education, Youth and Sports of the Czech Republic	Optimisation and functionalisation of suture material containing nanofibers for medical use	0 /0	0 /0	323 /13	337 /13	396 /16
Ministry of Education, Youth and Sports of the Czech Republic	Motor competence: basic concept and key factors	0 /0	0 /0	0 /0	121 /5	154 /6
Liberec region	Congress of Czech Polonist Studies	250 /10	0 /0	0 /0	0 /0	0 /0
Cooperation Czech-Saxony, Objective 3	Czech-Saxony literary landscape. Interactive map with wide options	2 048 /81	654 /26	0 /0	0 /0	0 /0
Cooperation Czech-Saxony, Objective 3	Springs connect landscapes and states - environmental education and cooperation in the Liberec - Zittau region	1 640 /65	4 231 /167	0 /0	0 /0	0 /0
Czech National Agency for International Education and Research	Borders and Migration: Approaches and Methods in Research and Teaching	439 /17	0.2 /0	44 /2	0 /0	0 /0
Foundation for Holocaust Victims	Publication "Synagogues and places of worship in Liberec"	0 /0	0 /0	50 /2	0 /0	0 /0
Foundation for Holocaust Victims	Publication "Following the Footsteps of Liberec Holocaust Victims"	0 /0	0 /0	0 /0	60 /2	0 /0
Czech National Agency for International Education and Research	Sites and Channels of Contact Within and Across Borders: Languages, Narratives and Representations	0 /0	0.3 /0	0 /0	420 /17	0 /0
The Lilia and Karel Janečková Foundation	Financial support for the Didactic Workshop	0 /0	0 /0	0 /0	0 /0	98 /4
Statutory City of Liberec	Academix discussion evenings	0 /0	0 /0	0 /0	0 /0	49 /2
State Culture Fund of the Czech Republic	Academix discussion evenings - Social metabolism	0 /0	0 /0	0 /0	0 /0	30 /1
State Culture Fund of the Czech Republic	Academix revue - Social metabolism	0 /0	0 /0	0 /0	0 /0	30 /1

In the role of beneficiary						
Provider ²⁵	Project name	Provider ²⁶				
		2019	2020	2021	2022	2023
Statutory City of Liberec	Academix revue	0 /0	0 /0	0 /0	0 /0	49 /2
Liberec region	Academix discussion evenings	0 /0	0 /0	0 /0	0 /0	47 /2
Total		11 824 /466	15 686 /619	13 372 /527	13 329 /526	14 353 /566
In the role of another participant						
Provider ²⁷	Project name	Provider ²⁸				
		2019	2020	2021	2022	2023
Ministry of Health of the Czech Republic	Treatment of diabetic wounds with nanofibrous covers releasing platelet lysate components	1 380 /54	1 435 /57	1 335 /53	0 /0	0 /0
Grant Agency of the Czech Republic	Enhanced growth of human skin cells on biomimetic nanofibrous matrices for active wound healing	1 017 /40	0 /0	0 /0	0 /0	0 /0
Grant Agency of the Czech Republic	Controlling the microstructure and properties of lead-free piezoceramic materials using advanced technologies for their preparation	361 /14	365 /14	0 /0	0 /0	0 /0
Ministry of Education, Youth and Sports of the Czech Republic	Research infrastructure for experiments at CERN	521 /21	770 /30	978 /39	945 /37	892 /35
Ministry of Education, Youth and Sports of the Czech Republic	Gaining new knowledge about the microworld in the CERN infrastructure	414 /16	332 /13	335 /13	252 /10	0 /0
Technology Agency of the Czech Republic	Geodiversity within the city: perception, function, potential	486 /19	436 /17	429 /17	0 /0	0 /0
Grant Agency of the Czech Republic	New realisms on the Czechoslovak art scene 1918–1945	655 /26	0 /0	0 /0	0 /0	0 /0
Ministry of Health of the Czech Republic	Biomechanically defined resorbable materials for cardiovascular surgery	0 /0	861 /34	1 319 /52	1 291 /51	1 015 /40
Total		4 834 /191	4 199 /166	4 396 /173	2 488 /98	1 907 /75

²⁷ Ibid.

²⁸ Ibid.

Table 3.3.2 – Contract research activities

Client ²⁹	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
G. Benedikt Karlovy Vary, s.r.o.	Application of antibacterial salt to ceramic products	0 /0	0 /0	35 /1	0 /0	0 /0
Statutory City of Liberec	Professional organisational preparation of a sociological survey	0 /0	0 /0	0 /0	23 /1	0 /0
Statutory City of Liberec	Development of the study - demographic analysis	0 /0	0 /0	0 /0	50 /2	0 /0
Bystřice primary school	Didactic incubator	0 /0	0 /0	0 /0	0 /0	50 /2
Ostrava-Poruba primary school	Didactic incubator	0 /0	0 /0	0 /0	0 /0	35 /1
Municipal district Praha 7	Didactic incubator	0 /0	0 /0	0 /0	0 /0	25 /1
Brethren School, Prague	Didactic incubator	0 /0	0 /0	0 /0	0 /0	75 /3
Pavel Tigrid Grammar School	Didactic incubator	0 /0	0 /0	0 /0	0 /0	52 /2
Nanoprogress, z.s.	Laboratory equipment for the preparation of pure nanofibrous yarn, composed only of nanofibers, without core carrier yarn	0 /0	0 /0	0 /0	5 625 /222	8 319 /328
Total		0 /0	0 /0	35 /1	5 698 /225	8 924 /352

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts³⁰, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

The self-evaluation mentions ten outputs, mostly non-bibliometric, from our applied research. Several of them are linked to projects of the Technology Agency of the Czech Republic, but some were created purely within the framework of institutional funds. Some of the selected results also

²⁹ If the client is from abroad, indicate in brackets the country of origin of the client.

³⁰ See Terms definition.

represent a larger set of outputs arising from longer-term systematic activity. The selection of results again illustrates the breadth of FSHE's disciplinary reach, from natural sciences (FORD 1) to humanities (FORD 6) with a focus on the social sciences (FORD 5)

Selected results:

1. **Software: IS EpiGIS-COVID & Mobile EpiGIS:** Information system software for creating and managing epidemiological survey data with a special focus on COVID-19. A set of forms allows data from individual SARS-CoV-2 cases to be collected, edited, managed, visualised and printed. The result is installed on the secure server of the Regional Health Authorities (RHA) of the Liberec Region and is used by the RHA monitoring team and management to monitor the epidemic. Access to the result is limited to authorised users within the current operation (the guarantor of the application grants authorisation). It is also installed on the server of the RHA of the Hradec Králové Region. Since 2022, it has also been available as a mobile application "Mobile EpiGIS". It was created as part of the project "Solutions to epidemic and emergency events by including the aspect of spatiality with a focus on interaction with citizens and other partners" (Technology Agency of the Czech Republic).
2. **Software: Software for planning and managing searches for missing persons in the field:** Based on the input data about the missing person, the place and time of the event and the data from map documents, the software calculates the probable location of the missing person. The software then prepares the search sectors and estimates the search time. It also proposes the deployment of search resources. It creates printouts and outputs for GNSS (GPS) devices to successfully manage a search operation. The software also records the progress of the search, including notes on the sectors. Furthermore, the software enables visualisation and analysis of the search progress based on tracking the search teams either online or offline. Last but not least, it can record the search result and save the search project to the server for further processing. The software is currently actively used by six regional directorates of the Police of the Czech Republic, reported as an excellent result (Module 1) with social benefit (this output was created from institutional support only).
3. **Article: Urban geotourism development and geoconservation: Is it possible to find a balance?** This article is the output of broader research, the main objective of which was an evaluation and presentation of the potential of geodiversity in the urban environment from the point of view of tourism, recreation, and education with regard to the protection and sustainable use of natural and cultural heritage. A sub-objective was to promote geodiversity and its importance (promotional materials, audiovisual productions) in urban spaces and create specific proposals for rational and sustainable use for tourist, recreational, and educational purposes. It is mainly about the design of geotourism trails as an alternative tool for the presentation of natural and cultural heritage within cities and workshops focused on the role of geodiversity in urban spaces. These and other project activities contribute to the development of urban geotourism as a new, sustainable form of tourism. This output was created as part of the project "Geodiversity within the city: perception, function, potential" (Technology Agency of the Czech Republic).
4. **Chapter in a book: Research of the climate of teaching staff: methodological options and results:** The output acquaints the reader with the methodological procedures and with a summary of the results of the three-year research project "Stability and changes of primary school teaching staff" (Grant Agency of the Czech Republic 2016–2018) and the follow-up project "Quality of the social climate of basic and secondary school teachers and possible interventions" (Technology Agency of the Czech Republic) focused on investigating the

climate of primary school teachers in the Czech Republic. The research was based on the influential theoretical concept of social climate by Kottkamp, Mulhern and Hoy (1987), including the application of the Czech version of the research instrument of these authors. The phenomenon of turnover was mainly based on the complexly framed theory of four capitals by Mason and Matas (2015), which appears to be the closest to the professional culture of Czech primary school teachers. The social climate, which is defined as a non-simple phenomenon, was extensively investigated in a mixed research approach. The scope of the research and the demands of its methodological approach required the teamwork of six researchers. With such a broad thematic grasp, the authors ranged from pedeutology and school theory to the areas of school management and the psychology of work and organisation. Studying the climate of the teaching staff is a key tool for understanding the climate of the entire school. This is a basis for the well-being not only of the teachers, but above all of the pupils.

5. **Patent: Method of spinning a polymer solution or melt using alternating electric voltage and a device for performing the method:** The patent is for the production of nanofibers by spinning a polymer solution or melt with an AC electrical voltage applied to the spinning electrode and/or to the solution or melt. During spinning, the spinning electrode formed by a linear flexible structure is wound between two driven coils, which have a spiral groove on the circumference. At least a portion of the spinning electrode in the groove of one of the coils wades in the solution or melt in the reservoir. The solution or melt is spun on the part of the spinning electrode as it is wound between the coils. Spinning takes place around the circumference of the spinning electrode, and the nanofibers cluster into a formation moving away from the spinning electrode. The part of the spinning electrode present in the space between the two coils, which forms the active part of the spinning electrode, also performs an additional reciprocating sliding movement in the direction perpendicular to the longitudinal axis of the active part of the spinning electrode. The patent is also for the device used to carry out this method.
6. **Map & Book: Living Names & Atlas of Liberec's Living Names:** The "Living Names" web map application collects folk toponyms and supplementary information in the territory of Liberec and Stráž nad Nisou. The research was carried out in three phases: Collection of used names (a questionnaire survey aimed at obtaining comprehensive toponymic material); determination of the knowledge/distribution of the collected data (names) among residents; determination of the spatial fixation of the most famous names. The collection of all the data took place through crowdsourcing, i.e. by involving the lay public. More than one and a half thousand respondents actively participated in the project; they shared over three thousand toponyms and additional information. The resulting map allows the continuous addition of new names and information. One can browse the names spatially or in tabular form, filter them using distribution among people, and, for certain names, it is possible to display their spatial fixation. The map application was followed by the publication of an atlas. Its first textual and pictorial section defines living names and geographical nomenclature in general and in the studied area, it explains the methodology behind the data collection and the creation of the interactive map. Follow several chapters focused on historical context and the relationship between living names and the environment they describe. This first section ends with a chapter devoted to spatial fixation. A number of historical and contemporary photographs, postcards and period advertisements accompany the texts. The second atlas part is made up of 29 map sheets at several scales covering Liberec and Stráž nad Nisou. The

topographic background was compiled using data from RÚIAN, OpenStreetMap, DIBAVOD, and Data50 data. The atlas contains 1,123 names indexed in the third part.

7. **Article: Research of 100-year-old trends in physical fitness among youth in the territory of former Czechoslovakia, including information about the design and methodology of the related project:** The article was created as part of the project "Secular trends in physical fitness among youth: 100 years since the first nationwide testing in the territory of Czechoslovakia" (The Ministry of Education, Youth and Sports). The aim of the article and the entire project was to replicate the nationwide national testing of the level of physical fitness among youth in the territory of the former Czechoslovakia used in 1923. The methodology of the replicated testing of the level of physical fitness was reduced. However, it was prepared in accordance with the earlier historical methodology so that the results of testing the physical fitness of 11-19-year-old youth could be compared with the original study. At the same time, the aim of the project was to contribute to the enhancement of the awareness of experts and the general public about the given issue. The research and its outputs had a nationwide reach, including distribution through nationwide public media (Czech Radio, Czech Television, TV Nova).
8. **Book & Software: Development of basic movement skills in children of younger school age & Software for evaluating the test battery for assessing the level of psychomotor development:** The book presents an overview of basic movement skills of children in the 1st grade of elementary school (in the form of methodological cards), the acquisition of which should be achieved at a younger school age within the conditions characteristic for ordinary elementary schools. We explain the selection and the importance of mastering those particular basic movement skills for the further development of the child. Each skill is first discussed in the book in detail together with the proposal of its evaluation. The software then serves to evaluate the test battery for assessment of the level of psychomotor development in younger school age. The application uses authentication via Shibboleth technology, then using name and password. Users can create a list of children and assign individual tests to them. The tests are subsequently evaluated, and the results are then displayed to the user. Test results can be downloaded in PDF format. These outputs were produced within the project "Diagnostics of motor competence in pedagogical practice: identification of children at risk of dyspraxia of younger school age" (Technology Agency of the Czech Republic).
9. **Approved methodology: Methodology of crisis management within residential social services for the elderly:** The methodology was created as an output of a qualitative investigation at one selected residential service for the elderly in Liberec. This is a pilot output and, at the same time, serves as a pilot text, the purpose of which is to provoke a discussion among other professionals, i.e. experts in the field of the performance of social services for clients in residential facilities. We do not present any finite, fixed standards but rather the prerequisites for the creation of such. The research, as a necessary prerequisite for the creation of the methodology, was carried out with the aim of finding out how helping professionals coped with the burden associated with COVID-19 or with the change in the service provision regime that resulted from the epidemic of the new disease. From the point of view of creating the methodology, this is a retrospective, when we could use actual experience with COVID-19 from the years 2020 and 2021 to formulate the principles of crisis management within residential services for clients in situations of threat to health and life in general. An example of such a situation was the threat of a blackout, which we were very close to in the Czech Republic in June 2022. The methodology was created as part of the

"Innovation of Crisis Management of Residential Social Services for the elderly" (Technology Agency of the Czech Republic) project.

10. Software: Expert system to support ethical decision-making in the field of research and development of nanotechnology: The expert system is intended to support ethical decision-making in the field of research and development of nanotechnology in emergency situations. The ES is designed to guide the researchers to ensure that their decisions correspond with basic human rights, values and ethical principles and that they reflect nanotechnology regulatory systems, which ensure that nanotechnology is developed in an ethically sound manner. In addition to experts in nanotechnology research and development, users of this system can also be experts in nanoethics, students in these fields, and members of ethics committees. The expert system was created as part of the project "Support for ethical decision-making in the field of nanotechnology research and development!" (Technology Agency of the Czech Republic).

Table 3.4.1 – Overview of research results in the period under evaluation

Type of result ³¹	Year of application	Name
Software	2020	IS EpiGIS-COVID
Software	2021	Software for planning and managing searches for missing persons in the field
Chapter in a book	2022	Research of the climate of teaching staff: methodological options and results
Patent	2022	Method of spinning a polymer solution or melt using alternating electric voltage and a device for performing the method
Software	2022	Mobile EpiGIS
Specialised map	2022	Living names
Book	2023	Atlas of Liberec living names
Software	2023	Software for evaluating the test battery for determining the level of psychomotor development
Approved methodology	2023	Methodology of crisis management of residential social services for the elderly
Software	2023	Expert system for supporting ethical decision-making in the field of nanotechnology research and development

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

³¹ Specify the specific type of result. Add rows as needed.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³², providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³³

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

FSHE transfers R&D results into practice through applied research projects, direct cooperation with the application sphere (mainly schools, school facilities, public and state organisations) and outputs serving public institutions and the private sector.

Key tools for transfer include:

- Teaching materials and tools for education (e.g., textbooks, Didactic Incubator).
- Application of methodological approaches in education and management (e.g., crisis management methodology for residential social services, development of youth physical fitness).
- Development of specialised software tools (e.g., IS EpiGIS-COVID, search planning and management software).
- Cooperation on regional and international projects and events (e.g., geotourism trails, cooperation on the preparation of exhibitions in iQLANDIA, cooperation with the Regional Library in Liberec, the National Pedagogical Museum in Prague).

Typical users of the results and methods of cooperation:

- Schools and educational institutions: Textbooks, methodologies and software, e.g., test battery for the assessment of psychomotor development for use in school practice in elementary schools.
- Social services: The methodology of crisis management in residential services was developed in cooperation with providers of these services and has the potential for wider application.
- Cultural institutions: Performances, exhibitions, lectures, participation in the preparation of exhibitions.
- Regional administration: Outputs from the field of geotourism, including geotourism trails and map materials, supporting regional development.
- Public and state institutions: For example, regional health authorities in cooperation on the development and implementation of IS EpiGIS-COVID software, Police of the Czech Republic

³² In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³³ If the commercialisation of R&D&I results is carried out in this way.

- active use of the software for planning and managing the search for missing persons deployed at six regional directorates of the Czech Republic.

The evaluated unit searches for new users through:

- Active involvement in school grounds and in public space.
- Active involvement in public calls and projects (e.g., Technology Agency of the Czech Republic).
- Participation in professional events and workshops.
- Publication of outputs in professional media.

When dealing with intellectual property, FSHE follows the relevant TUL guidelines. The technology transfer system is described in the TUL Directive on the Protection of Intellectual Property at TUL and on the Commercialisation of Science and Research Results. Considering the focus of FSHE, the support of technology transfer is not an essential aspect of its activity; however, activities in the field of education such as the Didactic Incubator are actually a direct analogy of technology transfer. It is not customary in the field of education to patent this matter, so it is currently being formally conducted as contractual research.

Examples of the effectiveness of the transfer of results:

- Didactic Incubator: transfer of modern didactic methods into the practice of ordinary schools.
- Test battery: methodology and software for determining the level of psychomotor development for practical use in schools.
- IS EpiGIS-COVID: software deployed and used by regional health authorities, contributed to the effective management of the COVID-19 epidemic.
- Search management software: an application for the Police of the Czech Republic that directly improves the efficiency of search actions.
- Patent for the production of nanofibers: commercial potential exploited in the technology sector.

During the period under evaluation, FSHE obtained funding mainly through:

- Contracts concluded for public administration and partners from the application sphere.
- Licensing of technological solutions, e.g., patented method of manufacturing nanofibers, primarily through contractual research.
- Publication and sale of specialist materials (books, maps).
- Donations.

Table 3.5.1 – Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Donation: Financial support for the Didactic Workshop (The Lilia and Karel Janeček Foundation)	0 /0	0 /0	0 /0	0 /0	98 /4
Total	0 /0	0 /0	0 /0	0 /0	98 /4

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

During the years 2019–2023, FSHE devoted itself to a wide range of popularisation, creative, and educational activities across various disciplines. The aim was to bring scientific knowledge to the general public, support education, and reach different age and professional groups. The activities took place each year, even though the period under evaluation negatively affected by the COVID-19 pandemic, and included a wide range of themes and target groups that correspond to the multidisciplinary focus of FSHE. These activities not only made FSHE more visible, but also contributed to increasing the scientific literacy of the public.

The main activities included:

Popularisation lectures (for the public and specific groups)

- Interactive events (Researcher's Night, festivals, GIS Day, thematic workshops)
- Citizen science projects (e.g., data crowdsourcing)
- Media presentations (support of projects through articles, interviews, social networks)
- Educational programmes for schools, seniors and the public.

The following examples are selected that illustrate the above-mentioned aspects:

- **Geodiversity in urban spaces (2021):** Guided tours and the creation of a virtual educational trail focused on the natural wealth of Liberec. It included workshops and activities for schools and the general public. The activities aimed to introduce geography as a modern science accessible to all generations.
- **Series of lectures by the Department of History (2019–2023):** A series of educational events highlighting the importance of historical events and personalities. The series "Memory Places" - a series of lectures focused on historical sites and their significance in the context of the nation's memory, "Alternative Histories", "Returning Home - History in Public Space", "November Revolution 1989" and others were held, involving students and the general public.
- **Festival of Irish Culture (2022):** A multicultural week full of lectures, exhibitions and workshops brought Irish culture and history closer to the general public and students. The festival took place with the support of the Embassy of Ireland.
- **IQlandia Physics Fair and Educational Programmes (2019–2023):** The departments of mathematics and physics collaborated to prepare materials and ideas for exhibits and interactive educational programmes that promoted selected areas of mathematics and physics to visitors to IQlandia. The organisation of the fair with the help of playful experiments for children introduced the basics of physics in an entertaining manner. The successful popularisation attracted the attention of elementary schools in the region.

- **Column “About Czech from A to Z” (2019–2023):** Regular contributions by dr. Röhrich from the Department of Czech Language and Literature on Czech Radio discuss language themes in an accessible form and have a nationwide response.
- **Presentation of the research results of 100 years of physical fitness testing (2023):** The research and popularisation activities of the Department of Physical Education and Sports appealed not only to experts, but also to the general public and students. The results of the research were published through the media, including national news portals and FSHE’s social networks, and received a great response.
- **Activities of the FSHE Bohemia Choir (2019–2023):** The choir led by Dr. Konvalinková made several educational and popular programs combining musical performances with educational interpretation. These programs were dedicated to e.g., the national celebrations of Jan Ámos Comenius - a series of concerts “The Labyrinth of the World and the Paradise of the Heart”, which were conducted in Germany and the Czech Republic with the participation of soloists from the National Theatre, and the multicultural project “When the Motherland Calls” (2022), which connected the stories of war refugees and volunteers with melodramatic compositions for choirs. The event was also held in Great Britain and addressed both schools and the general public. Last but not least, the choir performed Concerts in Honor of Baron Liebie and English Christmas Concerts, which combined biblical excerpts with musical compositions in English. These activities were intended for both schools and the general public.
- **Exhibition “Amazon - 23 years since the discovery of springs” (2023):** Dr. Kocum from the Department of Geography participated significantly in the exhibition commemorating the expedition of Czech scientists who mapped the sources of the Amazon. It included photos and expert lectures about the expedition and climate change in the Andes.
- **Stolpersteine Project (2019–2023):** Organisation and implementation of the event of laying Stolpersteine (“stones of the disappeared”), the aim of which was to symbolically return the original citizens of Liberec, victims of the Holocaust, back to the public space of the city. The activity was widely publicised and raised awareness of the Holocaust and its victims. The leading personality of these activities was dr. Dr. Kateřina Portmann.
- **Literature in the reading landscape (2021–2022):** assoc. prof. Novotný from the Department of German co-organised the services “Literature in the landscape of reading” at several locations in Germany, Austria, and the Czech Republic. This series included public readings with authors including prominent writers such as Marcel Beyer and Ingo Schulze.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Self-assessment:

The panel states in the evaluation report that it is very difficult to evaluate a faculty such as ours when included in a single FORD category, as faculties of education are generally multidisciplinary. In the case of FSHE, the situation is even more complicated, because there is no science or philosophy faculty at the TUL, as is the case at other universities, and their role is partially taken over by the Faculty of Arts. In addition, FSHE includes several departments that are used by the entire university to provide teaching, especially the departments of mathematics, physics, chemistry, and physical education and sports.

The panel states that the rules of the self-evaluation report of Module 3 led to a focus mainly on the results related to the applied and contractual research conducted at FSHE, which penalises other aspects of its activity. The main recommendation is for FSHE to consider in future strategies that it is evaluated in FORD Social Sciences.

Table 3.1.6 (R&D&I Capacities) shows that inclusion in FORD 5 (Social Sciences) is justified. On the other hand, the overview from this table illustrates the multidisciplinary focus of FSHE. In the submitted self-evaluation report, we tried to cover both of these aspects in order to present FSHE in its entirety.

For the individual recommendations, we can state the following:

- **Recommendation 3.2, 3.3 and 3.4:**

Consolidate cooperation between natural sciences and humanities and strengthen social science research

FSHE is fully aware of the importance of interdisciplinary cooperation and purposefully tries to deepen interactions between the humanities and social sciences on the one hand and natural and technical sciences on the other. An example of successful interdisciplinary cooperation can be the Technology Agency of the Czech Republic project "Support for ethical decision-making in the field of nanotechnology research and development", which brought significant results. FSHE has also taken steps to support social science research, which we believe is clear from the self-evaluation report.

- **Recommendation 3.5 a 3.6:**

Make kindergarten and preschool education more attractive

This recommendation, which is not directly part of the Module 3 of the self-evaluation report, was intensively addressed in the period under evaluation. This was particularly reflected in the accreditation of the Teaching Programme for the 1st grade of primary schools, the setting and nature of which were positively evaluated by the rapporteur of the Board of the National Accreditation Office, prof. Šmelová.

Strengthen regional and cross-border cooperation

Regional cooperation is a long-term priority of FSHE. In accordance with the recommendation, FSHE is actively involved in cross-border cooperation with partners in Poland and Germany, especially in the areas of geography, history, and ecology research. These activities are documented by research projects implemented as part of cross-border cooperation.

- **Recommendation 3.7, 3.8 a 3.9:**

Transfer of technology

As the evaluation report correctly identifies, the transfer of technology outside the academic sphere in the classical sense of the word is not a core activity for faculties of our type. However, application outputs have been strengthened in the direction of practice. On the one hand, the Bioengineering Division was established at FSHE, which is closely linked to the Department of Chemistry, where several patents were created. On the other hand, there is also a transfer of knowledge in the field of humanities and social sciences, as we strive to illustrate in this report. An example is the expert system for searching for missing persons used by the Police of the Czech Republic, or the Didactic Incubator as an application of modern didactic methods directly into education.

- **Recommendation 3.10 a 3.11:**

FSHE strives to maintain international contacts both through students and colleagues, both on the side of incoming and outgoing mobility. As a system tool for support, FSHE established an internal mobility fund.

- **Recommendation 3.12:**

Although FSHE did not receive any specific recommendations, the faculty actively tries to popularise R&D activities, regularly participating in several popularisation events. FSHE also succeeded in entering the media space with its activities.

- **Recommendation resulting from the Protocol of the Ministry of Education, Youth and Sports: Improve the staffing situation in the field of pedagogy and psychology**

Although this is not the main content of this report, we note that there has been a significant increase in personnel in these areas. FSHE recently acquired an associate professor in the field of psychology and the Psychology Division was established. In addition, several younger and professionally promising employees were recruited, which contributes to the development of this discipline.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Faculty website	3.1	https://www.fp.tul.cz/en/
Strategy for scientific, research, development, innovation, art and other creative activities	3.1	https://www.fp.tul.cz/images/fakulta/strategicky-zamer/strategieVVI_FP-verze-2-23_EN.pdf

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Economics

FORD: 5 - Social sciences

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term objectives in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Self-assessment:

The Faculty of Economics of the Technical University in Liberec (FE) offers what businesses and organisations require at the start of the 3rd millennium, i.e., cutting-edge education, research, knowledge, experience, and cooperation. During its existence, FE has transformed into a prestigious, respected institution that promotes democratic principles, cultural diversity and humanistic values, and plays a significant role in the social development of the Liberec region.

Mission and vision

The mission of FE is to contribute to the expansion of knowledge through its educational and creative activities, push its boundaries in an international environment and strive for the practical application of new knowledge and its use in the development of society.

In the current dynamically changing environment, **the vision** of FE is to be an independent and internationally involved institution of European significance, which actively seeks out key societal challenges and research tasks and brings their comprehensive solutions.

FE holds the international certificate EFQM – European Foundation of Quality Management and the National Quality Award of the Czech Republic in the START PLUS programme. The development of key activities at FE is defined in the [Strategic Plan for Educational and Creative Activities and the Internationalisation Strategy of the Faculty of Economics of the Technical University of Liberec for the period 2021-2025, with a view to 2030](#) and its annual update in the form of implementation

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

plans. FE also has a Science, Research and Innovation Strategy until 2025 with a view to 2030 and a Personnel Development Strategy until 2030. Their purpose is to contribute to the fulfilment of the vision and mission of TUL in accordance with the [TUL Strategic Development Plan for 2020 with a forward view to 2030](#).

Self-reflection of the social contribution

FE has been a recognised partner of regional governments and research institutions (which is reflected in the contractual research or applied research projects area, see Chapter 3.3) and, especially within the framework of the Partnership Model, a partner of economic entities supporting the development of innovation and entrepreneurship. The outputs are based on implemented projects and collaborations, and have their practical application (see Chapter 3.4). Several results have addressed national social needs, e.g., innovation of national and regional strategies, evaluation of the socio-economic position of inhabitants in the Czech regions, evaluation of the impact of clusters on the performance of member enterprises, family businesses vitality assessment, digital transformation of business, online marketing communication, and others. Other results have been presented and used at the European level, e.g., Study on the impact of concluding the EU-MerCoSur trade agreement, global university entrepreneurial spirit students' survey, people management challenges for SMEs in five European regions, lobbying transparency's impact on democratisation in Central and Eastern European countries. The transfer of R&D outputs into practice is realized through scientific conferences ([Liberec Economic Forum](#)), the holding of roundtables to connect the corporate and academic spheres, activities of the [Student Business Club](#) and others (see Chapter 3.5). FE provides a range of activities for the corporate and public sphere through the [Office of Analysis and Studies](#). FE also publishes the prestigious scientific journal [E&M Economics and Management](#).

Distribution of research activities according to the type of research

Scientific research activity is one of the key activities provided by FE and is focused on:

- **Basic research:** In the years 2019 - 2023, two projects of the Grant Agency of the Czech Republic were implemented.
- **Applied and contractual research:** In the years 2019 – 2023, three projects of the Technology Agency of the Czech Republic were implemented, the Erasmus+/K2 project with an overlap into research, two Visegrad grants projects, three Ministry of Education, Youth and Sports projects including the Student Grant Competition, two international projects as the other participant and more than 20 contractual research projects with revenues of more than 80 thousand EUR.

Organisational structure

FE consists of the following specialised departments:

- Department of Business Administration and Management (business environment, management of business processes and organizational relations, strategic business management).
- Department of Marketing and Trade (areas of marketing strategy and research, marketing and corporate communication).
- Department of Economics (economic theory, economic and regional policy, European economic integration).
- Department of Informatics (organizational information processes, internet marketing, and multimedia data processing).
- Department of Finance and Accounting (corporate finance, controlling, financial management, public finance, taxes, accounting, auditing, banking and business valuation).

- Department of Economic Statistics (statistical, econometric and economic-mathematical methods and operational research methods).
- Department of Foreign Languages (business English, German, including a certification course in German, Russian, Spanish, and French).

The management of FE consists of the Dean and Vice-Deans for academic affairs, foreign affairs, conception and development, science and research and external relations. The Dean's Office provides administrative and organisational support, coordination of projects and communication with partners and students. FE maintains a stable staffing policy, with minimal annual changes in academic staff (see Table 3.1.1). FE implements educational activities in the field of economics (see Table 3.1.6), specifically through 12 accredited study programmes in the Czech language (one professional programme), five programmes in the English language, at the Bachelor's, Master's and Doctoral levels. FE also has an accredited procedure for the appointment of Associate Professors and Professors in the field of Business Economics and Management. In 2024, FE received institutional accreditation for EA Economics (for Bachelor's studies) and EA Informatics (for all three levels of study). The overall number of students reached 1273 in 2023 (over a five percent increase from previous stable years), of which 673 were women.

Long-term objectives

1. Prioritise research themes with international impact and key themes for the development of regional and national values. Increase basic research grant projects supported by national or international providers.
2. Support inter-faculty and interdisciplinary cooperation at TUL. Increase the number of working groups involved in international cooperation in science and research.
3. Fulfil the strategy in the field of creation and protection of intellectual property and transfer of research results into practice. Increase the commercialisation of R&D results and expand cooperation with industrial partners.

Table 3.1.1 - Staffing per FTE²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	3.00/0.00	3.00/0.00	3.00/0.00	3.00/0.00	2.55/0.00	14.55/0.00
Associate Professor	9.91/8.00	10.24/7.66	9.94/7.27	10.21/7.08	11.29/7.83	51.59/37.84
Assistant Professor	39.17/29.15	41.26/30.63	39.41/29.78	38.79/30.64	39.42/30.80	198.05/151.00
Assistant	3.35/2.55	3.21/2.41	2.88/1.66	2.45/1.03	2.65/2.05	14.54/9.70
R&D Personnel ³	3.53/0.94	1.75/0.25	1.65/0.01	1.40/0.00	1.40/0.00	9.73/1.20
Researchers in other categories ⁴	10.99/7.70	10.08/7.21	8.43/6.04	7.84/6.24	7.61/6.10	44.95/33.29

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

Technical and economic staff ⁵	12.89/12.42	13.42/12.16	11.77/10.05	12.89/10.97	13.18/11.18	64.15/56.78
Scientific, research and development staff involved in teaching activities	65.42/47.40	67.10/44.47	62.77/44.76	61.86/44.96	63.21/46.78	320.36/228.37
Early career researchers ⁶	9.17/6.49	10.17/5.06	10.76/8.00	9.20/6.53	10.43/7.71	49.73/33.79
Total ⁷	82.84/60.76	82.96/60.32	77.08/54.81	76.58/55.96	78.10/57.96	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	1	0	0	0	2	0	0	0
Associate Professor	0	0	0	0	3	3	4	3	1	0	1	1
Assistant Professor	0	0	11	8	13	7	12	10	5	5	0	0
Assistant	1	1	1	1	1	0	0	0	1	1	0	0
R&D Personnel ⁹	0	0	0	0	2	0	0	0	0	0	0	0
Researchers in other categories ¹⁰	0	0	2	1	4	3	4	3	1	1	1	0
Technical and economic staff ¹¹	0	0	3	3	4	4	2	2	3	3	0	0
Scientific, research and development staff involved in teaching activities	1	1	13	10	22	13	20	16	10	7	2	1
Early career researcher ¹²	0	0	4	3	3	1	3	2	0	0	0	0
Total ¹³	1	1	17	13	28	17	22	18	13	10	2	1

⁵ Who participates in the management and support of R&D&I in the institution.

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (excluding persons working on agreement on work activity or agreement on work performance).

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

¹² See Definition of Terms in Methodology HEI2025+.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	0	0	1	0	2	0	0	0
Associate Professor	0	0	1	0	4	2	4	3	1	1	0	0
Assistant Professor	0	0	8	6	15	10	11	8	4	4	0	0
Assistant	1	1	1	1	0	0	1	0	1	1	0	0
R&D Personnel ¹⁵	0	0	0	0	1	0	0	0	0	0	0	0
Researchers in other categories ¹⁶	0	0	2	1	1	1	2	1	4	3	0	0
Technical and economic staff ¹⁷	1	0	1	0	6	6	4	4	0	0	0	0
Scientific, research and development staff involved in teaching activities	1	1	11	8	20	13	19	12	12	9	0	0
Early career researcher ¹⁸	0	0	5	4	2	0	1	1	0	0	0	0
Total ¹⁹	2	1	13	8	27	19	23	16	12	9	0	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

¹⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	791	446	762	409	795	444	827	429	890	461	4065	2189
Master's ²⁰	367	231	414	246	445	261	423	247	421	231	2070	1216
Doctoral	21	10	23	13	28	14	40	16	30	11	142	64
Lifelong Learning Courses											0	0
Total	1179	687	1199	668	1268	719	1290	692	1341	703	6277	3469

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	3/0	1/0	3/0	1/0	3/0	1/0	3/0	1/0	3/0	1/0	15/0	5/0
Master's	3/1		4/1		4/1		4/1		4/1		19/5	
Doctoral	4/4		4/4		4/4		4/4		4/4		20/20	
Lifelong Learning courses									1/0		1/0	
Total	10/5	1/0	11/5	1/0	11/5	1/0	11/5	1/0	12/5	1/0	55/25	5/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	0	-	11
	1.2 Computer and information sciences	8	Balanced basic and applied research	
	1.3 Physical sciences	0	-	
	1.4 Chemical sciences	0	-	
	1.5 Earth and related environmental sciences	1	Applied Research	
	1.6 Biological sciences	0	-	
	1.7 Other natural sciences	2	Balanced basic and applied research	

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

2. Engineering and Technology	2.1 Civil engineering	0	-	1
	2.2 Electrical engineering, Electronic engineering, Information engineering	0	-	
	2.3 Mechanical engineering	0	-	
	2.4 Chemical engineering	0	-	
	2.5 Materials engineering	1	Applied Research	
	2.6 Medical engineering	0	-	
	2.7 Environmental engineering	0	-	
	2.8 Environmental biotechnology	0	-	
	2.9 Industrial biotechnology	0	-	
	2.10 Nanotechnology	0	-	
	2.11 Other engineering and technologies	0	-	
3. Medical and Health Sciences	3.1 Basic medicine	0	-	0
	3.2 Clinical medicine	0	-	
	3.3 Health sciences	0	-	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0	-	0
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	
	4.4 Other agricultural sciences	0	-	
5. Social Sciences	5.1 Psychology and cognitive sciences	0	-	86
		62	Balanced basic and applied research	
	5.2 Economics and Business			
	5.3 Education	3	Applied Research	
		8	Balanced basic and applied research	
	5.4 Sociology			
	5.5 Law	1	Balanced basic and applied research	
	5.6 Political science	9	Basic Research	
	5.7 Social and economic geography	1	Applied Research	
		1	Balanced basic and applied research	
	5.8 Media and communications			
		1	Balanced basic and applied research	
	5.9 Other social sciences			
6. Humanities and the Arts	6.1 History and Archaeology	0	-	2
	6.2 Languages and Literature	2	Applied Research	
	6.3 Philosophy, Ethics and Religion	0	-	
	6.4 Arts (arts, history of arts, performing arts, music)	0	-	
	6.5 Other Humanities and the Arts	0	-	
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

Position in the research community

FE holds the international certificate EFQM – European Foundation of Quality Management and the National Quality Award of the Czech Republic in the START PLUS programme. In 2020, FE received an award in the HREA Excellence Award 2020 competition for the best projects and professionals in the field of human resources in the category of small and medium-sized enterprises for the project “SMEs HRM Attraction, Retention and Performance Enhancement Network”. FE is a joint member of the Czech Economic Society, the Association of Social Responsibility, the university platform at the Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic, a founding member of the Czech Society for System Integration and the Platform for the Bioeconomy of the Czech Republic, and is a member of the People Management Forum platform. In 2023, the publication of the international impact journal E&M Economics & Management continued at FE for the 25th year. FE is a respected partner of state and local government bodies at the national level. Traditional partners in the implementation of research tasks and projects, and therefore also the implementation of its results, are e.g., The Czech Statistical Office, the Ministry of Industry and Trade, the Ministry for Regional Development, or the Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic. FE members were actively involved in a number of different regional initiatives, e.g., The Innovation Platform of the Liberec Region, the Employment Pact of the Liberec Region, initiatives to create a business incubator in the Liberec Region, as well as within the working group of the regional permanent conference of the Ministry for Local Development for social inclusion in the Liberec region or the Listem 21 Endowment Fund.

Individual and other prestigious R&D&I awards

FE strengthened its impact in the research community during the period under evaluation. This may be demonstrated by the awards won by selected academic personnel, the most significant being the Award of the Minister of Education, Youth and Sports, which was awarded in 2021 to Mgr. Tereza Semerádová, Ph.D. for work on the applied research “Development of skills necessary for the digital transformation of business”, connecting science and research with educational activities through state-of-the-art online tools and the HREA Excellence Award 2020 awarded to doc. Ing. Kateřina Maršíková, Ph.D.

Participation of academic employees in editorial boards of international scientific journals

FE academic employees also serve on the editorial boards of international journals, i.e., Engineering Economics, E&M Economics and Management, and in the peer-reviewed journals Global Journal of Business Social Sciences Review and ACC Journal and others listed in Table 3.2.2.

The most important lectures of academic employees abroad and invited lectures

FE employees were invited as renowned experts to lectures at partner foreign universities, see Chapter 3.2.3. Each year, more than 50 experts from application practice and foreign experts give lectures at FE or participate in important events organised by FE (Liberec Economic Forum in 2019, 2021, and 2023 and roundtables 2019, 2021, 2023), the most important of which see Chapter 3.2.4.

Involvement in the evaluation of national or European project/programme calls

Reputation in the research community is also strengthened by the participation of individual employees in evaluation panels of national and international project structures, specifically Grant Agency of the Czech Republic Panel 403, Technology Agency of the Czech Republic Zéta, Sigma, Transport, Environment, Operational Programme Johannes Amos Comenius, Global University Entrepreneurial Spirit Students' Survey, INTER-EXCELLENCE II, INTER-ACTION programme, and the LUAUS23 call.

Membership in professional societies:

The membership of FE academic personnel in professional societies includes several important functions and involvement that support FE's international prestige and contribute to its involvement in research and development. Here is a summary of the most important memberships:

- doc. Ing. Aleš Kocourek, Ph.D. – Member of the Expert Board of the Listem21 Foundation, the Executive Board of the Employment Pact of the Liberec Region, the Society for Regional Science and Politics,
- doc. Ing. Pavla Vrabcová, Ph.D. – Member of the Expert Section of the Quality Council of the Czech Republic Social Responsibility and Sustainable Development (advisory body of the Ministry of Industry and Trade), the Czech Business Council for Sustainable Development (CBCSD), and the working group New Methodological Trends of Sustainability within the framework of the CBCSD, the Platform for the Bioeconomy of the Czech Republic,
- doc. PhDr. Ing. Pavla Bednářová, Ph.D. – Member of the Accreditation Committee for Higher Professional Education, member of the Eurasia Business and Economics Society, Regional Science Association International,
- prof. Ing. Ivan Jáč, CSc. – Member of the Board of Directors of the District Chamber of Commerce in Liberec, member of the jury for the evaluation of companies within the Deloitte "Czech Best Managed Companies" programme,
- prof. Ing. Šárka Laboutková, Ph.D. – Member of the Czech Society for Political Sciences, Member of the European Consortium for Political Research (ECPR),
- doc. Ing. Petra Rydvalová, Ph.D. – Member of the University Platform at the Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic (AMSP ČR),
- prof. Ing. Miroslav Žižka, Ph.D. – Member of the Czech Society for Operational Research,
- Ing. Lenka Červová, Ph.D. – Member of the Council of the Association for the Promotion of Tourism in the Liberec Region,
- Ing. Olga Malíková Ph.D. – representative of TUL in the Audit Examinations Committee and Member of the Appeals Committee of the Chamber of Auditors of the Czech Republic,
- doc. JUDr. Ing. Bohumil Poláček, Ph.D., MBA, LL.M. – arbitrator at the Arbitration Court of the Economic Chamber of the Czech Republic and the Agrarian Chamber of the Czech Republic and Chairperson of the Air Bank audit committee,
- doc. Ing. Klára Antlová, Ph.D. – Secretary of the Czech Society for System Integration.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Faculty of Economics	Label 2020	Czech National Agency for International Education and Research
Kateřina MARŠÍKOVÁ, doc. Ing. Ph.D.	HREA Excellence Award 2020	HR FORUM, s.r.o.
Tereza SEMERÁDOVÁ, Mgr. Ph.D.	Award of the Minister of Education, Youth and Sports for excellent educational activity. 2021	Ministry of Education, Youth and Sports
Petr PRŮCHA, Ing. and Peter MADZIK, doc. Mgr. Ph.D.	RPA Forum best paper award at the international conference BPM 2023	Utrecht, Netherlands
Pavel PELECH, Ing.	International Conference on Applied Economics and Business and Sustainable Tourism Management best paper award 2023	Copenhagen, Denmark
Michaela MATOUŠKOVÁ, Ing	1 st place in the category of students in doctoral studies at the 16 th international conference YOUNG SCIENTIST 2023	Ostritz /Marienthalu (Germany)
Jakub ANDAR, Ing. a Dominik KOLÁŘ, bc.	Junior quality manager certificate 2021	Czech Society for Quality
Karina TATEK BENETTI, Bc. Ing. Ph.D.	Prize of the Rector of Tashkent State University of Economics for the development of international cooperation	Tashkent State University of Economics
Denisa SKRBKOVÁ, Ing. Bc. BA (Hons)	Best paper award AABD 2021	Academy of African Business and Development

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Miroslav ŽIŽKA, prof. Ing. Ph.D.	ACC Journal, ISSN 1803-9782 (print), ISSN 2571-0613 (Online), deputy editor-in-chief. E&M Economics and Management, ISSN 1212-3609, E-ISSN 2336-5064, executive editor. Trendy v podnikání, eISSN 2788-0079, member of the editorial board.
Helena NEUMANNOVÁ, PaedDr. Ph. D.	ACC Journal, ISSN 1803-9782 (print), ISSN 2571-0613 (Online), member of the editorial board.
Jiří KRAFT, prof. Ing. CSc.	Inžinerině Ekonomika (Engineering Economics), Print ISSN 1392-2785, Online ISSN 2029-5839, member of the editorial board. Kreativnaja Ekonomika (Creative Economy), ISSN 1994-6929 (print), ISSN 2409-4684 (online), member of the editorial board.
Aleš KOCOUREK, doc. Ing. Ph.D.	Global Journal of Business and Social Science Review, E-ISSN 2289-8506, Print ISSN 2180-0421, member of the editorial board.
Jaroslava DĚDKOVÁ, doc. Ing. Ph.D.	Reflexie, ISSN 2585-7428, member of the editorial board.
Tereza SEMERÁDOVÁ, Mgr. Ph.D.	Frontiers in Communication, ISSN 2297-900X, associate editor for advertising.
Petr WEINLICH, Ing. Ph.D.	Frontiers in Communication, ISSN 2297-900X, review editor for advertising.

Pavla VRABCOVÁ, doc. Ing. Ph.D.	Waste Forum, ISSN 1804-0195, member of the editorial board. Mundus Symbolicus, ISSN 1210-809X, member of the editorial board. Prameny a studie, ISSN 0862-8483, member of the editorial board. Czech Hospitality and Tourism Papers, ISSN 2571-0389, member of the editorial board.

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Miroslav ŽIŽKA, prof. Ing. Ph.D.	Do Clustered Firms Outperform the Non-clustered Ones? Evidence of Firms' Financial Performance in Traditional Industries	22 nd TCI Network Global Conference, Antwerp (Belgium)	2019
Lenka STRÝČKOVÁ, Ing. Ph.D.	An Introduction to Accounting Concepts and Financial Statements; Analysis of Financial Statements.	University of Foggia (Italy)	2019
Kateřina MARŠÍKOVÁ, doc. Ing. Ph.D.	Managing People: The Challenges and Opportunities for Small Business	University of Huddersfield, Huddersfield University Business School (UK)	2019
Zdeněk BRABEC, Ing. Ph.D.	Harmonisation of accounting, International Financial Reporting Standards.	Uniwersytet Ekonomiczny we Wrocławiu, Filia w Jeleniej Górze (Poland)	2021
Aleš KOCOUREK, doc. Ing. Ph.D.	Impact Assessment Studies of EU Trade Agreements (Methodology & Main Findings)	European Trade Economist Network at the European Commission on the grounds of the Ministry of Industry and Trade of the Czech Republic as part of the Czech Presidency of the Council of the European Union	2022
Jaroslav DEMEL, Ing. Ph.D.	Fundamentals of an international trader	ISCAL Lisbon (Portugal)	2022
Pavel PELECH, Ing.	Marketing Communications in the Sharing Economy - Brand Importance	Conference ICAEB 2023, Denmark (best presentation award)	2023
Pavel PELECH, Ing.	Innovative marketing and strategies of red/blue oceans	Technical University of Applied Sciences Wildau (Germany)	2023
Kateřina MARŠÍKOVÁ, doc. Ing. Ph.D.	Sustainable human resource management in the international context	WSB University (Poland)	2023
Karina TATEK BENETTI, Bc. Ing. Ph.D.	Climate Change, Sustainability in Insurance Market	Cairo University (Egypt)	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Luboš KOMÁREK, Prof. Ing. et Ing. Ph.D., MSc, MBA	Czech National Bank	The role of the CNB in establishing monetary and financial stability	2019
Dalia KHALIL, prof.	Cairo University (Egypt)	Insurance Industry in Egypt	2019
Michal BROŽA, Mgr.	United Nations Information Centre Prague	The importance and role of the UN in a globalized world	2020
Larry SMITH, Prof.	University of Waterloo (Canada)	Innovation and Entrepreneurship in Waterloo Region	2021
Marek PYSZKO, Ing.	Ministry of Foreign Affairs	Economic Diplomacy of the Czech Republic	2021
Monika PALATKOVÁ, doc. Ing. Ph.D.	CzechTourism agency	Recovery of the International Tourism 2021+: Opportunities and Challenges for the New Normal	2021
Anne Grethe SYVERSEN, Assistant Professor	Norwegian University of Science and Technology	How can knowledge management play an important role in sustainable business development?	2022
Rupert BAUMGARTNER, prof.	Department of Environmental System Sciences, University of Graz, Austria	Sustainable Strategic Management in the era of the Anthropocene	2023
Martin BRADBEER, Dr.	Technical University of Applied Sciences, Germany	Intercultural communication in managing human resource	2023
Frances MCGREGOR, Dr.	University of Huddersfield, Huddersfield University Business School	Current HR Challenges	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Tereza SEMERÁDOVÁ, Mgr. Ph.D.	Grant Agency of the Czech Republic Panel 403	Grant Agency of the Czech Republic	2023
Tereza SEMERÁDOVÁ, Mgr. Ph.D.	Technology Agency of the Czech Republic Zéta, Sigma, Transport, Environment	Technology Agency of the Czech Republic	2020 - 2023
Tereza SEMERÁDOVÁ, Mgr. Ph.D.	Operational Programme Johannes Amos Comenius	Ministry of Education, Youth and Sports of the Czech Republic	2023
Petra RYDVALOVÁ, doc. Ing. Ph.D.	Global University Entrepreneurial Spirit Students' Survey	University of St. Gallen and the University of Bern (both Switzerland)	2021 2023

Pavla ŠVERMOVÁ, Ing. Ph.D.	INTER-EXCELLENCE II, programme INTER-ACTION, Call LUAUS23	Ministry of Education, Youth and Sports of the Czech Republic	2022

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the period of 2019–2023²³. This should be done from the full list in annex tables (Table 3.3.1–3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

FE performs projects from the Grant Agency of the Czech Republic as part of basic research, as well as applied research projects (mostly in cooperation with enterprises) from the Technology Agency of the Czech Republic, the Ministry of Industry and Trade, the Ministry of Education, Youth and Sports, as well as international projects. The selected projects document the social and knowledge contribution of FE in the field of economics, or informatics (focusing specifically on information management). The results of the research contributed to the development of the supporting Business Economics study programme at FE, in all three degrees of study, including the doctoral degree. The social relevance is demonstrated via specific results (full overview in the Appendix, Tables 3.3.1 and 3.3.2) with regard to the achieved results or the application potential of the projects. FE has long-term emphasis on intensive cooperation with the corporate sphere, both in terms of research activities and in terms of the transfer of research outputs into practice and contract research.

Evaluation of effectiveness and impacts

The selected projects represent the wide range of FE research activities with scientific research and application potential. A key aspect is their interdisciplinarity, internationalisation and the ability to connect academic research with practice, whereby FE contributes to fulfilling its mission and solving societal challenges.

1. GA18-01144S: An empirical study of the effects of the existence of clusters on the performance of member enterprises. (2018–2021) – TUL 100%, without co-recipient

The main objective of the project was to find out whether the existence of natural or institutionalised clusters has a positive effect on the innovative and financial performance of the companies that form the core of the clusters. The research was conducted in seven sectors (automotive, engineering, textile, nanotechnology, IT, furniture, and packaging industry) showed that clusters are one of the factors influencing the performance of enterprises. From the point

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

of view of financial performance, a significant growth in performance was found only in the automotive industry. Furthermore, performance growth was identified in the group of institutionalised clusters in engineering, furniture, textile industry, and IT services. In the automotive industry, clustered enterprises showed faster technological change than non-clustered enterprises. More significant technological progress was found in the furniture cluster compared to enterprises in the natural cluster and outside the cluster. Also in the packaging industry, enterprises in the institutionalised cluster showed stronger technological progress. This project represents basic research. It contributed to the understanding of how business cooperation affects the innovative and, consequently, the financial performance of enterprises. The focus of the project fulfils the FE's research direction "Business cooperation and networking: implications for business performance", which includes the Strategy for Science, Research and Innovation at FE until 2025 with a view to 2030. From the point of view of interdisciplinarity, the project extends into operational research, in particular into the field of multi-criteria decision-making. In connection with the completed Grant Agency of the Czech Republic project 18-01144S, cooperation with CzechInvest is underway to implement the international project Interreg VI-C Europe: Realign Cluster Policies to Accelerate the Twin Green and Digital Transitions (AccelerateGDT 28119). Team member prof. Miroslav Žižka is an expert of the National Stakeholder Group for Cluster Policy.

2. TL01000303: Use of Big Data to evaluate the socio-economic position of residents in the types of territories defined by the Regional Development Strategy 2021+. (2018–2021)

During the project, a unique certified methodology NmetS 2021 was created, determining a repeatable and traceable procedure for estimating regional price levels and nominal and real net monetary incomes of residents of small areas (administrative districts of municipalities with extended powers and authorised municipal authorities). The results of the application of the methodology are the basis for an analysis and evaluation of small areas in terms of price development in various segments according to CZ COICOP and real estate prices, as well as the monetary income of the population (wages, insurance and non-insurance social benefits, business income, etc.). The results have application potential for monitoring, defining and evaluating the needs and problems of specific regions. They are important for more precise targeting of regional policy instruments, not only in the creation of strategic regional development documents, but also in the planning and implementation of specific measures and their subsequent evaluation. The net monetary income of the population in nominal and real value (regional purchasing power parity) can also be an indicator of the justification of socio-economic interventions in economically or socially weak areas and were included e.g., among the monitoring indicators of the Regional Development Strategy of the Czech Republic 2021+.

3. TJ02000206: Development of skills necessary for the digital transformation of business. (2019–2021)

The project performed by young researchers from the Department of Informatics was rated by the Technological Agency of the Czech Republic as a project **with excellent results**. The project brought new insights into the current readiness of enterprises to integrate electronic business tools, such as systems for creating behaviourally targeted advertising, the possibility of generating personalised content or applications for marketing automation. The project was implemented in cooperation with the Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic, which acted as an application guarantor in the project. This ensured the direct transfer of project results into practice and their maximum adaptation to the needs of the business environment. The objective of the project was to increase the ability of small and medium-sized enterprises to use new digital tools to acquire customers, optimise business processes and increase sales. The key outputs were an educational portal and an interactive

mobile application. These tools offer theoretical teaching texts as well as practical video tutorials focused on online marketing, multimedia content, web analytics, and data mining. These outputs currently enable companies to easily educate their employees and bridge the shortage of experts in the field of information and communication technologies (ICT). An important contribution of the project was also its influence on the development of the professional programme Information Management and the academically oriented programme System Engineering and Informatics. The knowledge gained and the tools created were integrated into the teaching, which enabled the students of both programmes to acquire practical skills and apply modern digital technologies in practice. Students are now able to prepare for the growing demand for experts in digitisation, e-commerce, and online marketing, which increased their applicability on the labour market.

4. GA16-08786S: The impact of lobbying transparency on democratisation and its consequences. (2016–2020)

The project aimed to assess how lobbying transparency affects democratization, institutional quality, and evaluate its main consequences. The project developed a comprehensive methodology reflecting the relationships/interactions between “actors of influence” and “holders of public office”. The result is a draft catalogue for evaluating the transparency of lobbying and the division of all measures into four categories, i.e., lobbyists, lobbying objectives, the so-called sunshine principles, and monitoring and sanctions, which provides a total of 158 indicators. Experts in the given field (primarily from the academic community and non-profit organisations) from five countries of Central and Eastern Europe, i.e., Slovakia, Poland, Hungary, Austria and Slovenia, collaborated on the research, thereby strengthening the role of research internationalisation at FE. The catalogue identified links between transparent lobbying and indicators of the quality of democracy as well as indicators of institutional quality. Common denominators when examining institutional quality/quality of democracy and lobbying transparency are indicators related to citizens (e.g., the ability of society/interest groups to comment on and influence upcoming policies/legislation or regular consultation of policy makers with civil society organisations), information related indicators that reflect the relationship between citizens and public authorities (e.g., availability/free access to information or disclosure, transparency and accuracy of information), and indicators limiting the scope for opportunities for corruption. The obtained results indicate that instead of focusing purely on adopted laws on lobbying, especially on the side of lobbyists, research of transparent lobbying should be more comprehensive. A broader, targeted approach to assessing the quality of the lobbying environment is essential in evaluating the quality of democracy and institutions in public policy. As part of the project, 1 x Jimp - WoS, 5 x Jsc, 11 x D (WoS, Thomson) and a professional book [*Transparent Lobbying and Democracy*](#) published by Springer International Publishing were created.

5. TL03000236: School-age children and their perception of online marketing communication. (2020–2023)

The project was implemented between August 2020 and July 2023 with the support of the Technology Agency of the Czech Republic as part of the ÉTA Programme. The team was composed of employees from FE, the Faculty of Science, Humanities and Pedagogy of TUL, and the Academy of Sciences of the Czech Republic. The research aimed to identify the role of the Internet in children's lives (ages 10-13), the online marketing tools they encounter, and their impact. The research showed that children see the online world as a normal part of their lives. On the Internet, marketing communication is aimed at them, while children do not recognise some of its forms or have a negative attitude towards them, which they mistakenly consider a manifestation of critical thinking, although it is a conforming acceptance of the opinions of adults

or peers. As part of the project, a didactic aid entitled *school-aged children and their perception of online marketing communication* was created, which consists of educational videos for teachers, methodology, worksheets for pupils in the 5th and 6th grades of primary schools or grammar schools, sheets with the correct answers, and glass presentations. Experts from the fields of marketing, pedagogy and didactics, and sociology participated in the creation of the didactic aid. This guaranteed the fulfilment of the objective of the ÉTA programme aimed at realising innovation potential in the fields of social, humanities and/or artistic sciences (SHUV). The results of two research projects on these themes are presented in a monograph by Munipress, including theoretical and practical benefits of the research, as well as recommendations for schools and parents on educating children about online marketing. The results of the research contributed to the development of the supporting study programme Business Economics at FE.

6. 2016-1-CZ01-KA203-023916: SMEs Human Resource Attraction, Retention and Performance Enhancement Network (SHARPEN). (2016–20219)

In 2020, FE received the **HREA Excellence Award 2020** award in the competition of the best projects and professionals in the field of human resources in the small and medium-sized enterprise category for this project, and two SHARPEN students from the Czech team won the “Young Scientist” award that is awarded each year to university students in the Euroregion Nisa. The project objective was to develop cooperation with SMEs and local authorities. An intensive 3 years of work led to the creation of an e-Handbook for SMEs as well as a survey and research performed to provide a unique and comparable international set of data on specifics of HR processes in SMEs in the project partners’ countries to help understand this environment and develop tools to help SMEs attract prospective employees. Research publications: People Management Challenges for SMEs in Five European Regions: a collaborative cross-regional research publication which involved the collection of primary data where the partner universities research strengths and competencies are put to good application to generate new insights, knowledge, and a comparative analysis in order to contribute to closing the gaps in HR management in SME fields.

7. Global University Entrepreneurial Spirit Students’ Survey (GUESSS). Lead Partner: University of St. Gallen. (2016 – to-date)

GUESSS stands for “Global University Entrepreneurial Spirit Students’ Survey”. It is one of the largest entrepreneurship research projects in the world. GUESSS is organised and managed through cooperation between the University of St. Gallen and the University of Bern (both in Switzerland). The main research focus is students’ entrepreneurial intentions and activities, including the theme of family business succession. GUESSS data have been used for several publications in leading international academic journals such as the Journal of Business Venturing (JBV) or Entrepreneurship Theory & Practice (ETP). Impact in practice is generated through numerous international and national project reports. GUESSS is a large, global research project about student entrepreneurship. The CEO of GUESSS is Prof. Dr. Philipp Sieger from the University of Bern. FE has been a project participant since 2016 as a partner responsible for the collection and processing of data from the Czech Republic. FE participated in GUESSS surveys in 2016, 2018, 2021, and 2023, and the research reports are available here: <https://www.guesssurvey.org/publications/publications/national-reports.html>.

8. Ministry of Industry and Trade: Study of the effects of the conclusion of the trade part of the Association Agreement between the EU and the Mercosur bloc on the economy of the Czech Republic. (2021)

The study's conclusions were published in a professional book titled, *Study of the effects of the conclusion of the trade part of the Association Agreement between the EU and the MerCoSur bloc on the economy of the Czech Republic* (hereinafter referred to as the Impact Study), which was prepared as part of a public tender for the Ministry of Industry and Trade of the Czech Republic. Elaboration of the Impact Study is an important part of the approval and subsequently possibly ratification process of the agreement. The Impact Study will serve as a basis for submitting the agreement for approval to the Government and the Parliament of the Czech Republic. The Impact Study contains a description of the trade part of the Association Agreement, the effects of the agreement conclusion on the Czech economy and, for comparison, the EU as a whole. It also contains detailed sectoral analyses based on relevant economic sectors and recommendations implementation. The comprehensive general equilibrium (CGE) model is mainly used to estimate economic impacts. The methodological part contains the specification and calibration of the model used for the purpose of quantifying the impacts of the trade part of the Association Agreement on the Czech and European Union economies and its economic sectors. The results represent the quantified economic impacts of the removal of both tariff and non-tariff barriers to trade on both the Czech and EU economies and include case studies of selected Czech companies. The results of research focused on the potential impacts of eight free trade agreements were presented to the European Commission by doc. Ing. Aleš Kocourek, Ph.D. at the Trade Economist Network meeting at the Ministry of Industry and Trade of the Czech Republic during the Czech Presidency of the Council of the European Union in 2022, see Chapter 3.2.3.

9. Association of small and medium-sized enterprises and crafts of the Czech Republic: Survey of the quality of family business. (2022)

The research report contains a summary of the study on the theme of education in family businesses. The key term "family business" was defined in the Czech environment in the framework of Government Resolution No. 1146/21 of 18 October 2021 - "Definition of a family business in the Czech Republic" (updated definition). The presented document is thematically supplemented by a separate annual quantitative survey of the Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic (AMSP ČR) conducted among family businesses across the Czech Republic. In 2022, the theme of family business education was addressed in the 92nd AMSP ČR survey (AMSP ČR, 2022). The aim of this research study is to define a framework for supporting family business education through a qualitative survey of the current state of knowledge. The definition of the approach is based on the confrontation of the findings from the quantitative survey No. 92/2022 (AMSP ČR, 2022) with qualitative research using guided interviews with selected family businesses highly rated in the framework of the National Award for Quality in Family Business. The intention was to determine the methods and sectoral focus of educational activities, forms of cooperation between family businesses and educational institutions, interest in internships as a form of education for successors, methods of financing educational activities and their evaluation, etc. Cooperation with AMSP ČR is ongoing following the application of the results of the Technology Agency of the Czech Republic R&D project TD03000035. In 2023, the project results were again used to assess family business vitality within the competition of the Quality Council of the Czech Republic at the Ministry of Industry and Trade. The project results are part of an audit of family businesses, with 22 companies being registered for the fourth year of the event in 2023.

10. Contractual research with Škoda Auto, a.s. (2021–2022)

FE has been cooperating for a long time with Škoda Auto, a.s., which is also one of its main partners, in the implementation of specific projects, which in the period under evaluation focused, for example, on the optimisation of the flow of non-returnable packaging in logistics, a proposal of the solution to the inadequate way of packing engines for their transport and replacing them with returnable packaging (bags) made of suitable material, or analysing the possibilities of using alternative fuels in road freight transport. In 2021 and 2022, FE performed three contractual research projects with a total revenue of 529.8 thousand CZK/ 20.9 thousand EUR.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Support (in thousands CZK/EUR) ²⁶				
		2019	2020	2021	2022	2023
Grant Agency of the Czech Republic	GA18-01144S: An empirical study of the effects of the existence of clusters on the performance of member enterprises. 2018-2021.	1 011.5 /39.9	1 031.7 /40.7	126.7 /5.0		
Technology Agency of the Czech Republic	TL01000303: The use of Big Data to evaluate the socio-economic position of residents in the types of territories defined by the Regional Development Strategy 2021+. 2018–2021.	1 412 /55.7	1 417.1 /55.9	651.6 /25.7		
Technology Agency of the Czech Republic	TJ02000206: Developing the skills necessary for digital business transformation. 2019–2021.	1 934.2 /76.3	2 441.2 /96.3	359.9 /14.2		
Grant Agency of the Czech Republic	GA16-08786S: Impact of lobbying transparency on democratisation and its consequences. 2016–2020.					
Technology Agency of the Czech Republic	TL03000236: School age children and their perception of online marketing communication. 2020–2023		200.3 /7.9	633.7 /25.0	811.2 /32.0	611.0 /24.1
Erasmus+/K2 Strategic Partnership for Higher Education	2016-1-CZ01-KA203-023916: SMEs Human resource attraction, retention and performance enhancement network (SHARPEN). Project partners: University of Huddersfield, University of Applied Sciences Zwickau, SMK University of Applied Social Sciences Klaipeda, University of Applied Sciences Kajaani. 2016–2019	1 082.4 /42.7				
Visegrad grants	221202303430: Services in tourism in the Czech-Polish border area. 2021–			174.9 /6.9	139.4 /5.5	17.7 /0.7

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

	2023 Project partner: Wrocław University of Economics and Business. https://www.servicesintourism.eu/					
Ministry of Education, Youth and Sports of the Czech Republic	EF-SMARTDATA Project: Smart data for the prevention and identification of faults in the system. 2018–2019					
Ministry for Regional Development	CZ.11.4.120/0.0/0.0/16_012/0001501: Economic aspects of business in the Czech-Polish border area. Interreg V-5 Czech Republic-Poland. Project partner: University of Wrocław. 2018–2019.	314.3 /12.4				
European Structural Funds	CZ.11.4.120/0.0/0.0/16_012/0000946: Analysis of tourism services in the Czech-Polish border area. Interreg V-5 Czech Republic-Poland. Project partner: University of Wrocław. 2018–2019.	121.7 /4.8				
Municipality of the City of Liberec	2022-FK--5.1-004: Creative techniques for sustainable living. 2022				30.4 /1.2	
Ministry of Education, Youth and Sports of the Czech Republic	Student Grant Competition, https://www.tul.cz/en/research/grant-programmes/sgc/	2 081.2 /82.1	2 053.3 /81.0	2 025.5 /79.9	2 170.0 /85.6	2 334.7 /92.1
Total		7 957.3 /313.9	7 143.6 /281.8	3 972.3 /156.7	3 151.0 /124.3	2 963.4 /116.9
In the role of another participant						
Provider ²⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
University of St. Gallen (Switzerland)	Global University Entrepreneurial Spirit Students' Survey (GUESSS). Lead Partner: University of St. Gallen. 2016-now.					
<u>EIT HEI Initiative</u> Horizon Europe (Spain)	EITHEISkills2Scale: Deep Tech Empowerment for Higher Education Institutes. Beneficiary: Universitat Polytechnica de Valencia (ESP), other partners: University of Lapland (FIN), Uzhorod National University (UA), NSCRD (GRE). 05/2023–07/2024. https://skills2scale.eu/					1 782.1 /70.3
Total						1 782.1 /70.3

²⁷ Ibid.

Table 3.3.2 - Contract research activities

Client ²⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Ministry of Industry and Trade of the Czech Republic	Study of the effects of the conclusion of the trade part of the Association Agreement between the EU and the Mercosur bloc on the economy of the Czech Republic. 2021			200.3 /7.9		
Association of small and medium-sized enterprises and crafts CZ	Survey of the quality of family businesses. 2022				50.7 /2.0	
ŠKODA AUTO a.s.	Automotive – Alternative fuels for road and freight transport. 2022				187.6 /7.4	
ŠKODA AUTO a.s.	Evaluation of the advantages of the new solution by comparison with the original one, taking into account technological, economic and environmental aspects. 2021			243.4 /9.6		
ŠKODA AUTO a.s.	Logistics – Optimising the flow of packaging. 2022				98.8 /3.9	
Liberec region	Mapping of culturally creative industries in the territory of the Liberec region. 2023					245.8 /9.7
Liberec region	Processing of the analytical part for the Tourism Development Strategy in the Liberec Region. 2020.		78.6 /3.1			
Liberec region	Updating the tourism development strategy. 2023					50.7 /2.0
Liberec region	Updating the analytical part of the Tourism Development Strategy in the Liberec Region. 2021			48.2 /1.9		
District Chamber of Commerce	Legal conditions for cross-border sales and services - publication. 2023					20.3 /0.8
Statutory city of Liberec	Cultural and creative industries - Study of monitoring indicators. 2022				129.3 /5.1	
Statutory city of Liberec	Processing of territorial analytical documents for SO ORP Liberec, 5th full update. 2020		286.4 /11.3			
Tourist region of Liberec, Jablonec, Frýdlant and Tanvalds	Strategy for the development of the Tourist Region of the Jizera Mountains. 2021			40.5 /1.6		
DB Schenker Liberec	Economic study of the possibility of opening transshipment points for the					48.2 /1.9

²⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

	exclusive service of the centre of Prague. 2023					
MFP Paper s.r.o.	Logistics audit and warehouse design. 2023					103.9 /4.1
Domat Control System s.r.o.	Warehouse logistics audit. 2023					48.2 /1.9
Damedis, s. r. o.	Logistics – Warehouse design. 2022				48.2 /1.9	
INTRALOG SERVICES s.r.o.	Simulation of the design of a new warehouse order fulfilment system. 2021			129.3 /5.1		
Jahodárna Brozany nad Ohří s.r.o.	Creating a warehouse design. 2021			45.6 /1.8		
Dana Strachotová	Analysis of purchase and sales data of a trading company. 2021			25.35 /1.0		
Total			365.0 /14.4	732.6 /28.9	514.6 /20.3	517.1 /20.4

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

In the period under evaluation 2019–2023, a total of 446 outputs were created at FE:

- of which 186 articles were published in mainly foreign scientific and professional journals (of which 89 in WoS journals with a non-zero impact factor), 26 scientific monographs, 36 other books including chapters, 182 conference papers,
- and one utility model and one functional sample in cooperation with the Department of Nonwoven Textiles and Nanofibrous Materials and the Department of Design TF TUL, one verified methodology, five other results (e.g., didactic aid in cooperation with the Department of Geoinformatics and Informatics Didactics Department of Pedagogy and Psychology FP TUL, software geodatabase), seven research reports (one in cooperation with the Department of Nonwovens of Textiles and Nanofibrous Materials FT TUL) and one workshop in cooperation with the Department of Production Systems and Automation FS TUL.

²⁹ See Terms definition.

The outputs are based on completed projects and collaborations (Chapter 3.3) and have already found their practical application, or are in the process of doing so in the near future. Several results were implemented into national, regional, or other strategies (Regional Development Strategy 2021+, Tourism Development Strategy in the Liberec Region, Development Strategy of the Jizera Mountains Tourist Region). FE supports equal opportunities for men and women in the fields of study, research, and career growth, and emphasises the consideration of the gender dimension when creating inclusive and diversity solutions that reflect the needs of a wide range of users. The use of R&DI results supports gender principles and gender equality, as their benefits are society-wide. The themes of economic sustainability, sustainable business, corporate social responsibility, sustainability of tourist destinations, or corporate resilience and sustainability are an integral part of scientific, research, and contractual activities and their results. The following ten selected research results demonstrate the contribution of FE to solving social needs:

1. Žižka, M., Rydvalová, P., Skála, M., Štichhauerová, E., Hovorková Valentová, V., Pelloneová, N., Skrbková, D.: **Innovation and Performance Drivers of Business Clusters: An Empirical Study (2021)**

The book (the result of the research: GA18-01144S An empirical study of the effects of the existence of clusters on the performance of member companies) expands and deepens knowledge in the field of industry clusters, it differs from similarly focused works in many respects. In addition to cluster initiatives, it deals with natural industrial districts that have undergone many changes in social, political, technological, and innovative areas. The authors draw on their own wealth of knowledge and the broad insight into the textile, glass and jewellery industries. The book deals with the development of the industry in the transition economy, which is specific to many countries in Central and Eastern Europe. The authors present their own methodology for defining economic entities in the sectoral core of a natural cluster, for the possibility of their subsequent research. The book traces the development of traditional industries in the theoretical concept of Marshall's industry districts. The authors point out the importance of hereditary skills, the role of continuity and technological innovation in building competitive advantage. In addition to traditional factors of competitiveness, the authors also examine the influence of family on the success of enterprises in clusters. Using examples, they show how, for example, the textile industry escaped its demise and, thanks to education and research (nanotechnology), found a new space in the market. They give instructions on how to measure the performance of enterprises in clusters, how to approach cluster policy to bring positive microeconomic and macroeconomic externalities. In connection with the completed Grant Agency of the Czech republic project 18-01144S, cooperation with CzechInvest is underway to solve an international project Interreg VI-C Europe: Realign Cluster Policies to Accelerate the Twin Green and Digital Transitions (AccelerateGDT 28119).

2. Kocourek, A., Šímanová, J., Šmída, J.: **Methodology for the use of Big Data for evaluating the socio-economic position of residents in the types of territories defined by the Regional Development Strategy 2021 (2021)**

The certified methodology, key output of the applied research project (TL01000303), represents a repeatable and traceable procedure for extracting big data from state administration bodies (in particular the Czech Statistical Office, Ministry of Labour and Social Affairs, Ministry of Finance, Ministry of the Interior) for the estimation of spatial socioeconomic disparities indicators. Comparable indicators for the entire state territory have not yet been available either in the Czech Republic or in the world, despite strong demand for this type of indicators from state

administration bodies, local governments and the part of research organisations focused on regional development. The methodology includes a procedure for calculating the nominal net monetary income in administrative districts of municipalities with extended jurisdiction, specifies a reliable method of calculating the index of the regional price level and the index of net monetary income of residents in regional purchasing power parity on the territory of individual types of municipalities, NUTS3, NUTS2, ITI and LAG territories. Outputs based on this methodology contribute to the definition, evaluation, and identification of needs and issues of specific lower Czech territorial units, and to the more precise regional policy instruments targeting in the creation of strategic regional development documents and also in the implementation of specific policies and their evaluation. The result was implemented by the Ministry of Regional Development into the monitoring system of indicators of the Regional Development Strategy 2021+, within the framework of the Rural Development and the Affordable Housing Policy Concept. Furthermore, it was implemented in the territorial analysis documents of Liberec. Regional authorities, the national network of local action groups and the CzechInvest Agency for Business and Investment Support have also interest in it. The results based on the methodology are further updated by the project team and provided to the implementing authorities for the next period.

3. Maršíková, K., Moš, O., Rydvalová, P. and Štichhauerová, E.: **People management challenges for SMEs in five European regions: Spotlighting the (in)visible and the (in)formal and embedding SME HR issues firmly in the business and knowledge environment. (2019)**

HRM in SMES in the international context and the need of professionals to share knowledge in this area. The results (of the research: 2016-1-CZ01-KA203-023916: SMEs Human resource attraction, retention and performance enhancement network, SHARPEN) presented in the monograph are based on the same methodology and research conducted in selected European regions in small and medium-sized enterprises (in the CZ, FIN, LIT, GER, and the UK). The publication maps (in relation to the environment of selected regions with emphasis on labour market conditions), activities and tools aimed at acquiring and maintaining quality human resources in SMEs. The monograph confirms the specificity and diversity of problem solving in the field of HRM in SMEs, where the expert is often replaced by the owner of the enterprise, as was observed in selected European regions and international comparison. It also confirms the focus of SMEs on key activities in HR and the neglecting of others. Although these facts are often mentioned in the literature, there is no improvement in practice either in the Czech Republic or abroad, which the study demonstrates. It identifies the challenges faced by SMEs in selected regions and helps to develop the theme both at the theoretical and practical level for the future. Based on the above facts, it can be stated that the results presented in the monograph significantly help professionals to learn new approaches in this field. The monograph was published in a printed version in five languages: English, Czech, Lithuanian, Finnish, and German.

4. Rydvalová, P., Valentová, E. and Petrů, N.: **Education in family businesses. Study to survey the quality of family businesses (2022)**

The research report contains a summary of the study on the theme of family businesses education. The document complements the annual quantitative survey of the Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic (AMPS ČR). The aim of this research study was to define a framework for supporting family business education through a qualitative survey of the current state of knowledge. The definition of the approach is based on the confrontation of the findings from the quantitative survey with qualitative research using

guided interviews with selected family businesses highly rated within the National Award of the Czech Republic for Quality in Family Business. The research led to the project Family business - Solving Social and Economic Disparities in Municipalities, which developed new procedures for defining and evaluating the family businesses health and proposals for supporting their development as part of the solution to the development of the business environment of rural municipalities in the wider area. Another result is the design of effective education for family-type businesses using information technology, which meets the requirements of society, the labour market, and the economy as much as possible. The effort is to prevent the depopulation of small villages by creating more favourable conditions for the implementation of reproductive intentions of young people within the family business and thereby contribute to maintaining territorial cohesion. In 2023 the results were used to evaluate the family businesses vitality in the framework of the Quality Council of the Czech Republic competition organised by the Ministry of Industry and Trade. FE is also a member of the university platform at the AMSP ČR and participates as a partner in the project “AMSP ČR – SUFABU – Succession in Family Businesses | Training Model for Sustainable Succession Process in Family Businesses”

5. Semerádová, T. and Weinlich, P.: **Website Quality and Shopping Behaviour - Quantitative and Qualitative Evidence (2019)**

The social and scientific contribution of the publication (the result of the research: TJ02000206 – Developing the skills necessary for digital business transformation) lies in the unique analysis of web design parameters, which are expected to have a potential impact on the user experience and behaviour on websites and e-shops. Thousands of copies of the book (4800) were downloaded, and it contributes to the definition of web quality based on the identification of online behavioural patterns depending on the functional and aesthetic parameters of web design and causal relationships between their combinations. By covering various aspects of the user experience and web design, this publication also proposes a methodical procedure for measuring the quality of websites based on the analysis of secondary sources and the authors' own experimental results. The findings presented in the publication build upon the experience of 250 web design experts, data from web analytics of selected e-shops, and the results of behavioural experiments using an eye tracker camera. In the short time since its publication (April 2020), the publication has caught the interest of prominent foreign researchers dealing with web design, which is manifested not only in the high number of downloads but also in citations, e.g., in the journal Profesional del information (Q1 Scopus, Q3 WoS) by Rafael Pedraza-Jimenez (WoS: Hi8, 171 citations; Scopus: Hi9, 239 citations) and Llus Codina (WoS: Hi9, 267 citations, Scopus: Hi9, 373 citations). The result was exclusively created by employees of FE, with no other institution or bodies being involved in the process of its creation. <https://doi.org/10.1007/978-3-030-44440-2>

6. Burešová, J., Pospíšilová, M., Ungerman, O., Dědková, J., Jursová, J. et. al.: **Online marketing communication targeting school-age children (2023)**

The main objective of the monograph (the result of the research: TL03000236: School age children and their perception of online marketing communication) is to identify online tools and marketing communication methods targeting school-age children and to find out if and how children perceive this communication. Qualitative research was conducted using a digital ethnographic walk and deep interviews to find this objective. The research respondents were 16 pupils in elementary school's 5th and 6th grades and a multi-year grammar school. Qualitative research narrowed the thematic areas, which were further subjected to quantitative research

using an online questionnaire survey. A total of 591 respondents took part in this research again in the 5th and 6th grades and a multi-year gymnasium. The results are divided into four thematic chapters dealing with the use of digital devices, children's knowledge and opinions about marketing, the online media that children visit and marketing communication on them, and the purchase process of children. Research has shown that children perceive the online world as a regular part of their lives. On the Internet, marketing communication is aimed at them, while children do not recognise some forms or have a negative attitude towards them, which they fondly regard as a manifestation of critical thinking. The absence of critical thinking makes them easy prey for manipulation. At the end of the book, the theoretical and practical benefits of the research are formulated, including recommendations for schools and parents on how they should educate children in the subject of online marketing.

7. Kocourek, A., Šímanová, J., Kejzar, J.: Study of the effects of the conclusion of the trade part of the Association Agreement between the EU and the MerCoSur bloc on the economy of the Czech Republic (2022)

The monograph *Study of the effects of the conclusion of the trade part of the Association Agreement between the EU and the MerCoSur bloc on the economy of the Czech Republic* (hereinafter referred to as the Impact Study) was prepared for a public tender for the Ministry of Industry and Trade. It is an analytical document submitted with the Association Agreement between the EU and the MerCoSur bloc for approval by the Government and voting in the Parliament of the Czech Republic, important for the subsequent ratification process of the free trade agreement. The Impact Study was published on the website of the Ministry of Industry and Trade for the transparency of the approval process. It contains a description of the trade part of the Association Agreement, the effects of the Agreement conclusion on the Czech economy and, for comparison, the EU as a whole and the MerCoSur block. It also contains sectoral analyses based on relevant economic sectors and recommendations for the agreement measures implementation. The method for estimating economic impacts is the advanced computable general equilibrium (CGE) model of international trade. The methodological part contains the specification and calibration of the model used for the purpose of quantifying the impacts of the trade part of the Agreement on the Czech, EU and MerCoSur economies and its economic sectors. The results represent the quantified economic impacts of the removal of tariff and non-tariff barriers to trade on the Czech, EU and MerCoSur economies, and include case studies of selected Czech enterprises experienced in trading in the MerCoSur territory. Its level of processing, scope and methods is comparable to impact studies performed for the European Parliament and the European Commission. The results were presented with a positive response at the Trade Economist Network meeting at the European Commission in 2022.

8. Antlová, K., Rydvalová, P., Lamr, M.: GUESSS National reports 2021 – Student Entrepreneurship in the Czech Republic (2021)

GUESSS research (the result of the Global University Entrepreneurial Spirit Students' Survey (GUESSS)). From 2016 – to-date) aims to discover unique to unique views on business from the point of view of university students. The research examines several themes, such as business plans, nascent business, growth and performance of new businesses, the sequence of the family business. It is essential to examine the factors that influence the subsequent involvement of students in business. Entrepreneurship is perceived positively to increase employment, growth in living standards, promote common interests and objectives. Innovation and creativity are the key factors of success. To teach entrepreneurship and also innovation is a new mission in all

universities. In the Czech Republic, we can say that almost all the universities are trying to increase the student's entrepreneurial activities, are establishing different learning hubs (or innovation centres) that support innovative ideas and have the module of entrepreneurship in their curricula. Also, large enterprises are beginning to support these activities through some competitions, e.g., "hackathon days". All these activities are very convenient alternatives to traditional ways of teaching. Here, students can implement their start-up activities and meet the experienced entrepreneurs and business angels. Cooperation between the universities and enterprises is increasingly more important for innovations as it produces knowledge and disseminates it within society. Many unprecedented challenges, such as the knowledge economy, globalisation, financial and environmental crises, and tackling epidemics contribute significantly to finding innovative solutions, and universities are part of these solutions.

9. Summary research reports of contractual research results for the Liberec Regional Office.

(2021: Červová, L., Ungerman, O. Update of the analytical part of the Tourism Development Strategy in the Liberec Region; 2019: Dědková, J., Červová, L., Ungerman, O. Analysis and Proposal of the Tourism Development Strategy in the Liberec Region - analytical part)

This contractual research project was commissioned by the Regional Office of the Liberec Region in 2019 and focused on the analytical part of the Tourism Development Strategy in the Liberec Region (LR). The outputs of the analytical part serve as a basis for formulating the Tourism Development Strategy in LR 2021. The analytical part contains a PESTEL analysis of LR tourism, a detailed characterisation and analysis of tourist areas on the territory of LR, an analysis of accommodation capacities and attendance (including the intensity and density of tourism) and more outputs of primary research on awareness of tourist destinations in LR. The entire analysis is supplemented by many infographics. In 2021, contractual research project was again commissioned by the Regional Office of the Liberec Region and focused on updating the analytical part of the Tourism Development Strategy in the Liberec Region, which was implemented by FE in 2019. All the data were updated, especially with regard to the COVID-19 pandemic, which strongly affected the entire tourism industry. All infographics were also modified and supplemented.

10. Laboutková, Š., Vymětal, P. and Šimral, V.: Transparent Lobbying and Democracy (2020)

The scientific monograph (the result of the research: GA16-08786S: Impact of Transparency of Lobbying on Democratisation and Its Consequences) was published by the prestigious foreign publisher Palgrave Macmillan. The original benefit is that 1) this is the first study to offer an in-depth analysis of lobbying developments in Central Europe; 2) it deals with the transparency of lobbying in a comprehensive and structured way. The chosen approach is innovative because it focuses on the factors of transparent lobbying, which have never been previously considered. The book provides a new solution consisting of both an interdisciplinary approach to the theme and in particular an effort to create a methodology for assessing the transparency of lobbying, its role in the democratisation process, and a methodology for evaluating the main consequences of this transparency. In this book, transparency in lobbying is conceptualised in a broader environment as an alternative to current forms of evaluating transparency in lobbying. The significant contribution of this book is also in the empirical analysis of lobbying in Central and Eastern European Countries based on the catalogue created by the authors. The authors' complex approach to the issue, as well as a combination of theoretical and empirical investigation of transparent lobbying rules, represent a fundamental contribution to the theory of democracy, economic policy, the process of democratisation, and the specification of sophisticated factors

strengthening the institutional quality and the institutional reflexivity. This book has the potential to reach an international audience of experts and interest lay persons, and both complement and compete with publications on similar issues.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ³⁰	Year of application	Name
Scientific monograph (with an international overlap)	2021	Žižka, M., Rydvalová, P., Skála, M., Štichhauerová, E., Hovorková Valentová, V., Pelloneová, N., Skrbková, D. Innovation and Performance Drivers of Business Clusters: An Empirical Study
Certified methodology	2021	Kocourek, A., Šimanová, J., Šmída, J. Methodology for the use of Big Data for evaluating the socio-economic position of residents in the types of territories defined by the Regional Development Strategy 2021
Scientific monograph (published in five languages with an international overlap)	2019	Maršíková, K., Moš, O., Rydvalová, P. and Štichhauerová, E. People management challenges for SMEs in five European regions: Spotlighting the (in)visible and the (in)formal and embedding SME HR issues firmly in the business and knowledge environment
Summary research report	2022	Rydvalová, P., Valentová, E. and Petrů N. Education in family businesses. Study to survey the quality of family businesses.
Scientific monograph (with an international overlap)	2019	Semerádová, T. and Weinlich, P. Website Quality and Shopping Behaviour - Quantitative and Qualitative Evidence
Scientific monograph	2023	Burešová, J., Pospíšilová, M., Ungerman, O., Dědková, J., Jursová, J. et. al. Online marketing communication targeting school-age children
Scientific monograph	2022	Kocourek, A., Šimanová, J., Kejzar, J. Study of the effects of the conclusion of the trade part of the Association Agreement between the EU and the MerCoSur bloc on the economy of the Czech Republic
Research report	2021	Antlová, K., Rydvalová, P., Lamr, M. GUESSS National reports 2021 – Student Entrepreneurship in the Czech Republic https://www.guesssurvey.org/resources/nat_2021/GUESSS_Report_2021_CzechRepublic.pdf
Summary research report	2021	Červová, L., Ungerman, O. Update of the analytical part of the Tourism Development Strategy in the Liberec Region
Scientific monograph (with an international overlap)	2020	Laboutková, Š., Šimral, V. and Vymětal, P. Transparent Lobbying and Democracy

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication

³⁰ Specify the specific type of result. Add rows as needed.

outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³²

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

At FE, research outputs in the field of knowledge are protected by copyright, mainly publications, i.e., monographs and articles with an international scope, research reports, certified methodologies, maps or software. In commercialisation, contractual research, professional studies, and courses are most often implemented.

The research contractors and the **typical users** are mainly:

- Public administration and other institutions: Czech Statistical Office, Ministry of Industry and Trade, Ministry for Regional Development, Liberec Region, city of Liberec,
- Enterprises (SMEs, family and large businesses): e.g.: Škoda Auto, a. s., Schenker spol. s.r.o., MFP Paper s.r.o., Damedis s.r.o.

Transfer of outputs of research, development, innovation and other creative activities

- FE runs the [Office of analysis and Studies](#) to support cooperation with enterprises tailored to each enterprise, according to its interests and possibilities. FE offers specialised courses, e.g., Logistics, Financial Literacy for Everyone, Statistical Data Processing, Communication Skills. The Department of Informatics held online courses for the professional public focused on the issue of e-business (project TJ02000206).
- Since 1993, FE organises the [Liberec Economic Forum](#) **international scientific conference** every two years.
- **International roundtables:** in 2023 on the theme of Business Resilience and Sustainability in the Planetary Age - Rules of Survival, in 2022: Green (for) the Future, in 2021: People in Digi, in 2020: The national start-up and spin-off environment, as part of a centralised development project of the Ministry of Education, Youth and Sports. In 2019, FE co-organised

³¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³² If the commercialisation of R&D&I results is carried out in this way.

the **Knowledge Transfer Week** with a roundtable on the Business in the Digital Age theme, the Innovation Ecosystem conference and the Business Workout for students and graduates.

- The [Student Business Club](#) (SBC) and the study courses Entrepreneurial Project and Startups and Entrepreneurship, are aimed at supporting students' entrepreneurship, and innovative ideas. SBC annually organises a competition for the best TUL start-up. In the area of R&DI transfer, FE representatives participated in the university-wide project CTT – Effective Technology Transfer Process at the TUL (Reg. No. CZ.02.2.69 /0.0/0.0/16_014/000063, implementation period 2017 to 2021), resulting in the creation of the spin-off company TUC TUL. In cooperation with the Skills2Scale project partners, the international Deep Tech Acceleration Programme was held in 2023 for startups and startup projects. FE also cooperates with the regional business incubator LiPo.ink to fulfil the regional RIS3 strategy.
- The **Asset Valuation Centre**, since 2021, developed a method for valuing enterprises in distress using AI, short-term courses and the first long-term specialist study programme. The first **Information Centre of the Czech Society for Quality**, established at FE in 2023, strives to popularise and disseminate information about management systems and quality tools.

The most significant **non-grant revenues** include:

- Publication of the scientific journal [E+M Economics and Management](#). (Social Sciences Citation Index (Web of Science): Impact Factor: 1.195; 1.446; 1.422; 1.500; 1.400 / Scopus: SCImago Journal Rank: 0.322; 0.318; 0.312; 0.313; 0.320).
- Contributions from the Jablotron Alarms, Preciosa and Škoda Auto Startup foundations, which financially support professional student competitions (Preciosa Crystal Challenge, since 2012; The Best START-UP at TUL, since 2015).

Finding new users of results and commercialisation:

1. Activity of the [Office of Analysis and Studies](#).
2. Personal presentations and creation of new contacts and opportunities within the [Liberec Economic Forum](#) and international roundtables.
3. Establishment and operation of specialised centres - Property Valuation Centre, Information Centre of the Czech Society for Quality.
4. Activities within SBC TUL, TUC TUL and LiPo.ink.
5. FE cooperation within TUL inter-faculty and interdisciplinary projects. FE cooperates on the [EDIH](#) project. European Digital Innovation Hub - Northern and Eastern Bohemia builds on the existing connection between expert and technological know-how of advanced digitisation activities of its partners providing long-term services in the field of digital transformation of SMEs and public institutions, innovation, technical education, and basic and applied research, all linked to artificial intelligence and cybersecurity (05/2023 – 04/2026).

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Additional activity (non-contractual research)	1237.1/48.8	1062.2/41.9	981.0/38.7	1247.2/49.2	1328.3/52.4
Commercial courses	7.6/0.3				
Gifts	131.8/5.2	131.8/5.2	131.8/5.2	152.1/6.0	
Total	1376.5/54.3	1194.0/47.1	1112.8/43.9	1399.3/55.2	1328.3/52.4

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

FE is aware of the importance of promoting the results of R&D&I to the professional and general public and communication in the area of R&D&I, while its activities in this direction are not only focused on economic discussion with the public, but are also part of and often an initiator of the popularisation of R&D&I at the university-wide level.

Partnership model

- Since 2009, FE systematically approaches relations with the external environment using its own concept called the **Partnership Model**. Within this system, FE cooperates in many areas with its main partners and partners. The main partners of FE are: Broker Consulting, ČSOB, a.s., Ernst & Young, Jablotron, Kaufland, Knorr-Bremse, Komerční Banka a.s., Kooperativa pojišťovna, a.s., Lasvit, Liberec region, Magna Bohemia, s.r.o., Praktik System, s.r.o., Preciosa, a.s., Statutory City of Liberec, Škoda Auto, a.s., UCT Czech Republic, and ZF Frýdlant.

Popularisation and communication

- Extensive and comprehensive promotion and communication of FE is conducted on the FE [website](#) and social networks Facebook, Instagram, YouTube, and LinkedIn. Articles about FE are regularly published in the **T-UNI** online newsletter, and are picked up by regional and national media.

Cooperation with graduates

- Cooperation and maintaining ties with graduates are endured through the Alumni Club, the job opportunities portal **Job TUL**, which was created in 2020 by FE employees, as well as through FE newsletters, and communication with FE's partners, i.e., employers of FE graduates.
- In 2023, the first **Silver Graduations** of FE graduates took place 25 years after completing their studies.
- An important university-wide project with outputs aimed at the public (especially graduates) was the project RoLiZ– Development of human resources of TUL for Increasing the Relevance, Quality, and Access to Education under the Conditions of Industry 4.0 (Reg. No. CZ 02.2.69/0.0/0.0/16_015/ 0002329), implementation period 2017–2022.

Open days, excursions, workshops, lectures, competitions

- Twice a year, FE organises open days for the general public with a tour of the building, providing the opportunity to talk with current students and academic employees. FE also presents itself at the university open days.
- Since 2019, FE and other TUL faculties, participate in the nationwide **Researcher's Night** event, opening its doors to the general public and presenting research findings. Over thirty academics participate annually, offering 7-8 creative stations full of knowledge, games, competitions, quizzes, and workshops. This event exceeds annually 1000 visitors.
- Since 2015, FE has been part of the TUL exhibition in the **iQLANDIA** regional science centre, widely visited by the public in 2019–2023.

- The public KPE Creative Techniques for Sustainable Life workshop took place in September 2022, prepared as part of the Culture and Tourism Fund 2022–5.1 Cultural Projects in the City of Liberec project with co-financing by TUL.
- In September 2023, FE with CxI TUL, T-Mobile CZ, and the 5G Alliance of the Czech Ministry of Trade and Industry, organised a workshop entitled How to use 5G Private Networks – Technology and Implementation. The event was visited by more than 50 representatives of the academic and commercial spheres.

Project days and specialised courses

- FE is part of the project NAKAP II (Fulfilment of the Regional Action Plan for the Development of Education in the Liberec Region II), which organises project days at TUL for secondary school students in the Liberec Region, specifically the project days Effective Upcycling of Plastics and Experimentation in Economic and Multimedia laboratory.

FE academic employees also hold **specialised courses** for the public, where members of the Department of Foreign Languages hold language courses at TUL as part of the Internal Language School and the University of the Third Age, and the Department of Finance and Accounting offers a lifelong learning course in the field of Business Valuation ending with a micro-certificate. The Department of Economic Statistics cooperates with the DESCARTES agency, which offers courses for the education of teaching staff, and is also active within the project financed by the Czech Economic Society - Experts for Schools.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Recommendation 3.2, 3.3, and 3.4, p. 3:

- In the years 2021–2023, four projects in the Central Register of Projects were successfully completed: Technology Agency of the Czech Republic (TL01000303, TJ02000206 and TL03000236) and Grant Agency of the Czech Republic (GA18-01144S with a deferred evaluation until 2023), two cross-border projects cooperation (EEA Norway and Interreg), and one project focused on capacity building supported by Horizon EIT HEI (Skills2Scale), where FE was a member of an international consortium of seven research organisations. Currently, two international cooperation projects are being implemented (V4 Programme, EEA Norway). In the period under evaluation, more than thirty project applications for external R&DI funding support were submitted to national and international agencies.
- Two important projects were implemented: Visegrad grants 221202303430: Services in Tourism in the Czech-Polish Border Area. 2021-2023. Project partner: Wrocław University of Economics and Business. Furthermore, the Interreg V-5 Czech Republic-Poland project CZ.11.4.120/0.0/0.0/16_012/0001501: Economic Aspects of Business in the Czech-Polish Border Area. Project partner: University of Wrocław (2018–2019), see Chapter 3.3.1.
- In the last five years, contractual research has become an increasingly important component of creative activity, commissioned mainly by public administration bodies, but also by private corporations, see Tab. 3.5.1.
- FE is a valued partner of the commercial sphere, to which it brings the education and expertise of academic employees and the results of science and research through the Office of Analysis and Studies. It thereby helps organisations and individuals to further increase

knowledge, streamline activities, observe new factors influencing their success, and create new competitive advantages. In 2022, FE implemented the Strategic Plan for Educational and Creative Activities, which is the basic strategic document for the development of the faculty. The Strategic Plan is drawn up for a period of five years and is revised each year along with an implementation plan. A revised Directive of the Dean was also adopted, which contains an elaborate motivational framework for applied and contractual research.

- An important strategic element of the support of FE's creative and research activities is the institutional support of excellent research projects from internal sources in the form of an internal grant competition. As part of this, the individual departments are involved in mutual cooperation in research programmes that are linked to the educational activities of FE. The fulfilment of the outputs of individual projects is continuously monitored and evaluated by the FE committee (research programmes at FE).
- Fe continues to actively respond to the calls announced in the Erasmus+ programme.

Evaluation Report Form, Recommendation 3.7, 3.8, and 3.9, p. 6:

- The Technology, Knowledge, And Services Transfer Strategy at TUL 2021+ defines the strategy of cooperation with the application sphere, TUL's relationship to intellectual property and its commercialisation, internal relations in technology transfer, and in the area of technology transfer management.

Evaluation Report Form, Recommendation 3.10 and 3.11, p. 9:

- Staffing was strengthened: doc. Dyntar (2019), doc. Dědková (2020), doc. Kocourek (2021); doc. Vrabcová (2022), and doc. Petříček (2023). Further HR development, with a vision of qualified and satisfied employees fully utilising their potential and fulfilling their career objectives in a dynamic, cooperative, and healthy work environment, is the content of the HR Development Strategy of the Faculty of Economics of the Technical University of Liberec until 2030. This document also includes other four academic employees ready to being their habilitation or professorship proceedings.
- The quality of results and outputs is continuously being strengthened and the quartile structure of journal results is improving, see Chapter 3.4.1 (total in the period under evaluation: two JIF Q1, nine JIF Q2, 12 JIF Q3, 37 JIF Q4). Support for strengthening the quality of results and outputs is also provided by the motivational system established by the Directive of the Dean and the Strategic Plan for Educational and Creative Activities.
- **Evaluation Report Form, Recommendation 3.12, p. 9:**
- Outputs from projects and overall communication of FE's cooperation with partners is published on its website. Active promotion of R&D&I and cooperation with the professional and general public in 2019 – 2023 is described in Chapters 3.5 and 3.6.

Evaluation Report Form, IMPROVEMENT POTENTIAL, p. 11:

1. For contractual research, there was a significant increase in the number of concluded contracts in the years 2019 - 2023 (0, 3, 7, 5, 6), the revenues of which were (in thousands of CZK/EUR) in the years 2019 - 2023 (0/0; 365.0/14.4; 732.6/28.9; 514.6/20.3; 517.1/20.4), see Tab. 3.3.2. FE continues to actively support the search for and implementation of contractual research.
2. Records of science and research results are presented in TUL Publication, Cassandra and TUL Project Management.
3. The Technology, Knowledge, and Services Transfer Strategy at TUL 2021+ defines the strategy of cooperation with the application sphere, TUL's relationship to intellectual property and its commercialisation, internal relations in technology transfer, and in the field of technology

transfer management. FE is actively involved in technology transfer: marketing studies, as well as business and entrepreneurial education. Also, the EIT HEI Initiative project, which was implemented by FE in cooperation with CxI, FM TUL and FME TUL, focussed precisely on this issue.

4. The Technology, Knowledge, and Services Transfer Strategy at TUL 2021+ defines the strategy of cooperation with the application sphere, TUL's relationship to intellectual property and its commercialisation, internal relations in technology transfer, and in the field of technology transfer management.
5. At FE, The quality of results and outputs is continuously being strengthened and the quartile structure of journal results and monographs is improving, see Chapter 3.4.1 (total in the period under evaluation: two JI Q1, nine JI Q2, 12 JI Q3, 37 JI Q4). The main tools for managing the quality of publication activity at FE are the motivation system established by the Directive of the Dean, the Strategic Plan for Educational and Creative Activities, as well as an emphasis on higher quality research and publication activities of students in doctoral study programmes.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
The Faculty of Economics of the Technical University of Liberec	3.1; 3.3; 3.7	https://www.ef.tul.cz/en/faculty
Research Programmes at the Faculty of Economics, Technical University of Liberec	3.1; 3.7	https://www.ef.tul.cz/AKA/1000/fe-tul-research-programmes-1.pdf
The TUL Strategic Development Plan for 2020 with a forward view to 2030	3.1	https://doc.tul.cz/7331
TUL Publication	3.7	https://publikace.tul.cz/?lang=en
E+M Economics and Management	3.1; 3.5	https://www.ekonomie-management.cz/eaims-scope/
Office of Analysis and Studies	3.1; 3.5; 3.7	https://www.ef.tul.cz/en/office-of-analysis-and-studies
Student Business Club (SBC)	3.1; 3.5	https://sbc-tul.cz/?lang=en
Liberec Economic Forum	3.1; 3.5	https://www.ef.tul.cz/lef-2023-777
GUESSS	3.3	https://www.guesssurvey.org/

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Arts and Architecture

FORD: 6 - Humanities and the arts

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Self-assessment:

The Faculty of Arts and Architecture (FAA) is based on a link between artistic-creative and technical-design research and architectural, urban planning, and artistic practice. Most teachers head successful architectural studios, participate in projects, or also work as independent artists. Architecture and art are dedicated to the creation, transformation, and interpretation of the built environment and spatial expression on many different scales. They combine art, science, design, planning, and touch on ethics, aesthetics, culture, and society. Creative and research activities focus on the following: Architecture and urban planning, visual arts – creation in public spaces, and the theory and history of the visual arts and architecture.

Mission and Vision of the Faculty

In 2023, FAA prepared a “Strategy for Science and Research at the Faculty of Arts and Architecture in Liberec 2023-2030”, which defines the mission and vision for science and research.

Mission:

- Science, research, innovation, and creative activity are based on free knowledge, creativity, and innovative potential in art and architecture.
- FAA contributes to an understanding of the importance of art and culture in society and to solving environmental issues.
- Science, research, innovation, and creative activities are an integral and visible part of life at FAA and contribute to its good name and the whole university.

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

Vision:

- FAA is a respected institution with a clearly defined scientific, research, and creative programme.
- FAA plays an important role in shaping cultural life and the quality of the built environment in the Liberec Region.
- The research activities of FAA are based on cooperation between individual departments and on partnerships with other TUL faculties, as well as with other universities, the public sphere, non-profit organisations, and the private sector.
- FAA utilises the potential of interdisciplinary research in art and architecture, and supports innovation and cooperation with the application sphere.
- FAA is built on teaching, research, and creative work; all these components complement each other synergistically.
- FAA motivates teaching staff to advance in their careers and provides dignified conditions for scientific research and creative activity.
- FAA is an institution with a clearly defined doctoral study programme. It is a coveted institution for early-stage, highly-motivated academics and creators.

Research activity

In the field of science and research, FAA has a specific position within TUL. This is based on an interdisciplinary approach with a focus on Ford 6.4. Arts. However, some results are classified into related areas, such as Ford 2.1 Civil engineering, 2.3 Mechanical engineering and 2.5 Material engineering, or 5.7 Social and economic geography. The science and research strategy is based on the cooperation of theoretically-focused academic staff with practicing artists and architects. Publication and non-publication results are applied in RIV, and creative results from independent practice and academically anchored in RUV.

The main non-publication results include exhibitions, curatorial projects, and architectural projects. The main publication results include professional articles, chapters in professional publications, workshops, and contributions to conference proceedings. Theoretical research is complemented by practice-based research such as design-driven research, research by design, and artistic research. Due to the above-described specifics of linking independent practice and academic work, outputs outside of standard project opportunities are also created. The Faculty actively supports its academic staff in these activities.

Support of research activities and follow-up to pedagogical activities

On a practical level, the environment for a set direction is cultivated by supporting cooperation with cities, municipalities, companies, and cultural institutions, such as museums and galleries, and non-profit organisations with a predominantly cultural focus. This vision is prescribed both in teaching in Bachelor's and Master's programmes, as well as in doctoral study programmes and project activities of academic staff. Cooperation with external partners is covered by the activities of the Regional Contact Centre, which has long been involved in building a professional network and partnerships. The creative and research environment is complemented by support for students and doctoral students through participation in competitions and exhibitions such as the START-UP TUL startup competition organised by the Student Business Club, Hackathon, Art Week Liberec, and others. FAA supports project activities by utilising the services of the Technology Centre Prague, the regional centre of the Technology Agency of Czech Republic, and establishing and developing national and international contacts. The aim is to build professional networks and partnerships that may result in joint research projects.

Organisational Structure of the Faculty

The Faculty is made up of specialised departments that provide education in the fields of architecture and urban planning and visual arts-creation in public spaces:

- Department of Architecture
- Department of Urbanism
- Department of Art
- Department of Theory and History of Fine Art and Architecture
- Department of Civil Engineering
- Department of Load-Bearing Structures

Laboratories, workshops, and a specialist library are available to all students and academic staff.

FAA offers two accredited programmes in the Czech language for Bachelor's and Master's studies (architecture and urbanism, visual arts - creation in public spaces), one programme in English for Master's studies (architecture and urbanism) and two programmes in the Czech language for doctoral studies (architecture and urban planning, visual arts).

Long-term Objectives of the Faculty

FAA has set three long-term objectives, which it is gradually fulfilling through partial steps and long-term decision-making.

- People: FAA creates conditions for the professional growth of researchers and teachers at all stages of their careers and provides a setting suitable for scientific and creative activity.
- Research and creative activity: FAA participates in projects and takes into account themes that are priorities in a regional, national, and international context (sustainable architecture, innovation in materials and building procedures, circular economy, new technologies, new media and artificial intelligence, the role of art in shaping public spaces).
- Cooperation and internationalisation: A small faculty with a limited staff carefully selects scientific and research themes.

Table 3.1.1 - Staffing per FTE²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	2.60/0.00	2.74/0.00	2.96/0.00	2.21/0.00	1.45/0.00	11.99/0.00
Associate Professor	5.29/0.67	5.38/0.59	6.89/1.41	6.07/1.20	4.98/0.87	28.61/4.74
Assistant Professor	5.72/1.23	7.57/1.66	8.28/1.43	8.91/2.27	9.76/4.10	40.24/10.69
Assistant	8.67/2.75	8.32/2.84	7.41/3.11	5.86/1.52	5.19/1.33	35.45/11.55
R&D Personnel ³	1.00/0.00	1.49/0.00	1.62/0.00	1.64/0.00	1.00/0.00	6.75/0.00
Researchers in other categories ⁴	5.18/0.08	5.58/0.75	4.37/0.00	3.73/0.00	3.48/0.10	22.34/0.93

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

Technical and economic staff ⁵	8.24/6.80	7.83/7.00	7.76/7.00	7.12/6.33	6.04/6.00	36.99/33.13
Scientific, research and development staff involved in teaching activities	27.32/4.74	29.38/5.84	29.73/5.96	26.76/5.00	24.86/6.41	138.05/27.95
Early career researchers ⁶	3.53/1.00	3.94/0.05	5.14/0.85	6.30/1.85	7.43/2.98	26.34/6.73
Total ⁷	36.70/11.53	38.91/12.84	39.29/12.95	35.54/11.32	31.90/12.40	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	0	0	0	0	0	0	3	0
Associate Professor	0	0	0	0	0	0	2	0	3	1	1	0
Assistant Professor	0	0	2	0	2	1	3	1	1	0	0	0
Assistant	0	0	4	2	3	0	1	1	2	0	0	0
R&D Personnel ⁹	0	0	1	0	0	0	0	0	0	0	0	0
Researchers in other categories ¹⁰	0	0	4	1	1	0	2	0	1	0	0	0
Technical and economic staff ¹¹	0	0	0	0	4	3	3	3	1	1	0	0
Scientific, research and development staff involved in teaching activities	0	0	9	3	6	1	8	2	7	1	4	0
Early career researcher ¹²	0	0	2	0	2	1	1	0	0	0	0	0

⁵ Who participates in the management and support of R&D&I in the institution.

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (excluding persons working on agreement on work activity or agreement on work performance).

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

¹² See Definition of Terms in Methodology HEI2025+.

Total ¹³	0	0	11	3	10	4	11	5	8	2	4	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	0	0	1	0	1	0	2	0
Associate Professor	0	0	0	0	0	0	1	0	4	1	1	0
Assistant Professor	0	0	0	0	7	3	2	1	4	1	0	0
Assistant	0	0	4	0	2	1	0	0	0	0	0	0
R&D Personnel ¹⁵	0	0	0	0	1	0	0	0	0	0	0	0
Researchers in other categories ¹⁶	0	0	0	0	2	0	3	0	1	1	0	0
Technical and economic staff ¹⁷	0	0	0	0	2	2	3	3	1	1	0	0
Scientific, research and development staff involved in teaching activities	0	0	4	0	11	4	7	1	10	3	3	0
Early career researcher ¹⁸	0	0	0	0	6	2	2	1	1	0	0	0
Total ¹⁹	0	0	4	0	14	6	10	4	11	4	3	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

¹⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	156	94	147	84	147	87	144	88	142	98	738	451
Master's ²⁰	58	37	49	24	43	26	37	20	48	27	233	137
Doctoral	24	11	42	19	41	18	44	22	41	23	192	93
Lifelong Learning Courses												
Total	238	142	238	130	231	131	225	130	231	148	1163	681

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	3/0	0/0	3/0	0/0	2/0	0/0	2/0	0/0	2/0	0/0	12/0	0/0
Master's	3/1	0/0	3/1	0/0	2/1	0/0	2/1	0/0	2/1	0/0	12/5	0/0
Doctoral	1/0	0/0	2/0	0/0	1/0	0/0	2/0	0/0	2/0	0/0	8/0	0/0
Lifelong Learning courses	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Total	7/1	0/0	8/1	0/0	5/1	0/0	6/1	0/0	6/1	0/0	32/5	0/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	0	-	0
	1.2 Computer and information sciences	0	-	
	1.3 Physical sciences	0	-	
	1.4 Chemical sciences	0	-	
	1.5 Earth and related environmental sciences	0	-	
	1.6 Biological sciences	0	-	
	1.7 Other natural sciences	0	-	
2. Engineering and Technology	2.1 Civil engineering	6	Balanced basic and applied research	8

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

	2.2 Electrical engineering, Electronic engineering, Information engineering	0	-	
	2.3 Mechanical engineering	1	Applied Research	
	2.4 Chemical engineering	0	-	
	2.5 Materials engineering	1	Applied Research	
	2.6 Medical engineering	0	-	
	2.7 Environmental engineering	0	-	
	2.8 Environmental biotechnology	0	-	
	2.9 Industrial biotechnology	0	-	
	2.10 Nanotechnology	0	-	
	2.11 Other engineering and technologies	0	-	
3. Medical and Health Sciences	3.1 Basic medicine	0	-	0
	3.2 Clinical medicine	0	-	
	3.3 Health sciences	0	-	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0	-	0
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	
	4.4 Other agricultural sciences	0	-	
5. Social Sciences	5.1 Psychology and cognitive sciences	0	-	1
	5.2 Economics and Business	0	-	
	5.3 Education	0	-	
	5.4 Sociology	0	-	
	5.5 Law	0	-	
	5.6 Political science	0	-	
	5.7 Social and economic geography	1	Balanced basic and applied research	
	5.8 Media and communications	0	-	
	5.9 Other social sciences	0	-	
6. Humanities and the Arts	6.1 History and Archaeology	0	-	91
	6.2 Languages and Literature	0	-	
	6.3 Philosophy, Ethics and Religion	0	-	
	6.4 Arts (arts, history of arts, performing arts, music)	91	Balanced basic and applied research	
	6.5 Other Humanities and the Arts	0	-	
Total		100%	-	100%

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

Recognition in the Research Community

FAA has a strong position in the professional community. Several of the authors teaching at FAA have created socially beneficial buildings and works, and hold the most prestigious awards in the field. FAA has long been involved in shaping culture and the built environment in the Czech Republic. Theoretically-oriented academics are among the recognised experts in the field of curatorial and publication practice. They often popularise important themes and provide Czech culture with international impulses.

Individual and other Prestigious R&DI Awards

The kindergarten in Nová Ruda, designed by Petr Stolín and Alena Mičková, won the Czech Architecture Prize for 2019 and was also nominated for the international Mies van der Rohe Award 2022. Osamu Okamura, Dean in 2019-2022, won an award for the publication *Město pro každého* (A City for Everyone). Professor Petr Kratochvíl and Professor Tomáš Vlček were awarded the TUL Bronze Memorial Medal in 2024 for long-term outstanding work results. The participation of doctoral student Jan Koníček at the ACADIA conference in the USA, where he received a major award for his contribution, can be considered a very successful achievement.

Participation of Academic Staff on the Editorial Boards of International Scientific Journals

Between 2019 and 2023, Prof. Petr Kratochvíl was on the editorial board of the professional journal *Architektúra a urbanizmus* (Architecture and Urbanism). This peer-reviewed journal, included in the Scopus database, is published twice a year in Slovakia.

The Most Important Invited Lectures of Academic Staff Abroad

Mainly theoretical academic workers have lectured in foreign universities. In the period under evaluation, architectural historians Filip Šenk and Ondřej Hojda were most often in the USA, Europe and Asia.

The Most Important Lectures by Foreign Scientists and Other Guests

The research projects included lectures by prominent foreign experts, such as Christopher Long, who is a world expert on the work of Adolf Loos, or the English historian and critic Anthony Vidler. The interdisciplinary scope of FAA is demonstrated by a lecture by the American computer neuroscientist Michael Arbib.

FAA also enabled the students to meet with several internationally recognised architects and urban planners, such as Mark Johnson who teaches at Harvard, Jette Hopp from the Norwegian studio Snøhetta, or the Icelandic architect Dagur Eggertsson, who also led a workshop with the students.

Involvement in the Evaluation of National or European Project/Programme Calls

Involvement in the evaluation of R&DI within national and international structures is low. The exception is prof. Petr Kratochvíl, who is an evaluator of Czech and European project calls.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Osamu Okamura, Ing. arch. MgA.	BolognaRagazzi Award: New Horizons 2021, special jury prize for innovative picture books	The Bologna Children's Book Fair organisation, Italy
Petr Stolín, doc. Ing. arch.	Architect of the year 2021, Outstanding contribution to Czech architecture in the last five years	Czech Chamber of Architects, issuing company ABF, a.s.
Vladislav Bureš, Ing. Ph.D.	ČKAIT - Awarding awards and medals to 30 personalities for 2022	Czech Chamber of Authorised Engineers and Technicians
Jan Koníček, Ing. arch., and Pavel Pokorný, Miloš Florián and Klára Masnicová (Gergelitsová)	Jury prize for a contribution to the Nano.Web.Arch project at an international scientific conference ACADIA 2022, "Hybrids & Haecceities"	Association for Computer Aided Design in Architecture, USA

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Petr Kratochvíl, prof. PhDr. CSc.	"Architecture and urbanism", ISSN 0003-6870, Vice-Chairman of the Editorial Board of a Slovak journal (on the Web of Science)

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Filip Šenk, Mgr. Ph.D.	Modernity Place Identity. Tomáš Baťa Memorial	Philosophy of the City, Detroit Mercy University, Detroit, USA	2019
Filip Šenk, Mgr. Ph.D.	Topology and phenomenology of space and place in architecture	Philosophy of the City, Lahti, Helsinki Uni, Finland 17–19/06/2019	2019
Filip Šenk, Mgr. Ph.D.	Urban Aesthetics: Places in the city: borders and folds	Coordinator of aesthetics, art and culture, Prešov, Slovak Republic	2020

Filip Šenk, Mgr. Ph.D.	Adolf Loos and the Search for the „Where“ of Modern Life	Adolf Loos 150 (+1). Tradition and Modernity. MAXXI Museum, Rome, Italy	2021
Osamu Okamura, Ing. arch. MgA.	How do Creative Industries Change Post-Industrial Cities	Dnipro Center for Contemporary Culture (Ukraina): House of Europe Festival: "Dnipro — City for Everyone"	2021
Ondřej Hojda, Mgr.	(Non-) building in the age of climate crisis. Reversing architecture? Historical case study: Ladislav Žák (1900–1973)	University of Taipei	2022
Ondřej Hojda, Mgr.	Expo 1970 in Osaka and the Czech pavilion	Mimar Sinan University of Istanbul	2022
Petra Vlachynská, MgA. Ph.D.	Arts and Sites	Penser Le présent - Art et espace public, Les Beaux-Arts de Paris, France	2023
Vladimír Balda, Ing. arch.	Exploring Individual Approaches in Architectural Design	Opole University of Technology in Poland	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Mark Johnson	University of Denver and Harvard University	Designing the Future City - for Human and Global Health	2019
Joseph Tomlow, Dr.-Ing.	University of Applied Sciences Zittau/Görlitz	Antoni Gaudí and the principle of the hanging model - a historical panorama	2020
Jette Cathrin Hopp	Snøhetta	Presentation of the work of the architectural studio Snøhetta	2021
Elisbeth Chrastil	University of California, Irvine (UCI)	Cognitive Graphs: The Geometry of Spatial Knowledge	2021
Michael Arbib	University of California San Diego University of Southern California	From Neural Networks and Automata to Architecture	2021
Peter Carl	London Metropolitan University	The Embodied Topography and Metaphor (online)	2022
Anthony Vidler	The Irwin S. Chanin School of Architecture, Cooper Union, New York	Topology and Contemporary Art and Architecture (online)	2022

Claudia Quiring, Dr.	Staatliche Kunstsammlungen Dresden	Dresden Modern – Modern Dresden	2022
Dagur Eggertsson	studio Rintala Eggertsson Architects	Nordic Wood	2022
Christopher Long	The University of Texas, Austin	Adolf Loos. Space and contemporary architecture	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Petr Kratochvíl, prof. PhDr. CSc.	Member of the scientific board of the EU programme "JPI Urban Europe"	EU	2021
Petr Kratochvíl, prof. PhDr. CSc.	Evaluator of the Ministry of Culture projects NAKI II and III.	Ministry of Culture of the Czech Republic	Long-term
Petr Kratochvíl, prof. PhDr. CSc.	Evaluator of results for RD&I	Council of the Government for Research, Development and Innovation	Long-term

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the period of 2019–2023²³. This should be done from the full list in annex tables (Table 3.3.1–3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

In the period under evaluation, projects focused on interdisciplinary themes in culture, building culture, and politics, and projects based on experimental research of new technologies in architecture were also implemented. In 2023, FAA defined the following long-term research themes in its Strategy for Science and Research at the Faculty of Arts and Architecture in Liberec 2023-2030:

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

Architecture, urbanism, and landscape
 Modernism and architecture of the post-war period
 Principles of sustainable construction, architecture and urbanism
 Research of materials and the use of new technologies and construction procedures
 Art in public spaces and in society

Art, architecture, and digital technologies

These themes follow on from previously implemented projects and develop the potential of FAA. The research projects complement SGS projects, which were selected on the basis of 1. publication results included in the Scopus and WOS databases, 2. local themes of the Liberec region. These projects correspond to the long-term priorities and themes defined in the Strategy for Science and Research at the Faculty of Arts and Architecture in Liberec 2023 - 2030.

Topology and Poetics of Space, TL02000573, implementation period 2019 - 2022, percentage representation of FAA: 47.5%

This four-year research project was co-financed by the support of the Technology Agency of Czech Republic within the Éta Programme.

The main investigator of this research was proposed and accepted as Prof. dr. Tomáš Vlček from FAA. The grant was awarded to a team from the Interdisciplinary Seminar of Topological Studies of the Poetics of Art, Landscape and Architecture, founded by FAA and the Faculty of Mathematics and Physics of the Charles University in Prague in 2015 by Professor Jaroslav Nešetřil and Professor Tomáš Vlček.

The theme of the research was the solution of questions of contemporary knowledge overcoming the isolation of segments of contemporary culture, one of the main causes of the crisis of the cultural life of society in the modern and postmodern era. The methodological focus is a result of the complexity of topology, which is applied today in a number of inspiring interactions of various fields of creative work in science, philosophy and, last but not least, art. The scope and content of these interactions has become so pronounced since the last third of the 20th century that, in agreement with the French philosophers of the end of the 20th century, we can call it one of the most significant reversals in modern and late modern civilisation. In these contexts, the limited validity of theoretical clusters given by the belief in the sufficiency of the causal interpretation of phenomena, in the interpretation limited by their perception and evaluation as closed, static entities of reality, is shown. Topology opens up a more complex view of reality as an interconnected variety of qualities of things and events, perceived as multifaceted interconnected events.

Possibilities and Limitations of Socially and Environmentally Sustainable Participatory Housing in the Czech Republic, SS03010221, implementation period 2021 - 2023, percentage representation of FAA: 4%

This project was created by the Institute of Sociology of the Academy of Sciences and involved the architect Jiří Suchánek, teaching until 2022 at FAA, and PhD student Lukáš Houser.

The aim was to find a solution that combines the benefits of adaptation measures of ecological construction with those of the pro-environmental community lifestyle of the residents, creates high-quality housing and a lively city, develops the involvement of residents in the management of the building, neighbourhood and borough, ensures the required social mix and is in an accessible socio-economic regime.

In the first year, the focused was on conceptualising participatory housing in the Czech context, analysing the institutional framework regarding possibilities and limitations of participatory housing in the Czech Republic, and holding meetings and roundtables in partner locations. Work also began on a project output – a technical article for a monothematic issue of the Czech Sociological Review. Another output was a project symposium, available on the SOÚ AS CR YouTube account, which was attended by over 40 participants online.

In 2022, the following took place: workshops in partner cities (Liberec, Psáry, Jihlava, Opava, Pardubice), a questionnaire focusing on participatory housing preferences, excursions to foreign participatory housing projects (Leipzig, Berlin, Vienna), and an article to be published in 2023 in the Czech Sociological Review.

The final year of the project saw several outputs, from professional articles (published in the Czech Sociological Review and Critical Housing Analysis) to practical outputs e.g., Methodological Guideline and Participatory Housing Manual focusing on applying the acquired knowledge in the development of participatory housing in the Czech Republic. All outputs are available at the website of the project (A list of supportive documents/Links for Modul 3).

TOPOMOMO – Experimental Territory of Modernity, 100279841, implementation period 2021 - 2023, percentage representation of FAA: 50%

The project application was submitted as part of the cross-border cooperation programme SN-CZ 2014-2020 in cooperation with the German foundation Haus Schminke Löbau. The objective was to propose new communication and marketing strategies for buildings from the interwar period in the Saxony-Bohemian border area. A series of workshops was held in selected locations, which were intended to serve as way of finding new ideas, partners, and strategies for further long-term development and revitalisation. The objective of the project was also to improve communication within the region and create lasting awareness of the shared cultural heritage of modernity.

3D Printing in Construction and Architecture, CZ.02.1.01/0.0/0.0/16_025/0007424, implementation period 2018 - 2023, percentage representation of FAA: 13.8%

Multidisciplinary project of seven workplaces of four TUL faculties – Faculty of Mechanical Engineering, Faculty of Mechatronics, Informatics and Interdisciplinary Studies, FAA, and Faculty of Textiles. Co-researcher CTU Prague – Klokner Institute.

The project focused on using 3D printing in construction and architecture, and the development of a robotic device capable of printing structures on construction sites without using formwork or transporting prefabs from factories. The conceptual hardware and software of the printing robot was created, and some of its parts were verified on functional samples. Suitable building materials were researched and developed, and optimal building construction principles using the unique possibilities of this technology were sought. The work also involved research into the logic of the printing process and navigation method, enabling printing on construction sites.

The extent of outputs was limited to the main principles and components of the robotic device within the OPRDI project call Pre-Application Research.

The objective was to examine the possibilities of 3D printing as an alternative to conventional methods of making concrete structures and buildings. 3D printing can easily create lightweight, hollow, thin-walled, and complex structures, saving on building materials, especially cement and aggregates. 3D printing does not require formwork, reduces manual labour and, with a correctly set printing process, shortens the construction time.

Contributions include the complexity of the approach to the problem, including parallel and mutually complementary and influencing research and development activities in several fields. Main achievements include the development of modifiable printing material, development and implementation of specific robotic printing devices, including unique software, and printing of thin-walled structure samples and measurement of their mechanical properties, confirming the importance of the path taken.

SGS Projects

SGS-2021-2043 Nanotextiles, Non-Woven Textiles with Water Retention Properties and their Use in Architecture, principal researcher Ing. Arch. Jan Konicek

The project focussed on investigating nonwoven and nanotextile materials with water retention properties for use in architecture. Individual material samples were compared and the resulting data were evaluated. Based on the resulting data, architectural concepts were designed, using suitable materials for water retention, putting the research process of measuring samples into a real context. The project joined the global effort to solve the environmental issue of a loss of water on the planet.

SGS-2022-2015 Use of Growing Biomaterials for New Design Principles in Architecture, principal researcher Ing., Mgr. art. Jaroslava Frajová

The project responded to the challenges of the global crisis to change from wasting resources to sustainable materials and production. One of the great challenges for architecture is to deal with the decline in building materials and replace them with other materials or architectural principles. The project touched on the field of growing and adaptable architecture, which has great potential for sustainable architecture in the long term. The material used was biological, based on bacterial growth through the process of fermentation. The project focused on the compilation of methods for the creation of architectural structures and new principles of growth modelling of three-dimensional objects using fermentation, on which its functional properties were subsequently tested to define the final application possibilities.

SGS-2022-2048 Digital Artwork and the Audience, principal researcher Ing. arch. Ivo Loud

One of the fundamental differences between a digital (augmented reality, AR) and a physical artefact is the way the audience approaches the work. Whether a tangible work of art is placed in the interior of a gallery or in the public space of a city, it takes its place visibly in relation to a certain space. This relationship can be detected by the audience upon first entering the place. On the other hand, when viewing a digital work of art that has also been properly placed in the space, the first experience of the audience is limited to the place itself, and only then does it enter this space when the application displaying the digital work is launched. Surprise certainly plays a large role in audience behaviour. What are the other aspects that influence movement and the way a work of art is viewed? The audience interested in digital activities outdoors seems to be growing, but how can we record this phenomenon?

SGS-2023-2410 Research of Data Sources in the PLA Jizerské hory, principle researcher Ing. arch. Helena Hlávková

The project focused on the relevant theme of burdening the landscape with tourism and has the potential to bring new knowledge with practical use. By correctly assessing overtourism in the countryside, it is possible to find the most congested places and understand why the congestion occurs. The aim of this work was to find these places and precisely define the burden using the available data. There are a number of data sources available that can track this burden and highlight outbreaks.

SGS-2023-2413 Portraying Stories of the Territory from the Perspective of Stakeholders, principle researcher MgA. Ida Chuchlíková

The project focused on a specific architectural-urbanistic phenomenon, specifically drikets (small glass pressing workshops), which is a symptomatic moment in the development of glassmaking, or rather a place where glassmaking has had a significant impact on the forms of the living environment. The project combined artistic and historical research, which is suitable for an active documentation of doctoral studies at FAA.

Contractual Research

Three alternatives of the design of a multifunctional garage for bicycles, pushchairs, and mobile walkers for the elderly, with integrated charging stations and bicycle racks on the “Grundbachsiedlung” panel housing estate in the village of Olbersdorf. The designs were created using digital and parametric design procedures. This was a design study that meets the architectural and functional operational requirements arising from the essence of the assignment, but also takes into account the production and calculation parameters (possibilities and limitations) of large-format 3D printing. FAA TUL, Kommunale Wohnungsbau und Verwaltungsgesellschaft Olbersdorf mgH, Frauenhofer Institut Zittau, and 4D-lightweight Zittau participated in the project.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Support (in thousands CZK/EUR) ²⁶				
		2019	2020	2021	2022	2023
Technology Agency of Czech Republic	Topology and Poetics of Space	301 /11.9	499 /19.7	983 /37	1 781 /70.26	0 /0
Technology Agency of Czech Republic	Possibilities and Limitations of Socially and Environmentally Sustainable Participatory Housing in the Czech Republic	0 /0	0 /0	807 /31.83	1 069 /42.17	1 276 /50.34
Interreg ČR – Sasko (85% FRG grant, 5% CR grant)	TOPOMOMO – Experimental Territory of Modernity	0 /0	0 /0	1 115 /44	1 876 /74	0 /0
Ministry of Education, Youth and Sport of the Czech Republic	3D printing in construction and architecture 3D-STAR	3 388 /134	3 492 /138	3 791 /150	1 813 /72	242 /10
Ministry of Education, Youth and Sport of the Czech Republic SGS	System of application of digital work to public space	0 /0	190 /7	0 /0	0 /0	0 /0
Ministry of Education,	Plastic: limiting its use, replacing	0 /0	100 /4	0 /0	0 /0	0 /0

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

Youth and Sport of the Czech Republic SGS	it with environmentally friendly materials and analysing the impact on lifestyle					
Ministry of Education, Youth and Sport of the Czech Republic SGS	Nanotextiles, Non-Woven Textiles with Water Retention Properties and their Use in Architecture	0 /0	0 /0	150 /6	0 /0	0 /0
Ministry of Education, Youth and Sport of the Czech Republic SGS	Use of Growing Biomaterials for New Design Principles in Architecture	0 /0	0 /0	0 /0	150 /6	0 /0
Ministry of Education, Youth and Sport of the Czech Republic SGS	Sustainable Neighbourhoods in Context	0 /0	0 /0	0 /0	150 /6	0 /0
Ministry of Education, Youth and Sport of the Czech Republic SGS	Digital Artwork and the Audience	0 /0	0 /0	0 /0	150 /6	0 /0
Ministry of Education, Youth and Sport of the Czech Republic SGS	Apidomek 1.0	0 /0	0 /0	0 /0	0 /0	170 /7
Ministry of Education, Youth and Sport of the Czech Republic SGS	Research of Data Sources in the PLA Jizerské hory	0 /0	0 /0	0 /0	0 /0	130 /5
Ministry of Education, Youth and Sport of the Czech Republic SGS	Portraying Stories of the Territory from the Perspective of Stakeholders	0 /0	0 /0	0 /0	0 /0	171 /7
Total		3689 /146	4281 /167	6846 /270	6989 /276	1989 /78

In the role of another participant						
Provider ²⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Ministry of Industry and Trade - Operational Programme Enterprise and Innovation for Competitiveness	Reducing noise load from linear transport structures using active and passive elements	0 /0	0 /0	0 /0	0 /0	148 /6
Ministry of Industry and Trade - Operational Programme Enterprise and Innovation for Competitiveness	Application of geopolymers in fire safety of buildings	0 /0	0 /0	0 /0	0 /0	129 /5
Technology Agency of Czech Republic	digiBeton – Simulation and design of structures from digital concrete	0 /0	0 /0	0 /0	0 /0	117 /5
Technology Agency of Czech Republic	3D printing of cement-free materials in architecture	0 /0	0 /0	0 /0	0 /0	15 /0.6
Total		0 /0	0 /0	0 /0	0 /0	409 /16

Table 3.3.2 - Contract research activities

Client ²⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
KWV Kommunale Wohnungsbau und Verwaltungsgesellschaft Olbersdorf mit beschränkter Haftung, Olbersdorf, FRG	Three alternatives of the design of a multifunctional garage for bikes, pushchairs and mobile and mobile walkers for the elderly, with integrated charging stations				140 /5.54	100 /3.96

²⁷ Ibid.

²⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

Total				140 /5.54	100 /3.96

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

The Faculty of Arts and Architecture is an important contributor to the quality of the built environment and cultural life in the Liberec Region and on a national scale. It builds on the potential and legacy of the SIAL studio and Karel Hubáček, who enriched world architecture with the unique construction of the Ještěd television transmitter, which was awarded the August Perret prize in 1969. In 1969, also in Liberec, the first exhibition of sculptures in a public space took place in Czechoslovakia, which presented artists who are now a permanent part of the history of Czech art of the second half of the 20th century. The Faculty of Arts and Architecture continues and further develops the potential and historical heritage by emphasising an innovative approach in architecture, the connection of architecture, art, and new technologies, regional themes, and the gradual deepening of environmental themes.

Among the results that have a clear impact on society, it is possible to include buildings by architects, exhibition activities, and professional publications. These results are mainly used in the RUV database (Register of Artistic Outputs). Theoretically-oriented academic staff actively publish and, in cooperation with galleries, engage in curatorial and exhibition activities, often with an international dimension. The long-term objective is to increase the frequency of results in which both theoretical and practicing teachers participate.

Rozlomená doba (Years of Disarray)

Scientific monograph, 2019

The publication as part of the international project Rozlomená doba (Years of Disarray) 1908-1928 was created under the auspices of the European Union and the ministries of culture of the Czech Republic, Poland, Slovak Republic, Hungary, and Austria, and introduces you to the world of the Central European avant-garde at the time of the disintegration of the Austro-Hungarian Empire and the emergence of successor states. The book shows you in one place the diversity in the works of leading world-renowned creators from Central Europe.

²⁹ See Terms definition.

Magdalena Jetelová, Transformations of place and space

Exhibition, 2021

The exhibition by Magdalena Jetelová in the Regional Gallery in Liberec was part of the Topology and Poetics of Space project. In keeping with the focus of the research project, it was called Transformations of place and space, and in the form of an installation, it led visitors to reflect on the perception of space and the memory of a place. The exhibition was an example of the interpretation of creative thinking in the field of visual arts and theoretical scientific work.

Z galerie VEN!

Exhibition, 2022

The exhibition held in the summer of 2022 at the Jaroslav Fragner Gallery in Prague represents a unique attempt to evaluate the period after 1989 from the point of view of the production of art in public spaces. The exhibition presented 60 artistic interpretations. It included both permanent objects and temporary interventions, art festivals, and events. The framework for a critical approach was represented by four thematic areas including political themes as well as significance from the point of view of the formation of cities. The exhibition panels contained Czech-English commentary. The exhibition was organised within the framework of the Czech Presidency of the European Union. It was later reprised in Bratislava, Paris, Vienna, Brussels, Lodz. The authors were the curators of the exhibition.

Z Galerie VEN!

Scientific monograph, 2022

The publication accompanies the exhibition of the same name at the Jaroslav Fragner Gallery in Prague, in the summer of 2022. The introductory articles reflect on this theme from various theoretical and historical perspectives and, in addition to the editors, Ludvík Hlaváček, Denisa Václavová, Radek Horáček, Marie Foltýnová, Tomáš Knoflíček, Radoslava Schmelzerova also contributed to it.

Topology and poetics of space

Scientific monograph, 2023

The results of the project aimed at expanding the methodological understanding of architecture and art by means of topological thinking bring the possibility of refining the understanding of the relationships of a contemporary city and landscape, and the relationships between the present and the historical environment, mainly due to the attention paid to the issue of space and the perception of it.

As demonstrated by a two-volume publication written by prominent domestic and foreign experts (Joseph Rykwert, Peter Carl, Alberto Pérez Gómez, David Leatherbarrow, Werner Oechslin), topological research is relevant in architecture and urban planning, where a complex concept of spatial relationships, as presented in our research, does not reduce design issues to formal aspects. The central line is dedicated to the concept of space in relation to art and architecture, where space is articulated into images of the lived world through specific works. Emphasis on the lived world, the situatedness of a person in a specific environment, leads the research to the conclusion that attention must be paid to the treatment of the landscape and building links for solving the issues of urban development and the climate crisis.

TOPOMOMO – Experimental territory of modernity

Scientific monograph, 2023

In the case of the topography of modernist architecture, scholarly attention was focused on buildings and urban projects that have shaped the present, although they are not always exceptional architectural or urban examples. However, if we follow the development of cities, which in the Czech-

Saxony border region was particularly rapid and dramatic from the 19th century, we have no choice but to pay attention to the changes in the relationship between historical and modernist architecture.

The project came to its conclusions in the form of a professional monograph, in which the specifications of the local acceptance of modernism are shown. The transition from universally valid concepts such as “modernism”, which overlap events in art and architecture, especially at the beginning of the 20th century, often leads to distorted ideas about the real state of affairs. The conflict between universal concepts and specific manifestations leads to a re-evaluation of the forms of architecture and art in the Czech-Saxony border region, and therefore can lead to a justified and adequate treatment of the memory of this area.

Raumplan

Scientific monograph, 2023

This book focuses on the work of Adolf Loos in broader contexts that lead up to contemporary architectural events. The individual authors and the authors of the international team focused both on researching the ideas and work of Adolf Loos, and on examples of direct and less obvious connections to his work. The main unifying instant is the connection to space in architecture, which became a key part of architectural thinking at the end of the 19th and the beginning of the 20th century.

In addition to theoretical-historical analyses and interpretations, the book also includes interviews with several important contemporary architects, whose use of concepts and ideas of architectural space can be traced. Specifically, Alberto Campo de Baeza, Mauricio Pezo and Sofia von Ellrichshausen, Sou Fujimoto, and Momoyo Kaijima. The main contribution of the book is a search for historical continuities in the ever-changing and interconnected world of modernity, postmodernity, and the present.

CO-EXTENSIVE

Exhibition, 10/2023 – 01/2024, Gallery Rudolfinum Gallery, Prague

Curator: Filip Šenk

Artists: Marion Baruch, Larry Bell, Michał Budny, Angela Bulloch, Simon Callery, Ann Veronica Janssens, Anthony McCall, Jaromír Novotný, Robert Šalanda

This international exhibition held in the Rudolfinum Gallery in Prague was primarily based on two moments of reflection on the contemporary world. The first is the notion that images (in a broad sense from the thousands of images everyone has on their phones, through social networks to works of art) form a permanent part everyday experience of the world. The ubiquity of images has several consequences that are not always easy to see, e.g., the flattening of the experience of the world and the dominance of illusion in shared space. Images are very open to editing and manipulation, so what often looks like an accurate representation of reality may not refer to anything real.

The second is in an academic perspective. An early stimulus for the exhibition was the art-historical question of how and what remains alive in contemporary art from a wider circle of art, which is commonly referred to as minimalism. The answer follows the development of image forms in the rift between reality and illusion. Here, the almost automatic assumption of an autonomous image space is violated. Works mirroring this disruption suggest the infinity of the relational framework. Something real is always revealed in this: The defining moment of the exhibition is the merging of visual and real space. The presented artworks thematise various planes and levels of perception of space, in which the usual opposites of open-closed, close-far, flat-deep occur at once. This places images in an ambiguous situation: being an image and shaping the experience of space.

It has almost 25,000 visitors.

Manual of participatory housing

In the introduction, this methodological manual presents the social relevance of the development of available forms of housing. It also contains a conceptualisation of participatory housing, a dictionary of forms of housing from the perspective of participation, as well as an overview of stakeholders. There are six examples (best practices) from abroad. In the third part, there are seven different examples of participatory housing from the point of view of community involvement. Available in printed form.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ³⁰	Year of application	Name
Scientific monograph	2019	Years of disarray 1908-1928: Avant-gardes in Central Europe
Exhibition	2022	Magdalena Jetelová, Transformations of place and space
Conference	2022	Topology and poetics of space
Scientific monograph	2022	Outside the Gallery!
Exhibition	2022	Outside the Gallery!
Scientific monograph	2023	TOPOMOMO – Experimental territory of modernity
Scientific monograph	2023	Raumplan
Scientific monograph	2023	Topology and poetics of space
Exhibition	2023	CO-EXTENSIVE
Other result	2023	Manual of participatory housing

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

³⁰ Specify the specific type of result. Add rows as needed.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³²

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

Research in architecture, urban planning, and arts builds on knowledge and methods from practice. The Regional Contact Centre (RCC) provides a link between FAA and the built environment, and cooperates with local authorities in the region, companies, and non-profits bringing real tasks and issues to academia. The RCC provides contractual services, shapes cooperation and outputs, and coordinates opportunities between departments.

FAA cooperates with cultural institutions on exhibitions and accompanying programmes and presents the involvement of new technologies in art and architecture, artistic trends, and mediates international contacts.

The creative activities of FAA are closely tied to local governments and stakeholders who are involved in the creation of the built environment. Creative outputs of FAA are carefully monitored by the professional community of architects and artists are regularly published. Due to its impact on the built and cultural environment, the main beneficiary is the public, who use the buildings, visit exhibitions, or participate in public lectures and other popularisation activities.

Academic staff also provide the technical expertise used in the construction industry to create new subjects and an innovative approach to pedagogical practice and methodologies for barrier-free public buildings.

The activities of Jana Košťálová and Zuzana Zaoralová are not linked to projects in which FAA would be the main beneficiary. Both are involved in the projects: University leaders in SDGs (UNILEAD) - *Energy Management, Green Construction and Water Management and Support of Green Skills and Sustainability in Higher Education Institutions* within component 7.4 of the National Recovery Plan for Higher Education Institutions for the years 2023 - 2025 - preparation and implementation of the new subject *Sustainable Construction* and preparation of documents for the TUL Sustainability Strategy.

Jana Košťálová participated in the *Methodology of Integral Accessibility, support for the design and implementation of a barrier-free environment of transfer nodes for all users and supports the*

³¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³² If the commercialisation of R&D&I results is carried out in this way.

fulfilment of the EU Resolution ResAP(2001)1 on universal design in the Czech Republic, which is taught at universities and lifelong learning and was the subject of professional seminars for state administration and universities. It is also used in the accredited subject (from 2021/2022) “barrier-free buildings” for the Master’s study at FAA. Cooperation with FA CTU, AVU, UMPRUM, and DFJP UPce.

The methodology “*Integral accessibility for the creation of interchanges on regional railways*” was created based on Jana Košťálová’s dissertation and research and measurement methods (Fuzzy logic, Statistical analysis, Checkland’s methodology, UD). Tactile elements were designed for a shared platform of edge-to-edge rail and non-rail traffic. The methodology and tactile elements are used by the Railway Administration in new sample sheets: from 01/2025.

Zuzana Vyoralová participated in the OP RDI projects *Improving the quality of education at TUL and its relevance to the needs of the labour market* and *Developing human resources at TUL for increasing the relevance, quality and access to education under the conditions of Industry 4.0*. As part of the National Recovery Plan, she was involved in the *New Possibilities of Education Development at the Technical University in Liberec*.

Results of the Project Topology and Poetics of Space

The specialist book *Topology and Poetics of Space* is not intended for commercial use. This output is intended to support education and research activities. The target user of the result/output is and will continue to be the professional public - students and lecturers of advanced studies (especially graduate and doctoral studies), mainly from the fields of the visual arts and architecture, together with students and scientific and pedagogical staff of universities and scientific institutions from the fields of natural sciences (mathematics), humanities (anthropology, sociology, psychology, philosophy).

Results include cooperation with institutions associated with the Academy of Neurosciences for Architecture, University of San Diego.

The results were used in the following areas:

- Doctoral studies: Basis for dissertations and other research projects of doctoral students.
- Expert research: Basis for further research on the network of places and their relationship to the identity of cities.
- Professional public: Presentation of results at conferences, symposia and professional workshops.
- Non-professional public: Popularisation lectures and public discussions.
- Pedagogical application: Department of Theory and History of Fine Arts and Architecture (FUA TUL): Ideas developed in the course are actively applied in lectures on urbanism, art history, and architectural theory.

Results of the project Possibilities and Limits of Socially and Environmentally Sustainable Participatory Housing in the Czech Republic

The output is primarily two publications:

- Methodological guideline to participatory housing
The methodological guideline presents the social relevance of the development of available forms of housing. It also contains a conceptualisation of participatory housing, a dictionary of forms of housing from the perspective of participation, as well as an overview of stakeholders. There are six examples (best practices) from abroad. In the third part, there are seven examples of participatory housing from the point of view of community involvement.
- Manual of participatory housing
The Manual of Participatory Housing is primarily aimed at those interested in the given form of housing; however, it is also relevant for other stakeholders, primarily experts entering the process and representatives of local governments or state administration. The publication

focuses in more detail on the conceptualisation and compass of participatory housing. It presents another six examples of foreign projects (best practices) and, in the third part, instructions on how to implement a participatory housing project divided into nine groups of tasks and four key themes - milestones.

Target groups: municipalities, cities, self-governing authorities, general public, non-commercial use.

Results of the project 3D STAR– 3D printing in construction and architecture:

Multidisciplinary project of seven workplaces of four TUL faculties - Faculty of Mechanical Engineering, Faculty of Mechatronics, Informatics and Interdisciplinary Studies, FAA, and Faculty of Textiles. Co-researcher CTU Prague – Klokner Institute.

The objective was to examine the possibilities of 3D printing as an alternative to conventional methods of making concrete structures and buildings.

Contributions include the complexity of the approach to the problem, including many parallel and mutually complementary and influencing research and development activities in several fields.

Its main achievements include:

- Development of modifiable printing material
- Development and implementation of specific robotic printing devices including unique software
- Printing samples of thin-walled constructions and measuring their mechanical properties, confirming the importance of the path taken.
- Production of a functional sample - ceiling lattice element

The results were used in the following areas:

Professional research: The results of experimental research serve as a basis for further research.

Professional public: Research results were presented at conferences, symposia, and professional workshops,

Non-professional public: Popularising 3D printing as an innovative construction technology.

Start-up outputs of FUA TUL students in the period under evaluation:

FAA students successfully participate in the START-UP TUL competition organised by the Student Business Club at TUL. Every year in this competition, they win prizes for submitted projects.

2020:

Eduard Seibert - BEEHIVE This is a design for a collection of lamps made by bees. The lamps are made of beeswax, which is ecological, original, and capable of scenting an apartment. Although the bees apply wax to an embedded beeswax origami puzzle, no two lights are the same. Eduard Seibert describes the process of creating the lamps, "I take a glued sheet of beeswax, cut it, and then glue it with wax into the desired shape based on an icosahedron, which I put into the hive. The bees smell the wax and want to continue the work of the previous bees". In addition to the prototype, he has produced ten lamps and is starting to launch his own business. The project has an ecological undertone. He wants to help increase bee numbers. The bees begin to produce not only raw materials, but also products. "I am opening a whole new segment for beekeepers. I hope that it will be so revolutionary for the industry that other similar projects will follow, and bees will become a more financially interesting industry", says the creator.

2022:

In 2022, the expert jury awarded the prize to a project of the student **Ha Vu Thu - Vietmed application**. Ha Vu Thu, a student at FAA, designed an application based on the principles of telemedicine to help Vietnamese people eliminate the language barrier when contacting physicians. The aim was to provide cooperation between the application and Vietnamese physicians, who advise the patient online or help them with an appointment with a specialist. Another function is to offer interpreters to facilitate communication. The application is successfully used in practice.

DSP student **Jaroslava Frajová** was a designer in the **NanoArtes** Start-up team, focusing on luxury designer jewellery made from unnecessary plastic waste. This is handcrafted from new materials and in such shapes that contrast with classic jewellery. It gives the impression that it comes from the future. Another mission of NanoArtes is to provide educational activity in the field of science and sustainability.

2023:

Tereza Nalezená – Salát na střeše (Salad on the Roof): The Salad on the Roof project won first prize in the finals of the 9th annual Start-up TUL. It is a sustainability-promoting project that offers a solution in the form of rooftop hydroponic farms. These cool hot roofs, add greenery to the city, and produce fresh vegetables without the need for imports. The farm network works on a similar principle to community energy. It redistributes the product for immediate consumption within the network between places with a surplus and shortage of production. Rooftop farms are offered either as a service that can be rented within the Salad on the Roof farm network, or as a turnkey finished product.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Donations to the regional contact centre - cooperation agreements		344 /13.6	55 /2.2	209.5 /8.3	521 /20.6
Others – consulting					80 /3.2
Total		344 /13.6	55 /2.2	209.5 /8.3	601 /109.8

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

FAA is characterised by a unique connection of architecture, design, and visual arts with modern approaches to science and research. In addition to teaching activities, FAA emphasises the popularisation of science, research, and innovation, and improving communication with the non-professional public. Popularisation activities and programmes such as Architecture Day, Researchers' Night or AI Days significantly contribute to cultural and scientific awareness and help build relationships between experts and the public.

Regular guest lectures and workshops organised by FAA for the general public also contribute to the popularisation activities of the faculty. Thanks to cooperation with prominent architects and artists from the Czech Republic and abroad, participants can gain direct insight into current trends in architecture and design. Lectures by personalities such as Mark Johnson, Dominik Lang, Stanislav Kolíbal and Kateřina Šedá offer valuable perspectives on current issues and inspire new generations of students and the wider public.

Thanks to the diversity of these activities, FAA has long been contributing to the development of public awareness of architecture, art, and scientific research. Its popularisation programmes serve not only to pass on expert knowledge, but also to strengthen the public's relationship with architecture and scientific innovations, whereby supporting the involvement of citizens in creating a high quality environment.

In the period under evaluation, a new website of FAA was created, which was launched in 2024. FAA is active on social networks, specifically on Instagram, Facebook, and YouTube, where recordings of selected guest lectures are available. There is also intensive cooperation with the university's communication and marketing department, FAA is the most mentioned faculty of TUL in the media.

1. Professional events

Seminar of Hope

FAA became part of the important project *Seminář naděje* (Seminar of Hope), which was created under the leadership of the renowned curator Michal Koleček. The aim of this project is to present the individual TUL faculties through artistic interventions in public spaces and to offer a new perspective on their connection with the surroundings of the university campus and the city of Liberec.

On behalf of FAA, teachers Jan Stolín and Blanka Kirchner participated in the project, creating two unique installations. The first of which was Stolín's installation entitled *Kam kráčíš?* (Where are you going?), which was sensitively integrated into the facade of the Faculty of Engineering.

The second installation, designed by Blanka Kirchner, is entitled *Stejné místo. Stejný čas. Jiné pohledy* (Same City, Same Time. Different Perspectives), and is located in front of the building of the Faculty of Science, Humanities and Pedagogy on Komenského street, the creation of which involved over 600 employees and students from FP TUL (One Sentence Per Day project) and then artificial intelligence, which created the final text based on a large collection of sentences carved into a block of COR-TEN steel.

A series of guest lectures for the public

FAA regularly organises a series of guest lectures for the public, which was curated last semester by Petr Volf, a renowned columnist and art theorist.

The lectures bring important personalities of the contemporary art scene to Liberec, including, for example, the conceptual artist Kateřina Šedá or the sculptor and legend of Czech modern art Stanislav Kolíbal. The lectures offer not only insight into their work, but also inspiring discussions on contemporary themes of art, architecture, and culture, and create space for dialogue between artists, students and the general public.

2. Creative activity of students

Artweek-Liberec

Students of FAA regularly participate in the Artweek Liberec festival, where they present their projects, installations in public spaces and galleries. Their work reflects current social issues and connects architecture and art with an experimental approach. Involvement in Artweek encourages interdisciplinary collaboration and allows students to present their skills in a professional context to the general public. Participation in the festival also strengthens the connection of FAA with cultural events in the region and makes young talents visible on the art scene.

Signal festival, Prague

Students of FAA, Ondřej Drahokoupil, Vítězslav Plavec, and Filip Zeman successfully participated in the prestigious Signal Festival (Prague) with their light installation. Their installation entitled *Nezmar* (Hydra) offered a unique combination of art, technology, and architecture, while thematically responding to current social challenges. The installation used interactive elements and innovative lighting technologies to attract the attention of visitors and engage them in the experience. Participation in the Signal Festival allowed students to present their work in an international context and gain valuable experience in the production of large cultural events.

3. Popularly focused events

Architecture Day

FAA regularly participates in the national Architecture Day. The agenda includes guided tours and lectures focused on current architectural trends and sustainability in architecture. The aim is to connect experts and the general public and discuss current challenges and inspirations in the field of architecture.

Researchers' Night

FAA regularly participates in the national Researchers' Night. The agenda offers exhibitions, presentations, and workshops aimed at popularising approaches in architecture, design, and sustainable development. The aim is to bring scientific knowledge to the public and to support interest in science and research.

AI Days

AI Days at FAA - FAA focuses on presenting the application of artificial intelligence in the field of architecture, digital design, and art. Through workshops, lectures, and discussions, participants learn about the use of AI and new trends.

Ještěd F Kleci (JFK) competition

Ještěd F Kleci is a traditional student competition at FAA. At the end of each semester, a five-member jury composed of external members and experts has the task of announcing the best semester thesis from the fields of Architecture and Urbanism and Visual Arts - Creation in Public Spaces. The agenda of the competition also includes workshops for the public, lectures, and cultural events (theatre, concert).

4. Events for graduates

FAA regularly appeals to its graduates to become members of expert juries for the defence of student semester or final theses. This approach enables a connection between current teaching activity and practice, with graduates providing valuable feedback from the real world of architecture, urbanism, and art. Graduates are invited to lecture at FAA about their projects, professional experiences, and current challenges. These lectures serve as inspiration for students and emphasise the importance of continuity between study and practice. Approximately once every five years, FAA organises a meeting of graduates in the iconic studio of Karel Hubáček in block F2. This event offers a space for sharing experiences, memories, and professional achievements and strengthens community ties between generations of graduates.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Self-assessment:

Recommendation 3.2, 3.3, 3.4

Research at the Faculty of Arts and Architecture is based on the activities of theoretically focussed academics. Their publishing activities and other activities are closely linked to practice and do not serve theoretical and historical research. FAA sees the potential for project activity at the Technology Agency of Czech Republic rather than the Grant Agency of Czech Republic, which is more focussed on basic research. Technology Agency of Czech Republic programmes are application-oriented and support an interdisciplinary approach. FAA is involved in interdisciplinary activities, participates in the discussion on the themes of artistic research, which takes place at the level of universities with an artistic focus. Outputs with application potential were created.

Recommendation 3.5, 3.6

FAA developed the “Small Town Concept” by supporting SGS projects, which are locally focused and based on the aforementioned principle. One semester, the visiting studio was led by Mjolk architects, as recommended.

FAA supports and develops long-term cooperation between architects and artists on the one hand and theorists on the other. This cooperation is supported on an informal and formal level through internal calls from the Artistic Activities Fund and Publishing Activities Fund. The principle of cooperation between professionals from practice and theoreticians was implemented through several exhibitions, for example INDEX2, and the exhibition and specialist book entitled Outside the gallery! or the upcoming comprehensive exhibition and catalogue of the works of the founder of the faculty, Jiří Suchomel. Outputs of a research nature were created, which are based on a theoretical examination of the work of architects and artists teaching at FAA.

Recommendation 3.7, 3.8, 3.9

In 2023, FAA prepared the Strategy for Science and Research at the Faculty of Arts and Architecture in Liberec 2023–2030, which defines research themes and basic objectives and values that shape decision-making processes. The regional anchoring in relation to the research themes as well as the principles of involvement in the regions are clearly outlined. FAA sees the potential and space for fulfilling its role as an institution that shapes the cultural environment of the Liberec Region. At the same time, FAA, through its academic staff, is involved in cultural activities of national importance.

Recommendation 3.10, 3.11

The situation regarding habilitated employees is stabilised at the Department of Arts. The Department of Architecture is undergoing a transformation, and the issue of staffing is being actively addressed in connection with the new accreditation, which will be prepared in 2025. Both departments are staffed by teachers with the prospect of habilitation in the next three years. FAA supports employee trips abroad and establishing contacts.

Recommendation 3.12

FAA has strengthened its personnel for communication with the public and PR. It regularly provides information about upcoming events on social networks and reports on past events. It presents important events in an attractive way and regularly presents the work of successful students of Bachelor's and Master's programmes and doctoral students. FAA is also in contact with successful graduates. Each semester, it implements a series of curated, publicly accessible lectures with important personalities from the field of architecture and art. They also participate in popularisation activities such as Researchers' Night, AI Days and Architecture Day.

FAA uses the services of the university's communication and marketing department, which mediates contact with regional and national media, in which FAA is mentioned most often of all the faculties of the Technical University in Liberec.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Basic information about the faculty	3.1	https://webfua.fa.tul.cz/en/
Doctoral Studies	3.1	https://webfua.fa.tul.cz/en/study/doctoral-studies
Science and research at FAA	3.1	https://webfua.fa.tul.cz/en/research
Science and Research Strategy of the Faculty of Arts and	3.1, 3.3	https://doc.tul.cz/12248

Architecture in Liberec 2023-2030		
Topology and poetics of space, Vol. I, online publication	3.3, 3.4, 3.5	https://etul.publi.cz/en/book/4109-topologie-a-poetika-prostoru-svazek-i
Topology and poetics of space, Vol. II, online publication	3.3, 3.4, 3.5	https://etul.publi.cz/en/book/4112-topologie-a-poetika-prostoru-svazek-ii
Raumplan, online publication	3.3, 3.4, 3.5	https://issuu.com/galerie-gif/docs/raumplan_gif_publicace_issuu/1
Magdalena Jetelová, Transformations of place and space, information about the exhibition, web OGL	3.4	https://www.ogl.cz/en/magdalena-jetelova-transformations-of-place-and-space
CO-EXTENSIVE, information about the exhibition, website of Galerie Rudolfinum	3.4	https://www.rudolfinum.cz/en/event/30746--/

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Mechatronics, Informatics and Interdisciplinary Studies

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Mission

We create, disseminate, and apply knowledge in the field of mechatronics, informatics and applied sciences and pass this knowledge on to all who want to learn more.

Vision

The vision of the Faculty of Mechatronics, Informatics and Interdisciplinary Studies (FM) is to become a respected research workplace, an attractive educational centre, a reliable technology partner and a pioneer of new ideas and technologies in the field of mechatronics, informatics and applied sciences.

Self-reflection of the social contribution of the Faculty

FM is a recognised part of the Technical University of Liberec (TUL) and focuses on mechatronics, information technology, and selected areas at the border of natural and technical sciences. FM continuously strives for a close connection between educational and related scientific, research, development and innovation activities in these areas and through its activities steadily participates in the development of TUL. Scientific research and innovation activity is an integral part of the activities of the employees of FM. FM provides and coordinates research in the fields of information technology, software engineering, artificial intelligence, electronics, robotics, electromobility, automatic control, reliability and risk assessment and modelling, numerical modelling, coupled action mechanics, optics and special materials. The research directions of FM are also reflected in its

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

teaching activity, which is organised into three basic study programmes: Information Technology, Mechatronics, and Applied Sciences in Engineering.

FM is a strong and stable partner in the development of the county and region in an educational, research, and social role. FM also plays an important role in the transfer of knowledge into industrial practice, not only in the form of teaching in accordance with the current knowledge of R&D, but also in the form of cooperation with important industrial entities (within the Czech Republic and abroad).

Distribution of research activities according to the type of research

FM was founded as a distinctly interdisciplinary, science and engineering faculty, with close professional ties to other TUL components. It significantly participated in the establishment of the Institute for Nanomaterials, Advanced Technologies and Innovations (CtI), not only through cooperation, but also staffing. These facts are also reflected in the structure of R&DI results from the perspective of FORD fields, where 51.5% of the results for the period under evaluation fall into Ford 2 Engineering and Technology, and 44.5% of the results into Ford 1 Natural Sciences. Traditionally strong activities are in Ford 2.2 Electrical engineering, Electronic engineering, Information engineering (18.5%), 1.2 Computer and information sciences (14%), 1.3 Physical sciences (12.6%), 2.3 Mechanical engineering (9.5%), 2.5 Materials engineering (6.1%), and 1.1 Mathematics (5.1%). More detailed information can be found in the document [Science, Research and Innovation Strategy to 2025 with a view to 2030+](#).

Organisational structure of the Faculty

Within TUL, FM is one of the smaller faculties with a strong research focus, which is demonstrated by the relatively high ratio of the number of employees (120 - see Tab. 3.1.3) to students (578 - see Tab. 3.1.4). Thanks to this, FM can afford a personal approach and the involvement of good students in real research tasks during their Bachelor's and Master's studies. Another testimony of FM's research focus is the unusually high number of doctoral students considering the size of the faculty. Organisationally, FM is divided into [three departments](#), but in the field of science and research, it also flexibly uses a less formal structure of specifically focused and mutually cooperating research teams under the leadership of recognised experts in the field of science and research. Some of the research teams are mainly engaged in applied research, some in a balanced basic and applied research.

Table 3.1.1 - Staffing per FTE²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	6.52/0.00	6.39/0.00	7.53/0.00	6.79/0.00	7.15/0.00	34.38/0.00
Associate Professor	12.67/0.40	14.16/0.40	14.98/0.93	17.28/1.68	16.52/1.70	75.61/5.11
Assistant Professor	44.83/5.05	45.18/5.06	47.56/5.07	45.52/4.42	43.72/4.23	226.81/23.83
Assistant	6.07/0.50	7.81/0.55	5.00/0.73	3.27/0.50	3.77/0.50	25.92/2.78

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

R&D Personnel ³	3.74/0.01	5.27/0.57	8.41/0.28	9.37/2.68	4.03/1.85	30.82/5.39
Researchers in other categories ⁴	14.57/2.93	18.89/4.71	21.86/3.13	18.60/2.41	16.55/3.76	90.47/16.94
Technical and economic staff ⁵	11.92/11.92	12.74/12.66	12.36/12.10	12.16/11.98	11.20/11.16	60.38/59.82
Scientific, research and development staff involved in teaching activities	80.32/7.45	83.41/7.47	84.49/7.74	80.88/7.56	79.11/7.43	408.21/37.65
Early career researchers ⁶	16.14/1.80	18.27/2.18	20.77/2.23	16.41/1.00	11.66/0.83	83.25/8.04
Total ⁷	100.32/20.81	110.44/23.95	117.70/22.24	112.99/23.67	102.94/23.20	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	2	0	2	0	4	0	1	0
Associate Professor	0	0	0	0	8	0	4	1	5	0	1	0
Assistant Professor	0	0	26	3	25	3	2	0	0	0	0	0
Assistant	4	1	4	0	2	0	0	0	0	0	0	0
R&D Personnel ⁹	4	0	1	0	0	0	0	0	1	0	0	0
Researchers in other categories ¹⁰	6	1	10	1	4	2	4	0	1	0	0	0
Technical and economic staff ¹¹	1	1	3	3	3	3	3	3	0	0	0	0

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁵ Who participates in the management and support of R&D&I in the institution.

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (excluding persons working on agreement on work activity or agreement on work performance).

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

Scientific, research and development staff involved in teaching activities	4	1	36	3	40	4	12	1	10	0	2	0
Early career researcher ¹²	0	0	15	1	4	1	1	0	0	0	0	0
Total ¹³	15	3	44	7	44	8	15	4	11	0	2	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	3	0	1	0	4	0	1	0
Associate Professor	0	0	1	0	7	0	5	1	2	0	0	0
Assistant Professor	0	0	11	0	35	5	5	1	1	0	0	0
Assistant	4	0	3	0	0	0	0	0	0	0	0	0
R&D Personnel ¹⁵	0	0	0	0	2	1	0	0	1	0	0	0
Researchers in other categories ¹⁶	2	1	11	4	5	0	4	2	1	0	0	0
Technical and economic staff ¹⁷	0	0	4	4	5	5	1	1	1	1	0	0
Scientific, research and development staff involved in teaching activities	4	0	17	0	47	5	14	3	8	0	1	0
Early career researcher ¹⁸	0	0	11	0	4	1	1	0	0	0	0	0
Total ¹⁹	6	1	30	8	57	11	16	5	10	1	1	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported

¹² See Definition of Terms in Methodology HEI2025+.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

¹⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	351	31	369	34	385	31	384	36	354	34	1843	166
Master's ²⁰	119	14	119	13	129	13	146	19	142	14	655	73
Doctoral	83	30	93	33	98	33	103	35	82	27	459	158
Lifelong Learning Courses	0	0	0	0	0	0	0	0	0	0	0	0
Total	553	75	581	80	612	77	633	90	578	75	2957	397

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	4/0	0/0	4/0	0/0	4/0	0/0	4/0	0/0	4/0	0/0	20/0	0/0
Master's	5/1	0/0	5/1	0/0	4/2	0/0	4/2	0/0	4/2	0/0	22/8	0/0
Doctoral	3/1	0/0	2/2	0/0	3/3	0/0	3/3	0/0	3/3	0/0	14/12	0/0
Lifelong Learning courses	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Total	12/2	0/0	11/3	0/0	11/5	0/0	11/5	0/0	11/5	0/0	56/20	0/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	5	Balanced basic and applied research	46
	1.2 Computer and information sciences	14	Balanced basic and applied research	
	1.3 Physical sciences	13	Balanced basic and applied research	
	1.4 Chemical sciences	3	Applied Research	
	1.5 Earth and related environmental sciences	7	Balanced basic and applied research	
	1.6 Biological sciences	2	Applied Research	
	1.7 Other natural sciences	1	Applied Research	
2. Engineering and Technology	2.1 Civil engineering	1	Applied Research	51
	2.2 Electrical engineering, Electronic engineering, Information engineering	18	Balanced basic and applied research	
	2.3 Mechanical engineering	10	Balanced basic and applied research	
	2.4 Chemical engineering	1	Applied Research	
	2.5 Materials engineering	6	Applied Research	
	2.6 Medical engineering	4	Applied Research	
	2.7 Environmental engineering	3	Applied Research	
	2.8 Environmental biotechnology	1	Applied Research	
	2.9 Industrial biotechnology	0	-	51
	2.10 Nanotechnology	4	Applied Research	
	2.11 Other engineering and technologies	3	Applied Research	
3. Medical and Health Sciences	3.1 Basic medicine	1	Applied Research	2
	3.2 Clinical medicine	0	-	
	3.3 Health sciences	1	Applied Research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0	-	0
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	
	4.4 Other agricultural sciences	0	-	
5. Social Sciences	5.1 Psychology and cognitive sciences	0	-	1
	5.2 Economics and Business	0	-	
	5.3 Education	0	-	
	5.4 Sociology	0	-	
	5.5 Law	0	-	
	5.6 Political science	0	-	

	5.7 Social and economic geography	0	-	
	5.8 Media and communications	0	-	
	5.9 Other social sciences	1	Applied Research	
6. Humanities and the Arts	6.1 History and Archaeology	0	-	0
	6.2 Languages and Literature	0	-	
	6.3 Philosophy, Ethics and Religion	0	-	
	6.4 Arts (arts, history of arts, performing arts, music)	0	-	
	6.5 Other Humanities and the Arts	0	-	
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

The position of the Faculty of Mechatronics in the research community is commented in the following sections:

Position in the research community

FM is a recognised research institution in the Czech Republic and abroad in the field of computer science, informatics and artificial intelligence, electronics, control, electric drives and automation, as well as applied sciences on the border between engineering and natural sciences, such as is numerical modelling of multiphysics processes, optical and laser technologies, and research into intelligent materials and structures.

Individual and other prestigious R&D awards

The most important award of FM employees for the period under evaluation was the repeated placement of doc. Yalcinkaya on the Stanford list of 2% of the world's most cited scientists, and also the Honor of the Governor of the Liberec Region for the lifelong contribution to the development of communication technologies of prof. Nouza. Professor Nouza is one of the founders of FM and the long-term head of the computerised speech processing laboratory SpeechLab, which is one of the most successful laboratories in the field of voice technology in the Czech Republic. With his scientific team, he has long been engaged in analysis, processing and automatic speech recognition, and digital signal processing.

FM is also proud of the number of awards won by its graduates for their Bachelor's, diploma and dissertation theses. If we do not count the prizes awarded internally (Dean's prize, Rector's prize,

and Prof. Zelenka's prize), FM students have received five awards of the Governor of the Liberec Region, eight Preciosa awards, one Siemens award, one Matlab award, one Crytur award for the best diploma thesis during the evaluated period in CR and SR, one Laurin & Klement award from Škoda Auto, three František Egermayer awards, and other awards for their work at various conferences and exhibitions.

Participation of academic staff in the editorial boards of international scientific journals, in professional societies, lectures abroad, lectures by foreign guests, and involvement in the evaluation of project/programme calls.

FM employees are members and chairpersons of several scientific societies and associations, scientific committees of international conferences, editorial boards of international journals (see Tab. 3.2.2) and panels and evaluation bodies of Czech and foreign grant agencies (see Tab. 3.2.5). Invited lectures abroad and lectures by foreign guests at FM are summarised in Tab. 3.2.3 and 3.2.4.

Additional service to the scientific community and evidence of recognition in a global context

As an important proof of recognition by the research community, it is possible to mention the selection of the most prestigious impact journals in the first quartile or decile, where FM employees regularly act as reviewers: IEEE Transactions on Signal Processing (Q1), Optics Express (Q1), Optics and Lasers in Engineering (Q1), International Journal of Thermal Sciences (Q1), Journal of the Acoustical Society of America (Q1), Computers in Biology and Medicine (Q1), Journal of Fluids and Structures (Q1), SIAM Journal on Control and Optimization (Q1), Mathematics and Computers in Simulation (D1), Scientific Data (Q1), Physical Review Letters (D1), Nature npj Computational Materials (Q1), Science Advances (D1), Composites Part B (Q1), New Journal of Physics (Q1), Journal of Sound and Vibration (Q1), Mechanical Systems and Signal Processing (Q1) and others.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Jan Nouza, prof. Ing., CSc.	Honour of the Governor of the Liberec Region for lifelong contribution to the development of communication technologies	Liberec Region
Fatma Yalcinkaya, doc., Ph.D., M.Sc.	World's Top 2% Scientists	Stanford University

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Zbyněk Koldovský, prof. Ing., Ph.D.	IEEE Open Journal of Signal Processing, ISSN 2644-1322
Petr Šidlof, doc. Ing., Ph.D.	ACC Journal, ISSN 1803-9782
Jan Stebel, doc. Ing., Ph.D.	Applications of Mathematics, ISSN: 0862-7940
Jaroslav Nosek, prof. Ing., CSc.	Scientific Bulletin of the NSTU Novosibirsk, ISSN 2658-3275
Jan Kamenický, Ing., Ph.D.	Social and Natural Sciences Journal, ISSN 1804-9710
Jaroslav Nosek, prof. Ing., CSc.	Transactions of Scientific Papers, ISSN 2307-6879
Pavel Mokřý, prof. Ing., Ph.D.	IEEE Transactions on Materials for Electron Devices, ISSN 2993-1576

Fatma Yalcinkaya, doc., Ph.D., M.Sc.	Composite Materials Research, ISSN 2251-2667

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Zbyněk Koldovský, prof. Ing., Ph.D.	Blind Extraction of Moving Sources via ICA/IVA	Friedrich-Alexander-Universität Erlangen-Nürnberg	2021
Zdeněk Plíva, prof. Ing., Ph.D.	3D printed microelectronics & new design concepts, 27/10	Ministry of Industry and Trade Massachusetts Institute of Technology	2022
Zdeněk Plíva, prof. Ing., Ph.D.	Additive Manufacturing of 3D Coils, Equipment of Cell Cultivation and More	European AME User Forum 2022	2022
Fatma Yalcinkaya, doc., Ph.D., M.Sc.	Identifying the Hidden Danger: Microplastics in Drinking Water and Promising Removal Strategies	NoMicroBaltic workshop, Sl. Swedish Institute	2023
Fatma Yalcinkaya, doc., Ph.D., M.Sc.	Novel Hybrid Nanofibrous Membranes for Water Treatment	4th International Conference on Physical Chemistry & Functional Materials, Firat, Turkey	2021
David Vališ, prof. RNDr. Ing., Ph.D.et Ph.D., DSc.	Reliability Assessment and Accelerated Testing	Mülhem University of Technology, Germany	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Horst, Schulte, Prof.	HTW Berlin	Intensive Lecture on Fuzzy Control	2019
Jonathan, Love, Prof.	Imperial College London	Intensive Lecture on Model Predictive Control	2019
Sharon, Gannot, Prof.	Bar-Ilan University, Faculty of Engineering, Izrael	Lecture on advanced methods for acoustic source localization	2019
Pinchas, Tandeitnik, Dr.	Bar-Ilan University, Faculty of Engineering, Izrael	Seminar on the acoustic laboratory at Bar Ilan University	2019
Vadim, Zhmud, Prof. Ing. DrSc.	NSTU Novosibirsk, Rusko	New methods of numerical optimization of regulators for mechatronic systems	2019

		Methods of high-precision measurements of frequencies and phase differences	
Olaf, Kolditz, Prof. Dr. Ing.	Helmholtz Centre for Environmental Engineering GmbH – UFZ, Leipzig, Federal Republic of Germany	Environmental Engineering at TU Dresden	2019
Vladimír, Lekhov, Dr.	Lomonosov Moscow State Univ, Faculty of Geology, The Department of Hydrogeology	Solute transport in the low permeability media: laboratory, field and model	2019
Alessio, Fumagalli, Dr.	Politecnico di Torino, Torino, Italy	Flexible discretisations for mixed-dimensional Darcy-type flows in fractured porous media	2019
François, Pigache	Institut National polytechnique de Toulouse, France	Networking for Research and Development of Human Interactive and Sensitive Robotics Taking Advantage of Additive Manufacturing	2020
Mojtaba, Ahmadi, prof.	Carleton University, Ottawa, Canada	Summary of Research Activities at the ABL Lab at Carleton Focus on Rehabilitation Robotics	2022

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Petr Červa, doc. Ing., Ph.D.	TREND	Technology Agency of the Czech Republic	2023
Pavel Márton, Ing., Ph.D.	Research grants	Deutsche Forschungsgemeinschaft (DFG)	2022
Pavel Márton, Ing., Ph.D.	China Israel Research Program	Israel Science Foundation (ISF)	2021
Milan Hokr, doc. Ing., Ph.D.	InterExcellence	Ministry of Education, Youth and Sports of the Czech Republic	2021
Karel Židek, doc. RNDr., Ph.D.	EIC Pathfinder - Horizon Europe	European Commission	2021-2023
Jan Šembera, doc. Ing., Ph.D.	Environment for Life, Alpha, Zeta, Epsilon	Technology Agency of the Czech Republic	2019-2023
Jan Šembera, doc. Ing., Ph.D.	Basic research (VV2021)	The Slovak Research and Development Agency	2022
Milan Hokr, doc. Ing., Ph.D.	Basic research (VV2020)	The Slovak Research and Development Agency	2021
Karel Židek, doc. RNDr., Ph.D.	EIC Pathfinder - Horizon 2020	European Commission	2019-2020

Ondřej Novák, prof. Ing., CSc.	GAMMA	Technology Agency of the Czech Republic	2019

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the period of 2019–2023²³. This should be done from the full list in annex tables (Table 3.3.1–3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

Work on research projects represents one of the basic pillars of FM's activities, both for its academic staff and for students in subsequent Master's and doctoral programmes. The share of resources from research projects in the total budget of FM was equal to 35% in the period 2019-2023, in addition, FM received another 3% of the budget from contractual research projects.

FM's portfolio of research projects covers both basic research (Grant Agency of the Czech Republic, Ministry of Education, youth and Sports Inter-Excellence) and applied research projects (Ministry of Industry and Trade Trio, Technology Agency of the Czech Republic Trend/Sigma/Theta/Transportation). FM also participated significantly in several important European Horizon projects and one other project of the European Commission. During the period under evaluation, FM also received one grant from the US Navy's Office of Naval Research Global, which is a relatively rare success for research institutions in the European area. A complete overview of the projects implemented in the period under evaluation can be found in Tab. 3.3.1 and on the website, the following paragraphs describe the ten most important projects of FM for the period under evaluation:

Grant Agency of the Czech Republic 20-17720S, The Czech Science Foundation, Advanced Mixing Models for Blind Source Extraction (2020-2022) - Zbyněk Koldovský

The project focused on the development of new digital signal processing methods from the field of blind signal extraction (BSE). The aim of BSE is to extract one or more signals from a mixture of signals that are observed by a sensor array. Blind methods do not require specific information about the observed signals, so they can be used to solve many key tasks where such information is not available. As part of the project, several new models and algorithms were developed for the blind extraction of moving resources. From the point of view of applications, benefit was proven

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

especially in the field of blind speaker extraction. Six articles were published in journals and 10 in the proceedings of international conferences. Three results were applied in Module 1 of the M17+ methodology (grades 1 and 2, the third is awaiting evaluation). The project supported the career development of three PhD students, strengthened FM's know-how in the field of statistical signal processing and opened up other perspectives for research in the field of blind and partially blind signal separation.

N62909-19-1-2105, Office of Naval Research Global, Advanced Methods for Blind Extraction of Independent Sources from Multi-Sensor Observations (2019-2021) - Zbyněk Koldovský

A research project funded by the US agency Office of Naval Research Global focused on the development of new algorithms for the blind separation of sources observed by a system of sensors. The main contribution is provided by on-line speaker extraction methods that use the side information obtained by an AI system to identify the speaker. The algorithms were implemented on a special platform with a planar and rotating array of 64 MEMS microphones, which simultaneously estimates the direction of signal arrival. The project supported the publication of five articles in journals and seven articles at international conferences.

LTAUSA19036 Advanced experimental research on synchronous and non-synchronous blade vibration (2019-2022) - Petr Šidlof

The project implemented by the Institute of Thermomechanics of the Academy of Sciences of the Czech Republic (IT ASCR), Faculty of Mechatronics and Duke University, N.C., USA focused on the flutter of blades of large turbomachines. Duke University is one of the most prestigious universities in the USA, ranked sixth in the USNews - Best Colleges ranking along with Caltech. The Duke Aeroelasticity team is also one of the founding members of the GUIde consortium, bringing together research institutions and companies involved in the development of turbomachines (Duke University, NASA, Doosan, GE, Honeywell, Pratt & Whitney, Rolls-Royce, etc.).

During the project, a unique device was developed to measure the aerodynamic load of oscillating blade cascades at transonic modes and high reduced frequencies. With the help of this device, a set of almost 500 measurements was carried out at different flow regimes and blade vibration positions and frequencies, using several experimental methods (static pressure measurements, dynamic pressure measurements using Kulite probes, split film probe measurements in the blade flow), and an extensive database of experimental results was compiled. In addition, a new methodology of two-wave laser digital interferometry was developed and used. The measurement results were analysed and compared with numerical simulations using the harmonic balance technique developed at Duke University.

The main tasks of FM were to perform structural calculations of the blade drive mechanism, prepare sensors and measurement chain including data collection and processing and develop new optical methods for measuring the flow field. The direct result of the project are two functional samples, 11 articles in the proceedings of important international conferences and four articles in impact journals. Cooperation with the Duke Aeroelasticity team continues in two subsequent research projects (Grant Agency of the Czech Republic, Inter-Excellence USA).

Ministry of Industry and Trade TRIO FV40387 Development of CNC machining processes and measurement methods of high-precision optical elements made of hard materials with an unfavourable ratio of radius and diameter (2019-2022) - Pavel Psota

A project in which asphericon s.r.o. participated with FM led to the development of a unique technology for the production and measurement of precise hemispherical surfaces and to innovative methods of applying thin layers. New optical machining processes enable high-quality polishing of hemispherical optical elements right up to their edges. The development also included a subaperture interferometric measuring system, which, thanks to its robustness and industrial applicability, ensures fast and very accurate interoperational measurements. The evaluation of the project stated that, "Implementation of the results brings a significant shift in productivity and cost savings, in the context of this the developed technology is unique on the market". Interdisciplinary cooperation was a key factor in the success of the entire project. The project demonstrated the successful connection of optics, mechatronics, material sciences, and engineering.

FM played a key role, primarily in the development of complex measuring systems, including software development and implementation. The acquired knowledge and experience are further transferred to other educational and research activities of FM (e.g., the ongoing Ministry of Industry and Trade project Robotised workplace for the production of optics with precise automated measurement), thereby strengthening FM's role as a centre of education and research closely connected with industrial practice. The focus of the project and its results are thereby fully in line with the strategy of FM.

The economic benefits of the project were also significant. Thanks to the implementation of the results, in 2023 the revenue of asphericon s.r.o. increased by 8.6 million CZK, which represents 8.6% of total revenue. All production associated with the project was exported, which underlines its international competitiveness. The project also contributed to the creation of three new jobs.

Technology Agency of the Czech Republic TH03010018 DeepSpot - Multilingual technology for detection and early warning (2018-2021) - Petr Červa

As part of the project implemented in cooperation with Newton Technologies, a platform was created that uses deep neural networks to automatically detect keywords in spoken speech and transcribe fluent speech in thirteen main Slavic languages, i.e., Czech, Slovak, Polish, Russian, Ukrainian, Belarusian, Slovenian, Serbian, Croatian, Bosnian, Montenegrin, Macedonian, and Bulgarian. The platform is also used to detect entities (for example, commercial logos or people by their face) in image data and works in online (detection in a live data stream) and offline mode (very fast detection in data archives).

Based on this platform, Newton Technologies operates a whole range of add-on services, which it offers by itself or through its partners in the Czech Republic and abroad. In particular, the Beey web platform allows automatic transcription and subsequent correction of various audio recordings or the creation of subtitles. The keyword detection module is then used, e.g., in the TVR Alerts service, which alerts clients in the shortest possible time to entered keywords in various television and radio stations or programs available on the Internet.

The described platform received grade 2 according to the evaluation of the M17+ methodology, and in the following years (2021-2024) it was supplemented with support for Norwegian, Swedish, and Danish as part of the international project TAČR TO01000027 NordTrans, which was implemented in cooperation with the Norwegian university NTNU. Based on the results (published at the prestigious InterSpeech international conference), it can be argued that this technology achieves

transcription accuracy fully comparable or even better than the cloud-based speech transcription services of Google or Microsoft.

The development of the platform is also closely related to teaching at FM, specifically to the specialisation of Intelligent Systems, which is taught as part of the Bachelor's and subsequent Master's study field of Information Technology.

H2020 MSCA grant agreement No 764902 "Smart tomographic sensors for advanced industrial process control (TOMOCON)" (2017-2022) - Jaroslav Hlava

This project from the Marie Skłodowska-Curie Actions category focused on both research and education of top PhD students. As part of the research, several important steps were taken so that industrial tomography can be used not only for the purposes of monitoring industrial processes, but also as a basis for feedback control of industrial processes in real time. Unlike conventional sensors, which measure data at one specific measuring point, tomographic sensors are able to provide complete 2D or 3D information about events in a controlled process. This makes it possible to significantly improve the quality of the control of the process sensed in this way, but it requires the use of unconventional control algorithms and data processing methods. This project resonated with both FM's traditionally technical focus (automatic control and signal processing) and its natural science focus (modelling of complex processes with distributed parameters). This international project brought together 12 universities from several countries (Germany, Czech Republic, France, UK, Sweden, Poland, Finland, Holland, Brazil) and 15 industrial enterprises (including Shell, Siemens, Primetals, Tata Steel, etc.). The project coordinator was Helmholtz-Zentrum Dresden-Rossendorf, and FM was responsible for work package WP4 Process control, i.e., the main package with regard to the declared focus of the project on "advanced industrial process control". As part of the project, four semi-operational or laboratory-type demonstrators were created demonstrating the possibilities of control based on industrial tomography: Inline liquid separation, microwave drying, continuous metal casting, and batch crystallisation. FM participated in all these tasks, but especially in managing the process of continuous metal casting, which was the work of a PhD student employed at FM as part of the project. The dissertation was successfully defended at FM, and its author is currently working on the control of thermonuclear fusion at the British company Tokamak Energy.

Technology Agency of the Czech Republic FW03010640 - Advanced sensors and methods of automatic quality control of textile yarn in a spinning mill, 2020-2024 - Martin Rozkovec

The FW03010640 project followed on from the Ministry of Industry and Trade project TRIO FV20131 2016-2020. TRIO brought a pair of patents, whereas the Trend project brought a functional sample of equipment for the analysis of foreign admixtures and impurities in the processed material of a cleaning and carding machine, its prototype and also a functional sample of a device for online analysis of the technological properties of fibre material. Computer image processing methods were used for detection, and convolutional neural networks were deployed. The device monitors cotton material at various stages of processing and detects impurities from raw cotton to skeins, in laboratory quality at a fraction of the cost of laboratory equipment. The production is optimised, resulting in a reduced water consumption in the later stages of textile production, whereby contributing to the circular economy. The device for the analysis of impurities is in a zero production run and has been deployed in spinning mills in Greece, Switzerland, India, Pakistan, Vietnam, or Indonesia. A by-product of the collaboration is the creation of software that has not yet been applied in the Information Register of R&D Results.

The project covers interdisciplinary cooperation in the fields of engineering, textile industry, electronics, and software development. Scientific research workers from FM, as well as students, were involved in the project, which richly fulfils the mission and purpose of the existence of FM. Rieter CZ, VÚTS Liberec participated directly in the projects, and Rieter AG (Switzerland) and VUB (Czech Republic) indirectly. The research share of FM varied from 30 to 40% on various results. Parts of the work were consulted with experts from the Textiles and Mechanical Engineering faculties, as well as with local and international companies operating in the field of machine vision (primarily equipment selection).

Grant Agency of the Czech Republic 22-10047K / DFG ME 5391 - New Algorithms for the Evaluation of Flicker in the Context of Modern Electricity Grids, 2022-2025 - Leoš Kukačka

The project focuses on the development of a new algorithm for determining the level of interference in electricity distribution networks, which is capable of causing unwanted flickering of artificial lighting. The existing algorithm is based on the classic light bulb and is already outdated; the subject of the research is not only the investigation of the properties of modern LED light sources, but also the properties of modern networks with electrical power distribution sources, smart appliances, etc., as well as measuring the flicker visibility threshold with LED light sources. The project is implemented in cooperation with the University of Technology in Brno and the Technical University in Dresden, with TUL acting as the main coordinator. The content of the project is inherently interdisciplinary and wide ranging, from electromagnetic compatibility and electrical quality, through power electronics and lighting technology, to psychometry and biophysics. The result of the project will be, in addition to publications in professional periodicals, a new algorithm for calculating the degree of flicker perception, which will be provided to the relevant standardisation committees (IEC SC77A WG2 and IEC TC34 WG5) as a basis for updating the existing standards for electromagnetic compatibility (IEC 61000-4-15 and IEC TR 61547-1).

HORIZON-KDT-JU-2022-2-RIA/ EECONE - European Ecosystems for Green Electronics (2023 - 2026) - Lenka Kosková Tříšková

EECONE is a large international interdisciplinary project in the field of Key Digital Technologies with key research organisations and other players in the field (STMicroelectronics, Siemens and others) - with a total of 48 participants from all over Europe. The project focuses on a highly topical theme - environmental protection and reduction of waste production in the development of electronics. The research part is divided into four work packages (WP), of which FM participates in WP4 "New generation of electronics" with low environmental impact and WP5 "Ecosystem building". The main objective of the project is to reduce the amount of electronic waste in Europe by targeting already existing electronic waste, developing new tools to extend the life and recyclability of electronic waste, introducing new best practices at the European level and, most importantly, creating a strong European ecosystem in this area. As the best way to reduce the production of electronic waste is to minimise the volume of new electronic components, FM focuses on research aimed at updating software development to maximise the lifetime of systems and components, including the introduction of features for the longevity of embedded firmware, improved battery management and thermal management functions, and analysis of the modular architecture of firmware components.

FM is involved in the project in two areas, the first of which is research of sustainable technologies and extending the life of electronics. The second area of participation is the design and implementation of teaching for future engineers, where FM is preparing a course for students of

smart technologies and other students focused on the methodologies created during the first research part, or based on other outputs of other project participants (the overall principle of circular economy in the development of electronics, recycling methods, new projects, etc.)

European Joint Programme on Radioactive Waste Management (EURAD) - EC project within the EURATOM 2019-2024 programme (No. 847593, call NFRP-2018, COFUND-EJP) - Milan Hokr

The project as a whole dealt with the broad theme of preparing a deep repository for spent nuclear fuel and other radioactive waste. This was a pan-European collaboration involving organisations responsible for waste management in individual countries, as well as research and academic workplaces. The result was a body of knowledge about materials, technologies, and processes in the repository and geological environment, contributing to the demonstration of functionality and long-term safety. FM participated in the project as a linked third party (LTP) through the Radioactive Waste Repository Authority (SÚRAO) as a project partner. As part of the WP DONUT (development and improvement of numerical methods and tools for modelling combined processes) with the participation of FM, a combined model of mechanics and flow in fractured granite was created using parallel calculations, a methodology was created and applied to streamline calculations with parameter uncertainties with the help of multi-level Monte Carlo using machine learning, and a procedure for obtaining inputs for a model with combined parameters from a detailed 3D hydrogeological model was derived. Authors from FM contributed to five articles in journals with an impact factor. With calculations using stochastic data and surrogate models, J. Březina's group gained recognition among co-investigators, which led to an invited lecture at the EURAD Final Event and to obtaining the position of co-leader of a sub-task in a follow-up project. For calculations that balance accuracy and computational complexity, which is precisely the case of the safety of deep repositories, the proposed methods represent a significant shift.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Support (in thousands CZK/EUR) ²⁶				
		2019	2020	2021	2022	2023
Technology Agency of the Czech Republic	New materials and new methods for water treatment by ion exchange membranes	1 558 /61				
Technology Agency of the Czech Republic	Software for Complex and Stochastic Modelling in Hydrogeology	1 527 /60	1 503 /59	1 503 /59	119 /5	
Technology Agency of the Czech Republic	Prediction of EDZ properties affecting the safety and reliability of a deep	1 486 /59	3 033 /120	3 033 /120	3 033 /120	

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

	radioactive waste repository					
Grant Agency of the Czech Republic	Advanced Mixing Models for Blind Source Extraction		1 873 /74	1 873 /74	1 873 /74	
Technology Agency of the Czech Republic	Impact of geosphere evolution on radionuclide transport from deep repository of radioactive waste to biosphere	3 261 /129	7 523 /297	6 728 /265	4 843 /191	
Technology Agency of the Czech Republic	Application of a dual ¹ H/ ¹⁹ F radio frequency coil for temperature-dependent fluorine contrast imaging by magnetic resonance imaging		737 /29			
Technology Agency of the Czech Republic	Sustainable Healthcare Waste Management: Economically Feasible Minimisation of Impacts on Health and Environment		1598 /63	2 231 /88	3 096 /122	
Technology Agency of the Czech Republic	Methodology and software support for estimating the variability of indicators of social statistics			163 /6	635 /25	
Grant Agency of the Czech Republic	New Algorithms for the Evaluation of Flicker in the Context of Modern Electricity Grids				1 017 /40	1 975 /78
Technology Agency of the Czech Republic	Research and development of an electric power analyzer with electronic current sensors for feeders monitoring				4 041 /159	4 346 /171
Technology Agency of the Czech Republic	Improving the education and training of motorcyclists with the help of software for automatic analysis of telemetry data and artificial intelligence algorithms				2 124 /84	2 112 /83
Technology Agency of the Czech Republic	System for continuous monitoring of the vadose zone and prediction of					2 589 /102

	groundwater levels in deep aquifers					
Technology Agency of the Czech Republic	Creative software/digital neural network virtual futurologist A°D°A					935 /37
Ministry of the Interior	Expert decision support system for the implementation of gradual recovery measures		2 514 /99	2 595 /102		
Ministry of Education, Youth and Sports	New methods of machine learning, signal processing and digital circuit design	714 /28	610 /24	286 /11		
Ministry of Education, Youth and Sports	Implementation of online independent vector extraction based on utility functions	456 /18	391 /15			
Ministry of Education, Youth and Sports	Electromagnetic field interactions in medicine, cardiosimulation, and MR imaging	464 /18				
Ministry of Education, Youth and Sports	Collection and processing of big data	457 /18				
Ministry of Education, Youth and Sports	Development of a holographic method for measuring the surface topography of optical elements	456 /18	494 /19			
Ministry of Education, Youth and Sports	Application of advanced technologies and means of control in electromobility	730 /29				
Ministry of Education, Youth and Sports	Development of models and numerical methods and their application in SW for PDR solutions	300 /12				
Ministry of Education, Youth and Sports	Advanced experimental and computational methods in the natural sciences	591 /23	423 /17	291 /11		
Ministry of Education, Youth and Sports	Preparation and evaluation of nano- and micro-fibrous surfaces modified for preferential growth of specific bacteria	162 /6	285 /11			

Ministry of Education, Youth and Sports	Hydrogenation of carbon dioxide on synthesised and stabilised bimetallic nanoparticles using natural polymers	220 /9				
Ministry of Education, Youth and Sports	Analysis of diffusion phenomena during the controlled release of drugs from nanofibers	198 /8				
Ministry of Education, Youth and Sports	Application of technologies for the optimal operation of electric car battery storage.		750 /30	421 /17		
Ministry of Education, Youth and Sports	Measurement of 2D extinction of temporal speckles and single-pixel cameras		184 /7			
Ministry of Education, Youth and Sports	Interaction of modified ultrasound waves with biological systems		756 /30	435 /17		
Ministry of Education, Youth and Sports	Numerical solution of single and multiphase flows		286 /11	287 /11		
Ministry of Education, Youth and Sports	Nanomaterial techniques with improved catalytic performance for water and wastewater treatment		286 /11			
Ministry of Education, Youth and Sports	Development and implementation of methods of blind extraction of moving sources			208 /8		
Ministry of Education, Youth and Sports	Electromagnetic interference of industrial machine tools in a patient with an implanted pacemaker			151 /6		
Ministry of Education, Youth and Sports	Surface modification of nanofibrous membranes for water treatment			308 /12	362 /14	252 /10
Ministry of Education, Youth and Sports	Utilisation of augmented reality technology to improve the accuracy of continuous localisation			187 /7		

	and mapping (SLAM) in autonomous vehicles					
Ministry of Education, Youth and Sports	Utilisation and further improvement of the developed holographic method used for measuring the surface topography of complex samples			360 /14		
Ministry of Education, Youth and Sports	Imaging photoluminescence dynamics using random sample excitation and compressed sensing			181 /7	189 /7	
Ministry of Education, Youth and Sports	Development of a robust compressed sensing method using a coded aperture			193 /8		
Ministry of Education, Youth and Sports	Innovative modification of iron-based materials and their use in oxidation-reduction processes			300 /12		
Ministry of Education, Youth and Sports	Genetic diversity of the rhizosphere microbiome under stress conditions and exposure to pollutants			273 /11	249 /10	
Ministry of Education, Youth and Sports	Study of non-classical polarisation states in structured beams			150 /6		
Ministry of Education, Youth and Sports	Polyvinylidene fluoride nanofibers membrane for wastewater treatment application			193 /8	229 /9	229 /9
Ministry of Education, Youth and Sports	Investigating x-vectors in online speech processing systems				113 /4	113 /4
Ministry of Education, Youth and Sports	Design and construction of radiofrequency coils for ¹ H/ ¹⁹ H/ ³¹ P MR imaging and spectroscopy in the development of new responsive contrast agents and the study of cellular metabolites				321 /13	
Ministry of Education,	Identification and modelling of battery aging				113 /4	

Youth and Sports						
Ministry of Education, Youth and Sports	Research, development and application of advanced technologies in electromobility				531 /21	637 /25
Ministry of Education, Youth and Sports	LANDAU-WATER: Laser-assembled recyclable nanocatalysts towards degradation of antibiotics unwanted in water bodies				401 /16	368 /15
Ministry of Education, Youth and Sports	CFD, FEM and stochastic simulations				428 /17	
Ministry of Education, Youth and Sports	Development of photocatalytic self-cleaning coatings for inhibition of growth of undesirable microorganism				255 /10	224 /9
Ministry of Education, Youth and Sports	Advanced oxidation-reduction processes for remediation of contaminated water				432 /17	
Ministry of Education, Youth and Sports	Analysis of noise in ultra-precise laser transmission measurement				185 /7	
Ministry of Education, Youth and Sports	Hyperspectral microscopy in the near-infrared region based on compressed sensing				176 /7	
Ministry of Education, Youth and Sports	Definition of requirements for Linux4Space				207 /8	
Ministry of Education, Youth and Sports	Modification of hollow fiber ultrafiltration membranes through thin layers to reduce biofouling				252 /10	318 /13
Ministry of Education, Youth and Sports	Data collection, analysis, classification methods and road defect detection approaches					140 /5
Ministry of Education,	Economic model predictive control with adaptive complexity					162 /6

Youth and Sports	for intelligent hybrid photovoltaic-battery microgrids					
Ministry of Education, Youth and Sports	Analysis of the effect of electromagnetic interference on cardiac implantable electronic devices					124 /5
Ministry of Education, Youth and Sports	Improved autonomous vehicle driving based on GNN as a machine learning technique					94 /4
Ministry of Education, Youth and Sports	Energy model of a printing robot					223 /9
Ministry of Education, Youth and Sports	Spatial Modulation Testing in Compressive Hyperspectral Imaging					133 /5
Ministry of Education, Youth and Sports	Analysis of defects in optical coverage using nonlinear optical phenomena					204 /8
Ministry of Education, Youth and Sports	The Mechanism of Algae, Bacteria and Fungi Allies in Bio-based Plastic Degradation and the Potential Involved Enzymes					468 /18
Ministry of Education, Youth and Sports	Failure Prediction of Fiber Composite Materials					226 /9
Ministry of Education, Youth and Sports	Numerical homogenization using deep learning					198 /8
Ministry of Education, Youth and Sports	Optimization of Structured Laser Beam centroid detection					308 /12
Ministry of Education, Youth and Sports	Synthesis and application of green carbonaceous materials for the removal of emerging pollutants from water					264 /10
Total		12 580 /496	23 246 /917	22 350 /882	25 224 /995	16 642 /656

In the role of another participant						
Provider ²⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Ministry of Industry and Trade	Modular technological unit for process control of brewery production	1 327 /52	1 266 /50	1 021 /40		
Technology Agency of the Czech Republic	Expert system for monitoring, risk assessment, and decision support in the field of landscape use	880 /35				
Technology Agency of the Czech Republic	DeepSpot - Multilingual technology for detection and early warning	3 827 /151	3 827 /151	3 827 /151		
Technology Agency of the Czech Republic	Fast Reactive Power Correction System with Easy-to-Integrate Features for Plants with High Degree of Automation	1 629 /64	1 584 /63			
Technology Agency of the Czech Republic	Development of the system for asymmetrical fault location V-dip	772 /30	799 /32	407 /16		
Ministry of Industry and Trade	Development of the operating system and application layer for the 2nd generation communications unit for automotive	1 527 /60	150 /6			
Ministry of Industry and Trade	Management support system	670 /26				
Ministry of Industry and Trade	Virtual hospital model		304 /12	411 /16	552 /22	237 /9
Technology Agency of the Czech Republic	Reaction Vessel Development for Cultivation Algae with grow light LED using Carbon Dioxide from Biogas	495 /20	500 /20	460 /18	430 /17	
Grant Agency of the Czech Republic	UTIA advanced methods of blind subspace separation	991 /39				

²⁷ Ibid.

Ministry of Industry and Trade	Development of CNC machining processes and measurement methods for high-precision optical elements made of hard materials with an unfavourable radius-to-diameter ratio	791 /31	1 442 /57	1 529 /60	728 /29	
Ministry of Industry and Trade	Processing of waste and recycled textile fibres	562 /22	695 /27	695 /27	657 /26	
Ministry of Industry and Trade	Recycling of technological water in the beverage industry	1 369 /54	2 070 /82	2 159 /85	1 058 /42	
Ministry of Industry and Trade	Electromembrane Modules of New Generation	452 /18				
Ministry of Industry and Trade	Aplication of the principles "Industry 4.0" in the spinning mills	1 323 /52				
Ministry of Industry and Trade	High speed Wireless Car Communication - HW and SW Development	1 052 /41	1 299 /51	317 /13		
Technology Agency of the Czech Republic	Advanced technologies for the production of heat and electricity	1 545 /61				
Ministry of Education, Youth and Sports	Advanced experimental investigation of synchronous and asynchronous blade oscillations	140 /6	952 /38	915 /36	958 /38	
Grant Agency of the Czech Republic	Experimental research on flutter excitation function in turbomachinery		712 /28	837 /33	793 /31	
Technology Agency of the Czech Republic	Creation of an electric motorcycle - JAWA EL NICO		3 755/ 148	6 237 /246		
Technology Agency of the Czech Republic	Development of a GNSS track generator and CANBUS signal using machine learning using Software Defined Radio		3 120 /123	3 360 /133	2 650 /105	
Technology Agency of the Czech Republic	Smart filtration of tertiary wastewater treatment using hi-tech		3 198 /126	3 458 /137	3 326 /131	2 604 /103

	fabrics and nanofiber membranes					
Ministry of Industry and Trade	Development of geotechnical and geophysical technics for the creation of 2D and 3D image of a geological structure			530 /21		
Ministry of Industry and Trade	Research and development of laboratory workplace with antibacterial nanosurface on the basis of a thin surface sol-gel			727 /29		
Technology Agency of the Czech Republic	Technology for automatic speech transcription in selected Nordic languages			3 716 /147	3 716 /147	3 716 /147
Technology Agency of the Czech Republic	Virtual Convoy – comprehensive environment for testing CAR2X communication systems			2 440 /96	2 406 /95	2 180 /86
Technology Agency of the Czech Republic	BUSkit system for collecting, analysing, filtering, and simulating data of systems connected via automotive on-board buses			1 803 /71	1 780 /70	
Technology Agency of the Czech Republic	Advanced sensors and methods for automatic quality control of textile yarn in the spinning mill			1 844 /73	1 912 /75	1 932 /76
Czech Academy of Sciences	Effect of real exposure to polluted air on human lung and olfactory cells cultured under air-liquid interface conditions				1 111 /44	1 441 /57
Ministry of Industry and Trade	Modular system for domestic wastewater treatment				3 511 /139	5 015 /198
Technology Agency of the Czech Republic	Probabilistic consequence analysis of severe accidents				732 /29	774 /31
Technology Agency of	Representation of fault zones and discontinuities in				702 /28	1 736 /68

the Czech Republic	hydrogeological models for safety assessment of deep geological radioactive waste repository					
Technology Agency of the Czech Republic	An intelligent system of health support services				1 935 /76	1 943 /77
Technology Agency of the Czech Republic	Digital biomechanical twin of a custom 3D printed bicycle saddle					474 /19
Ministry of Education, Youth and Sports	European ECOsystem for green Electronics					280 /11
Ministry of Education, Youth and Sports	Origins and mechanisms of flutter and non-synchronous vibration in modern turbomachines operating at wide range of regimes					828 /33
Technology Agency of the Czech Republic	Modular battery management for applications requiring high functional safety					2 904 /115
EU	TOMOCON - Smart tomographic sensors for advanced industrial process control	1 836 /72	1 441 /57	885 /35	36 /1	
EU	European Joint Programme on Radioactive Waste Management EURAD			58 /2	731 /29	1 405 /55
EU	European ecosystem for green electronics - EECONE					355 /14
EU	Control Methods of Ferroelectric Self-Assembly - MSCA4Ukraine					1 010 /4
Total		21 188 /836	27 114 /1 070	37 636 /1 485	29 724 /1 173	28 959 /1 142

Table 3.3.2 - Contract research activities

Client ²⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
APPLIC s.r.o.	Verification of the IRCA3 camera system function + addition of measurements for noise reduction	41 /2				
Solar 7 s.r.o.	Upgrade of memory modules on DPCB-1 boards	119 /5				
Solar Global Service a.s.	Upgrade of memory modules on DPCB-1 boards	19 /1				
FVE 26 s.r.o.	Upgrade of memory modules on DPCB-1 boards	59 /2				
Rieter CZ, s.r.o.	2019: Research into the possibilities of extracting foreign impurities from fibre material in the phase of preparation of fibres for spinning. 2020: Continuation of research into the possibility of extracting extraneous impurities from fibre material in the phase of fibre preparation for spinning 2022: Development of OPC QS for camera system	800 /32	800 /32		232 /9	
Česká Rafinérská, a.s.	2019: RCM revision of operational file 2511; Basic course - reliability, safety and maintenance;	164 /7			100 /4	
DIEZ Bohemia s.r.o.	2022: Implementation of SW environment – technical consultancy	140 /6				
ABB s.r.o.	Design and implementation of test equipment including electrically controlled load for home switches	160 /6	3 294 /130			
DEVRO	Creation of risk analyses	51 /2				
Systematic a.s.	Modification to the machine documentation of the current version of a robot model	364 /14				
Systematic a.s.	2019: Development work for the year 2019 within the project concept "Development of automated stacking system SysLogeum 3000" for the project CZ.01.1.02/0.0/0.0/16_083/0009881; 2020: Processing of an expert evaluator's; Partial development work for 2020 in the project concept "Development of the automated stacking system SysLogeum 3000" for the project CZ.01.1.02/0.0/0.0/16_083/0009881; in 2021: Partial development works for the year 2020/2021 - Functional model	15 /1	50 /2	63 /2		

²⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

	of the warehouse. Partial development works are in the concept of the framework of the project "Development of automated stacking system SysLogeum 3000"					
Sklopan Liberec a.s.	SW modification of machine codes in VHDL language, SPI connection analysis and HW modification, delay element extension, FPGA line-line run signalling		73 /3			
Prettl Automotive Czech s.r.o.; DENSO MANUFACTURING CZECH s.r.o.; EPRONA, a. s.	2020 for Prettl Automotive Czech s.r.o.: measurement of flux over a magnet; 2021 for DENSO MANUFACTURING CZECH s.r.o.: delivery and revival of a TS105 dynamometer by Magtrol; Translation of the manual/creation of instructions for the TS105 dynamometer; 2021 for EPRONA, a. s.: MOBUS – consulting activity and cooperation on the development of a service application on a PC; CKJ for communication with the superior PC and GMOD		1 /0	238 /9		
SÚRAO (Radioactive Waste Repository Authority)	Consulting services related to the international project DECOVALEX		39 /2	125 /5		324 /13
Střední průmyslová škola a Vyšší odborná škola, Liberec	Delivery of a workplace for teaching electric drives.		655 /26			
Chemengineering Switzerland AG	Designs of electromagnetic motor models (approximately 5, 25, 50Nm)			383 /15		
SOUTH MORAVIA REGION	Research of documents on the use of mine water in the former mining areas of South Moravian lignite mines and in the Rosicko-Oslavanska coal basin			56 /2		
PKÚ s.p.	Analysis of the state of groundwater in the area of the mine field of the Centrum mine and the adjacent territory			490 /19		
ÚJV Řež, a. s.	Provision of services in the field of research support for the safety assessment of the technical solution of deep repositories - development, verification and validation of models and safety analyses				539 /21	1 364 /54
Hochschule Zittau/Görlitz	Feasibility study of economic energy storage in the context of smart energy infrastructure				940 /37	
Czech radioactive waste authority	Implementation of rock mass temperature monitoring in PVP Bukov				1 415 /56	686 /27

	and Rožná I mine - implementation of measuring, technical, research, documentation and descriptive works, the output of which will be the analysis and evaluation of the performed rock mass temperature monitoring, the creation of mathematical models of temperature development in the rock mass, and the design of in- in situ experiment					
ÚJV a.s. - LTD (4 th phase)	Implementation of the project Long Term Diffusion (LTD)– 4 th phase (Conceptual and preparatory work - contribution to Interim Report 1; Modelling - contribution to Interim Report 2; Comprehensive evaluation - contribution to Stage 5 and to the Final Report)				100 /4	350 /14
Liberec region	Development, production, and technical equipment of the scanning workplace for the digitisation of the original recording media of musical automats – as part of the project “Saving treasures from the depositories of the North Bohemian Museum in Liberec”, Reg. No. project CZ.06.3.33/0.0/0.0/17_099/0007912					930 /37
Škoda Auto a.s.	Cooperation in the field of digitisation and electromobility - Analysis of the increase in resistance; Analysis of HOD-steering wheels; Microscopic analysis of HOD steering wheels					234 /9
SÚRAO-PBHU2	Research support for the safety assessment of the deep storage technical solution - barrier assessment - several sub-contracts are ongoing within the contract: DZ01 - THMC process modelling methodology/from 2021; DZ02 - Evaluation of the lifetime of UOS with VJP/from 2023; DZ03 - Verification of thermotechnical calculations for HÚ VJP/2023-2024; DZ04 - Influence of the transport of radionuclides in rock through storage corridors and EDZ /from 2024				2 128 /84	3 055 /121
DOOSAN BOBCAT s.r.o.	E10 machine / automation research, machine preparation - programming, automation of E10 machine movements					34 /1
VÚTS, a.s.	Advanced validation of mathematical air flow models	395 /16				
Ing. Michaela Jakubíčková	Development and application of SMART textile materials to increase	115 /5				

VAT: 5516714	the antibacterial and self-cleaning properties of textiles					
LIMESA meters s.r.o.	Fundamental innovation of the control electronics of a flowmeter	250 /10				
KMB systems, s.r.o.	Use of advanced methods of statistical data analysis to compress a database of electricity quality measurements and for their easier evaluation by the user	327 /13				
ADDAT	Creation of a Linux Debian operating system and libraries for an ADA5 module	247 /10				
TOMTON	Testing of new functional materials for air purification in multifunctional heating elements		360 /14			
Systematic a.s.	Implementation of an algorithm for automatically finding a robot on the service rails of the SysLogeum 3000 storage system			159 /6		
Ing. Michaela Jakubičková VAT: 5516714	Market research of smart technological elements in textile products		15 /1			
4soft, s.r.o.	Development and application of thin inhibitory, antimicrobial layers for rubber children's playgrounds, including means for their cleaning		240 /9			
Pragotherm, servis fasád, s.r.o.	19088 Development of a new active-functional composite material for outdoor substrates		495 /20			
Czech Ski, s.r.o.	Optimising the lubrication properties of waxes to reduce the ecological burden and minimise the friction between skid and snow			492 /19		
Pragotherm, servis fasád, s.r.o.	Development of new inhibitory layers against fungi in interiors and households			492 /19		
Applic s.r.o	Increase in the sensitivity of an existing infrared camera using a hardware computing module		365 /14			
Createch, s.r.o.	Development of an intelligent control unit for municipal machines			245 /10		
Systematic a.s.	Development of an engine control unit for controlling a box lock			198 /8		
LIMESA meters s.r.o.	Fundamental innovation of a power source of the control electronics of a flowmeter			60 /2		
KMB systems, s.r.o.	Testing and completion of the development of a functional model and subsequently a prototype of a SMW panel power analyser with a new H7 measuring core and with an innovative way of exchangeable I/O			480 /19		

	and communication cards from the point of view of electromagnetic compatibility (EMC)					
Pragotharm, servis fasád, s.r.o.	Testing the properties of modified thin transparent coatings based on methyl-silicates with regard to potential applications as protection of roof coverings against microbial attack				482 /19	
LIMESA meters s.r.o.	Control software for a new type of flowmeter				50 /2	
GOODPED, s.r.o.	Development of a new generation electric moped (development, construction, and verification technical services on the electric equipment of a one-wheeled vehicle with battery drive)					499 /20
Createch, s.r.o.	Development of a graphical control interface for a prototype charging station				250 /10	
Trithor, s.r.o.	Feasibility study of the mechanical and electronic part of a functional sample of a single-purpose device for the production of frames for beehives for beekeepers				482 /19	
LIMESA meters s.r.o.	Communication modules for a new flow meter including operating firmware					75 /3
A G R O M E T A L L s.r.o.	Development of equipment and firmware for the machines of A G R O M E T A L L s.r.o.					500 /20
Total		3 266 /129	6 387 /252	3 481 /137	6 718 /265	8 051 /318

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

In the period under evaluation, FM produced 664 results, including 190 impactful articles, six patents, 11 utility models, 20 prototypes, 53 functional samples, 27 software, nine verified technologies, three pilot projects, three methodologies, three certified maps, and one trademark. Due to the number of results, Table 3.4.1 shows the results with the greatest application potential.

The research results of FM for the period 2019–2023 meet the principle of gender neutrality and sustainability. FM systematically supports equal opportunities regardless of gender and promotes environmentally responsible approaches in research and teaching. In many cases, projects and innovations created by FM during this period are aimed at reducing the consumption of energy or primary resources and therefore contribute to sustainable development, reflect social responsibility, and meet modern inclusion standards.

The following is a detailed description of ten of the most significant results from the perspective of FM, including two impact papers with the highest impact on society with top or excellent ratings in the M1 module (excellent results):

ČERVA, Petr, NOUZA, Jan, VÁCL, Jan and WEINGARTOVÁ Lenka. *Multilingual software technology for detection and early notification* [software]. Year of implementation 2021.

This software represents a unique platform using artificial intelligence methods, specifically deep neural networks, which allows keywords to be automatically detected in spoken speech and transcribe speech in thirteen main Slavic languages. On the basis of this platform, Newton Technologies operates a whole range of add-on services, which it offers in the Czech Republic and abroad as the Beey web platform, which allows automatic transcription and subsequent correction of various audio recordings or the creation of subtitles. Its add-on Beey workflow is then used for proofreading automatically transcribed records by various European companies engaged in monitoring television, radio broadcasts and the Internet. These services are most often used by journalists, public administration employees and various producers of video content (subtitles) through a payment gateway. Large users include the following domestic and foreign institutions and companies: Czech National Bank, TV NOVA, Czech News Centre, DVTV and large European monitoring agencies (Newton Media – Czech Republic, Slovakia, Poland, Presscut – Croatia, Kliping–Serbia, Bosnia and Herzegovina and North Macedonia, Archimed – Montenegro, and Looqme – Ukraine). The software technology was the main output of a four-year project from the Technology Agency of the Czech Republic with the designation TH03010018, in which TUL participated in cooperation with Newton Technologies. The individual modules are based on a unique research, which was published in 17 contributions at international conferences and one publication in an

²⁹ See Terms definition.

impact journal (Q2). The quality and technical parameters of the software platform are fully comparable with similar services of large companies such as Google Cloud or Microsoft Azure. If this were not the case, Newton's customers would always prefer to use competitive add-on editing tools and web services that routinely use the cloud technologies of large multinational companies. The software was rated 2 in the evaluation of excellent results of the M1 module.

KOLDOVSKÝ, Zbyněk and TICHAVSKÝ, Petr. *Gradient Algorithms for Complex Non-Gaussian Independent Component/Vector Extraction, Question of Convergence*. IEEE Transactions on Signal Processing. 1st edition IEEE, 2019, Vol. 67, No. 4. pp. 1050 – 1064. ISSN 1053-587X, EISSN 1941-0476.

In this project, the issue of blind extraction of a non-Gaussian source from a linear instantaneous mixture of signals observed by an array of sensors was revisited. We proposed a new parametrisation of the mixing system matrix, which involves only two vector parameters, i.e., the mixing and the separating vector related to the source to-be extracted. We derived new gradient algorithms that were shown to be efficient in performing the blind source extraction (BSE) task, and their convergence and other properties such as relations to previous BSE methods were studied. The contribution of this work resides in two main aspects. Firstly, it provides new insight into the BSE issue. It was shown that the mixing and separating matrices may be assumed structured with a reduced number of parameters, while the BSE task can still be accomplished without any loss of the extraction accuracy (compared to methods assuming fully parametrised system matrices). Secondly, our approach to BSE provides new directions for new BSE mixing models, theoretical analyses, and new algorithms.

To-date, the study paper has 52 citations in the Web of Science. Based on the ideas, we have computed several Cramér-Rao bounds for the achievable accuracy, we have proposed mixing models that are entirely novel in the BSE literature, and we have derived several novel algorithms with applications in audio source extraction, in particular, for the extraction of speech of a moving speaker recorded by multiple microphones. The technical terms in the title of the paper "Independent Component Extraction" and "Independent Vector Extraction" have become established in the community and are commonly used in the literature. This demonstrates the impact of the result on the scientific community focused on blind source separation. Within the evaluation of the excellent results in the M1 module, the result received the best possible rating "1".

KAUTSKÝ, Václav, KOLDOVSKÝ, Zbyněk, TICHAVSKÝ, Petr and ZARZOSO, Vincente. *Cramér-Rao Bounds for Complex-Valued Independent Component Extraction: Determined and Piecewise Determined Mixing Models*. IEEE Transactions on Signal Processing. 1st edition IEEE, 2020, Vol. 68, No 2020. pp. 5230 – 5243. ISSN 1053-587X, EISSN 1941-0476.

Blind signal separation/extraction (BSS/BSE) deals with a fundamental signal processing issue. When some data are observed for the first time, the effort is to partition the data into factors that have an easy interpretation, from which the interpretation (analysis) of the observed data follows. An example is the separation of signals, where we observe their opaque mixture using sensors and the BSS is able to unmix the signals without any a priori information. This project studied several signal mixing models for solving the problem of blind signal extraction based on the assumption that the target signal is independent of other signals. For this purpose, the theory of Cramér-Rao lower bounds (CRLB) is used to analyse the potential of the models.

The derived CRLB provides important insights regarding the new mixing models, which simulate dynamic mixing assuming piecewise stationarity and are therefore suitable, e.g., for the extraction of moving targets. The CRLB shows that the models not only exploit the non-Gaussianity of the signal (like previous static models), but also benefit from its non-stationarity and from the non-stationarity

of other signals. The finding about the CSV model is even more significant, with the CRLB showing that the extraction accuracy depends on the length of the entire data context. This opens space for new applications of the model, e.g., in recursive on-line source extraction. CSV allows the context to be modelled as a piecewise varying mixture. The result therefore made an impact on the entire area of blind source separation, showing that the idea of independent component analysis is not nearly as mature as previously thought.

The results appeared in IEEE Transactions on Signal Processing - a prestigious journal in the first decile. Within the evaluation of the excellent results in the M1 module, the result received the second-best possible rating "2".

DIBLÍK, Martin, ČERNOHORSKÝ, Josef, KOTEK, Vojtěch, KUČERA, Libor and HORÁK, Marcel. *Rehabilitation ergometer and its control* [patent]. Granted on 15 May 2019 under No. 307852.

The patent protects the intellectual property of a robotic bicycle ergometer device. The uniqueness lies in the independent drive/loading system for each limb. There is no mechanical linkage, but by deploying advanced control techniques, a load is set in real time to maintain the bipedal stereotype despite isolated monoparesis of a single limb. This method of automatic load adaptation extends the list of possible diagnoses not only to orthopaedics patients, but is also suitable for neurological patients after a stroke. The co-investigator was the Liberec Regional Hospital, Orthopaedic Department.

The patent has a practical implementation in two prototypes that passed mechanical and electrical tests at the Engineering Testing Institute. Both were used in treatment centres, specifically in Lázně Teplice nad Bečvou and the Arkada centre.

A secondary benefit is the improvement of the teaching of biomedical technology at the TUL Faculty of Health Studies and subjects focused on motion control and management at FM, where the equipment serves as a technology demonstrator and a platform for student works.

Last but not least, the achieved result also served to establish cooperation in international projects focusing on human-machine interaction. The output was communicated in the mass media and therefore served to popularise the study of technical fields at TUL. The patent was rated "2" in the evaluation of excellent results of the M1 module.

ČERNOHORSKÝ, Josef, MACH, Ondřej, NYROBTSEVA, Ekaterina, MAŠKOVÁ, Barbora, VÁVROVÁ, Andrea. *Validation of the UV robotic system for applications in healthcare facilities* [prototype]. Year of implementation 2022.

Nosocomial infections, i.e., infectious diseases that arise in a causal connection with the hospitalisation of patients, have significant effects on both the length of hospitalisation and the length of subsequent home treatment. Although health facilities in the Czech Republic are above average in a pan-European comparison, the effects of nosocomial infections are economically significant on a nationwide scale. In addition, some cases can be fatal, causing loss of human life and affecting the extended family.

A typical tool for suppressing infections is the chemical treatment of surfaces, supplemented with germicidal lamps in critical areas. However, they have a limited lifespan, high energy requirements and, in particular, a fixed radiation angle that cannot be changed due to the installation.

Even before the COVID-19 pandemic, experiments began on the use of modern UVC LED components for additional sanitation. Verification experiments were conducted in the microbiological laboratory

as well as control smears in critical areas in order to single out problematic surfaces and places where it is difficult to perform chemical treatment and additional stationary germicidal light is not sufficient. Based on these findings, an autonomous mobile robot with a UVC LED lighting system was built, which was deployed in the ENT clinic of the Regional Hospital in Liberec. Subsequently, control smears were performed to evaluate them. The functionality of the device was proven, with the fact that it would be advantageous to deploy a robotic arm with an additional illuminator to the stationary illuminator. The device is being further developed.

PALEČEK, Karel a ROZKOVEC, Martin. *Method of evaluating impurities in fibrous material by a neural network and a system for evaluating impurities in the fibrous material using a neural network* [patent]. Granted on 1 April 2021 under No. 308784.

The patent came from a project with Rieter CZ s.r.o. and Rieter Machineworks GmbH (MPO TRIO FV20131), in which FM acted as a subcontractor, and further from subsequent cooperation through the Technology Agency of the Czech Republic Trend project FW03010640, which led to the creation of prototypes of equipment for the evaluation of impurities in raw cotton.

An advanced camera sensor with a lighting module working in the visible, ultraviolet, and near-infrared radiation areas was designed as part of the collaboration. The sensor is equipped with an industrial camera with a conventional lens and is integrated using an industrial minicomputer based on a multi-core SoC with a CUDA computing module. The acquisition and image processing are controlled by modular SW based on microservices, which evaluates the degree and type of pollution of the cotton material in a blowroom using a neural network inference module (PyTorch or ONNX).

The sensor can replace extremely expensive instruments at a fraction of the cost. In addition, thanks to its location and evaluation speed, it eliminates the need to take material samples and can monitor the technological parameters of cotton processing in real time.

The international reach of the patented technology is demonstrated by its following deployment (as of 2023): the device is being tested in the Nafaktos spinning mills in Greece; Yunus, Narteks, Siricoglu in Turkey; in experimental spinning mills in Winterthur, Switzerland (Rieter Machineworks GmbH) and the Cotton Research Institute in Ústí nad Orlicí. At the ITMA 2023 trade fair in Milan, the device was presented and commercially offered as part of the solution for the new Rieter C81 carding machine and the Essential intelligent business solution. The sensor is also used in the newly developed waste analyser. The patent was rated “2” in the evaluation of excellent results of the M1 module.

PETRŮ, Michal, HLAVA, Jaroslav, JANDURA, Pavel et al. *Modular platform for autonomous chassis of specialized electric vehicles for freight and equipment transportation - Generation 0* [functional sample]. Year of implementation 2022.

This modular mobile platform with the acronym ANTeTUL has two main functions: 1) autonomous driving from A to B and 2) Follow me, where the functional sample copies the operator’s movements according to the application. It is therefore an excellent result with significant social relevance, but it also contributes to knowledge, helping shift the Czech Republic into a leading position in the field of autonomous driving with significant innovation potential for use in industry, agriculture, waste management, services, supply, and in the military sphere.

The ANTeTUL functional sample, in which 31 TUL employees from four faculties participated, has dimensions of 1600 x 850 x 600 mm, weighs 50 kg, and can transfer 100 kg. It was developed between 2018 and 2022. ANTeTUL moves by itself and reacts to static and moving obstacles, which is due to the developed software and its own “thinking”, whereby the platform is able to change and optimise

the planned route according to the current situation. A powerful PLC is used as the control system.

FM employees were responsible for the development and testing of the battery system and its electronic management, the design of DC drives and their control loops, mathematical modelling of the platform, the design and testing of various control algorithms, including model-based predictive control, and the development and implementation of sensor data processing methods (lidars, UWB sensors, etc.) so that the data from them can be used by the control system.

The uniqueness of the result is demonstrated by the fact that it was chosen by the European Commission in Brussels among 30 finalists out of 228 projects in the prestigious RegioStars competition and was included in the “A Connected Europe” section. The result was also graded “1” in Module 1.

EXNER, Pavel, SYSALA, Stanislav, ŠPETLÍK, Martin, BŘEZINA, Jan, STEBEL, Jan et al. *Software Endorse 1.0* [software]. Year of implementation 2022.

The long-term safety of a deep underground repository for radioactive waste is ensured mainly by the low hydraulic conductivity of the rock mass. However, during the construction of the repository, significant changes in the original stress state of the rock mass occur in the vicinity of the excavated tunnels, leading to changes in existing fractures and the formation of new fractures. This is called an excavation disturbed zone (EDZ). The developed software allows for the characterisation of the impact of EDZ on the safety of the nearby repository.

Safety assessments of flow and transport in crystalline rock often rely on discrete fracture network (DFN) models, as seen in Swedish and Finnish methodologies. However, DFN models struggle to capture the influence of numerous microscopic fissures. The Endorse software, with its Flow123d simulator, addresses this limitation by consistently employing a discrete fracture-matrix (DFM) approach.

The recipient of the result is the Czech Radioactive Waste Authority. The software can be used by other countries with plans for crystalline rock repositories, such as Germany, Switzerland, Romania, Spain, Korea, Japan, Canada, and USA. The software has been used for a model safety study within the European project EURAD (part of the Horizon 2020 programme under grant number 847593) and was presented in an invited talk entitled “Uncertainty Quantification and Multifidelity Techniques for Mechanical and Transport Processes in Fractured Rock” at the EURAD final.

Due to the specific function of the software and the open license, the social relevance cannot be assessed purely by economic indicators. Although the EURAD project is a research initiative, national radioactive waste authorities, who are the end users of the software, are included. Therefore, transferring results to these target users is integral to the project. Beyond its current use in deep repositories, the software has potential applications in civil tunnel safety.

MATOUŠEK, Ondřej, NOVOSÁD, Jan, PSOTA, Pavel et al. *Interferometric device for measuring deviations of the convex hemispherical shape of optical elements* [utility model]. Registered on 6 August 2022 under No. 36134.

The utility model protects an innovative interferometric device designed to measure precise deviations of the convex hemispherical shape of optical elements. The device, developed in cooperation between FM and asphericon s.r.o., combines subaperture interferometry with a unique multi-wavelength interferometric method. The technology enables fast and highly accurate measurement of surface deviations and enables the radius of curvature of optical surfaces to be measured in a single position, which makes it unique on the market.

The implementation of the interferometer the company asphericon s.r.o. to fundamentally increase the efficiency and quality of measurements in the production of optical elements. The technology was put into production in 2023 and became a key part of the company's production process, bringing an increase in revenue of 8.6 million CZK, or 8.6% of the company's total revenue, with all production being exported. This increase enabled the creation of three new jobs. The resulting measuring device is being further developed and several pieces are planned to be sold to the parent company.

The result represents one of the key elements enabling full automation of optical production. It therefore also became the basis for the Ministry of Industry and Trade project focused on robotised workplaces for the production of optics with accurate automated measurement, where accurate and fully automated measurement plays a vital role. The result is also used to solve projects for the European Space Agency (ESA), such as Infra-Red Lens Polishing For High Performance Applications or New Optical Polishing Techniques for Aspherical and Free From Lenses.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ³⁰	Year of application	Name
Patent	2021	Method of evaluating impurities in fibrous material by a neural network and a system for evaluating impurities in the fibrous material using a neural network (308783 and 308784)
Patent	2019	Rehabilitation ergometer and its control (307852)
Prototype	2022	Validation of the UV robotic system for applications in healthcare facilities
Utility model	2022	Interferometric device for measuring deviations of the convex hemispherical shape of optical elements
Software	2022	Software Endorse 1.0
Software	2021	Multilingual software technology for detection and early notification
Functional sample	2022	Modular platform for autonomous chassis of specialized electric vehicles for freight and equipment transportation - Generation 0

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

³⁰ Specify the specific type of result. Add rows as needed.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³²

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

The most important form of transfer of the research results of FM into practice is direct cooperation with specific enterprises, usually through a targeted grant or contractual research. FM further transfers research results into practice in the form of cooperation with state authorities (e.g., Czech Radioactive Waste Repository Authority - SÚRAO). Cooperation between FM and an enterprise very often starts either based on a contract or administratively via a simple regional or innovation voucher. Longer-term cooperation with industry then develops into applied projects (typically from the Technology Agency of the Czech Republic). Another form of transferring the results of creative activity into practice is the sale of licenses.

In most cases, the basis of cooperation is the direct contact of an FM employee with a specific enterprise. Part of FM's policy is also the partnership programme, which sets the rules for close cooperation between the academic environment and industrial practice. In 2022, a subsidiary company TUC TUL was founded at the Technical University of Liberec, which focuses on the transfer of knowledge into practice, and negotiations are currently underway on the possible use of selected results of FM.

During the period under evaluation, FM received an average of 6.4 million CZK per year from non-public non-grant sources (licenses, donations, additional activities of a research nature) (see Tab. 3.5.1 - the largest partners are ČEZ, Innogy Gas Storage, Simgeo, Škoda a.s., Newton Technologies, Office of Naval Research Global) and an average of 5.5 million CZK per year from contractual research (see Tab. 3.3.2).

³¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³² If the commercialisation of R&D&I results is carried out in this way.

TYPICAL USERS OF FM RESULTS

1. Newton technologies, a.s.

Newton Technologies, a.s. represents the main partner of FM for the commercialisation of R&D results in the field of voice technologies. Cooperation with this company has been ongoing since 2010, mainly in the form of joint applied research projects in the grant programmes of the Technology Agency of the Czech Republic. During the period under evaluation, an example of such cooperation may be the DeepSpot project (TH03010018), which created a multilingual software technology for detection and early notification, and the Technology Agency of the Czech Republic international project NordTrans (TO01000027), which was implemented in cooperation with the Norwegian university NTNU (see also Chapter 3.4).

2. Rieter a.s.

Rieter CZ s.r.o. is part of the Swiss concern Rieter, which is one of the world's largest manufacturers of machines and lines for the production of yarn from natural and synthetic fibres. FM has been cooperating with Rieter for a long time. Cooperation is limited to joint projects or subcontracted work. In the period under evaluation, FM collaborated on the development of the technology of a detector of impurities in cotton material for carding mills as a subcontractor for electronics and software (Ministry of Industry and Trade TRIO FV20131, 2016-2020), on a functional sample and prototype of a sensor for detecting impurities in cotton material and skeins (Trash Level Monitor), and on a functional sample of a sensor for measuring the properties of fibre material as a co-investigator (Technology Agency of the Czech Republic Trend FW03010640, 2020-2024), and further on modelling and measuring the pneumatic transport of raw cotton in a yarn preparation plant (in cooperation with FT TUL – Ministry of Industry and Trade Trio FV40025, 2019-2022) .

3. Radioactive Waste Repository Authority (SÚRAO)

SÚRAO is a state organisation that is legally responsible for handling radioactive waste. FM usually provides consulting services that are part of the long-term programme preparing a deep repository for spent nuclear fuel and, above all, proving its safety. The basis for safety assessment is both laboratory and field research of monitored processes, as well as numerical simulations, which allow experimentally determined processes and data to be extrapolated to selected storage configurations and large spatial and temporal scales. FM employees, in individual contracts based on tenders, either provide calculations of selected processes or help develop and verify calculation procedures subsequently applied directly by SÚRAO. These involve the modelling of heat propagation, water flow and transport of substances in fractured granite and interconnected thermo-hydro-mechanical and chemical processes in engineering barriers (steel casing and compacted bentonite). Knowledge gained in R&D support projects (Technology Agency of the Czech Republic, Ministry of Industry and Trade, Horizon2020) is applied, including the use of self-developed simulation software with unique functionalities.

4. ČEZ, a.s.

TUL provides long-term support to ČEZ, a.s. by monitoring the failure rate and evaluating the operational reliability of the control and management systems (CMS) of two nuclear power plants (NPP) operating in the Czech Republic. The basis of cooperation is a distinction between maintenance interventions, kept in the ČEZ database system (ISE-Passport) and Shift Logs (PDS), into real/valid faults and other maintenance interventions. This database is accompanied by analyses of equipment failure rate classified into production types and systems in which the component is operated. The final output is the non-standby value (for a dangerous fault) and the occurrence frequency (for a safe fault) of the specified safety functions, modelled using the fault

tree analysis (FTA) method. These results are forwarded to SÚJB, which, among other things, issues a favourable opinion on the extension of a license to operate the NPP.

5. K M B Systems, s.r.o.

KMB Systems produces components, complete solutions, and specific services in various areas of energy automation. The primary focus is the development of solutions for intelligent networks, transmission and distribution networks, industrial and commercial energy management, building automation, and other energy management projects. FM cooperates with KMB Systems based on grants from the Technology Agency of the Czech Republic (TH03010462, TH04020053), business vouchers and in the form of student works. In successful cases, the results are included in the company's production programme as functional device nodes, SW modules, or complete devices. Examples of commercialised products are innovation of the reactive power regulator NOVAR 2700, design of the compact KATKA 12 triac compensation block, testing of PWR3 power supplies with a high category of overvoltage resistance CAT IV, or development of protection against ferroresonance of instrument voltage transformers in AFR111 high-voltage networks.

NEW USERS OF RESULTS

FM is actively searching for new users of science and research results. The best working method is the personal contacts of FM staff with enterprises, but other options are also used, such as:

- Conferences
- Networking events
- Industrial trade fairs
- FM partner programmes
- Popularisation events (see also Chapter 3.6)

EXAMPLES OF THE COMMERCIALISATION OF RESULTS

1. Multilingual software technology for detection and early notification

The result of a project of the Technology Agency of the Czech Republic, implemented in cooperation with Newton Technologies, a.s., which it offers based on a contract on the use of results for the provision of a whole range of additional services in the field of transcription of speech into text or detection of various events in multimedia data. According to the contract, Newton Technologies pays a percentage of the turnover. Details of this result are given in chapter 3.4. Commercialisation is mainly through the [Beey](#) platform.

2. Software technology for speech transcription in Norwegian

A result of the above-mentioned international NordTrans project, which Newton Technologies, a.s. uses based on a contract for the use of results, according to which a percentage share of the turnover is paid, in particular within the framework of the [Beey](#) platform for the provision of services in the field of transcription of speech and subtitling of videos in the Norwegian language.

3. Determination of risk in the transport of hydrogen

This is a task solved for Net4Gas. The results of risk modelling in the vicinity of transit gas pipelines helped N4Gas determine safety and protection zones in the vicinity of gas pipelines during the planned transition to the transport of a mixture of natural gas and hydrogen, or even pure hydrogen. This cooperation was followed by a project for the Czech Gas Association, where the solution was extended for gas pipelines of smaller diameters and underground gas storage tanks.

4. Dynamic maintenance schedule

For UNIPETROL RPA, FM created a dynamic maintenance schedule using the RCM (Reliability Centred Maintenance) methodology and helped with the introduction of a new SW tool for recording analyses. This helps UNIPETROL reduce the costs of operation and maintenance of production equipment.

5. AFR111 ferroresonance protection

AFR111 ferroresonance protection is a unique solution for protecting high-voltage instrument transformers. This model provides active protection of a separate single transformer based on a calculation of the reserve to saturation of the core of its magnetic circuit, and it is blocked in the case of earthing. The device is unique because it provides active protection of individual transformers or when they are connected to a “V”. Competing products are intended for connection to an open triangle and cannot be used in installations where there is no three-phase measurement.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
License fees (NanoTrix, Newton Media, Fugasoft, Atrea)	185/8	196/8	90/4	180/8	230/10
Donations supporting scientific and research activities (Škoda Auto a.s., EVC Group, Office of Naval Research Global)	1178/45	842/32	1100/10	492/12	1368/40
Additional activity - research contracts (ČEZ, Unipetrol, DIZ Bohemia, Military Technical Institute, ZAT, SPEEL, innogy Gas Storage, SIMGEO)	4617/182	4505/178	5044/199	6474/253	5549/219
Total	5980/236	5543/219	6234/246	7146/282	5980/236

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

FM has long been involved in the popularisation of science, research and innovation and active communication with the public. It focuses on participation in national and regional events, organisation of its own popularisation activities, and educational programmes that bring technical and natural sciences closer to a wide range of interested parties from children, elementary school students to high school students, teachers, and adults. FM projects and events are designed to support interest in technical fields, motivate further education, and demonstrate the practical use of modern technologies in everyday life. FM also regularly participates in the organisation of professional events. These activities contribute to the development of cooperation between academia, industry, and the public sphere and raise awareness of current trends in technical fields.

1. Activities for the general public

Researchers' Night (2019, 2020 online, 2021, 2022, 2023)

A popular national event popularising science with a new theme every year. In recent years, visitors, especially parents with children, had the chance to see a 3D printed robotic hand, learn about the use of additive technologies in the production of moving artificial hands, or take a virtual walk around the faculty building.

5400 seconds (2023, 2x)

Lectures in the university lecture series, this time on the theme of using artificial intelligence applications in everyday life, prepared in cooperation with Faculty of Science, Humanities and Education TUL and the Liberec business incubator Lipolnk.

Mentoring at events supporting entrepreneurship

FM members actively participate in the role of mentors at regional ideathons and hackathons, specifically at DEXIC Hack (2020), whose aim was to find new advanced technological solutions in the development of an emergency lung ventilator, or at the Liberec student Ideathon Liberec (2022), where they contributed to the solution of specific issues in the region.

2. Activities for primary and secondary school students

CyberRobot (2019, 2020, 2022, 2023)

A traditional competition for robots that pupils and students design and build themselves. Each year, approximately 40 teams participate in two categories: autonomous robot - rescuer (competition of speed while covering a set course) and robot - human assistant (the originality and sophistication of the idea are evaluated).

Children's University (2019–2023)

Year-round free-time educational activity with a focus on technical and natural sciences. More than 100 children from the entire region participate each year. It offers two formats during the year: year-long, specifically focused courses and a one year-long course with a broader scope including lectures, laboratory exercises, and practice from several areas (e.g., robotics, microelectronics, biomedicine, nanotechnology). In the summer, there are weekly suburban courses focused on programming and building LEGO robots.

IT summer school (2020, 2021)

A one-week residential camp for high school girls focused on web design, programming, graphics, and IoT. The aim was to bring the world of IT closer to girls and show them that they can find their place in it. Organised in cooperation with the non-profit organisation Czechitas z.s.

NAKAP II project days (2020–2023)

Workshops aimed at motivating pupils to study polytechnic fields. FM held 28 workshops for secondary school students in the field of nanotechnologies, IT, robotics and control, and microelectronics.

3. Activities aimed at the professional public

Conferences, seminars and workshops

FM organised several professional events for specialists from industry and the public sector, e.g., a seminar on modern methods of recognition and processing of image information (2019) focused on

applications and problem solving of computer image processing for industrial use, the ECSMM-IEEE International Workshop of Electronics, Control, Measurement, Signals and their Application to Mechatronics (2021), and the 18th annual Czech-Slovak professional seminar focused on the design and diagnosis of electronic circuits and systems entitled “Computer Architecture & Diagnostics” (2022).

AMPER Brno (2019, 2022, 2023)

FM presented its focus and the results of science and research at the international trade fair of electrical engineering, electronics, and energy.

The COVID-19 pandemic had a negative impact, as it interrupted some of the regular activities, which are now gradually being restored.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

IEP 2020 recommendation: The faculty should make its research strategy clearer and could consider defining areas of excellence and organize itself around them.

FM response: An entirely new Science, Research and Innovation Strategy until 2025 (with a view to 2030) was created at FM in 2022: <https://www.fm.tul.cz/en/document/2078>

The strategy includes, among other things, the development of the system of research teams and the division of R&DI fields into main fields (where FM excels and the research teams belonging to the given field are sufficiently staffed, including the corresponding qualification structure) and secondary fields, which do not yet meet all the conditions. The main disciplines listed for 2023 in the strategy are Mechatronics, Computer Science and Electronics, and Numerical Modelling. The strategy also includes other prospective areas where FM will support the preparation and implementation of projects, specifically, modern energy, renewable sources, energy storage, energy transformation, automation, artificial intelligence, and autonomous mobility.

IEP 2020 recommendation: Reporting on the evaluation categories could be less qualitative and more quantitative (the appendices are not sufficient). A research information system tracking each faculty member's publications, projects, funding, resources, etc., could be helpful for these purposes. Maybe this needs to be addressed on the TUL level.

FM response: In the 2025 self-evaluation report, the outputs and results of FM are described in the most specific way possible. By the end of 2023, the database of publications and applied outputs of all TUL employees will be systematically used throughout the university. FM is one of the pioneering faculties using a web application and database for project management (GaP), the entire study agenda is maintained in the application STAG, international mobilities are managed in the application MOBILITY. To improve the overview of individual workers, the application CASSANDRA was developed at FM, which aggregates data from all the above-mentioned databases, whereby providing a comprehensive and clear view of the scientific research activities of individual workers.

IEP 2020 recommendation: Interaction with industry partners and technology transfer could be more structured and could be performed in collaboration with/across different faculties of TUL.

FM response: The most important form of the transfer into practice of the research results of FM is direct cooperation with specific enterprises, usually through targeted grants or contractual research. Many of these projects take place in cooperation with other faculties of TUL or with CxI. For practical reasons, the project is then managed by a single department, and the staff from the collaborating faculty are accountable to it. The projects mentioned in this self-evaluation report are e.g., AnteTUL EF16_025/0007293 and Rieter FW03010640. A partnership programme was recently implemented as part of the FM policy, which sets the rules for FM's close cooperation with enterprises and corporations.

In order to systematise and intensify the transfer of technology and knowledge into practice, the subsidiary company The University Company TUL (TUC TUL) <https://tuctul.cz/en/> was founded in 2022 at the Technical University of Liberec. TUC TUL is in regular contact both with the Vice-Dean for Research and with the heads of FM research teams, mediates contacts with enterprises requesting specific research tasks, and helps FM to find possible uses of selected research results.

IEP 2020 recommendation: Contract research should be aligned with the faculty's overall research strategy. In this context, faculty could consider how it can make sure that TUL/the faculty benefits from the IP generated out of contract research.

FM response: FM entirely agrees with this recommendation. This requirement was incorporated into the newly created Science, Research and Innovation Strategy in 2022, and FM ensures that contractual research is implemented in areas it considers to be key in its scientific direction. FM generates the largest amount of funds from contractual research in the area of reliability and risk assessment (contracts for nuclear and thermal power plants ČEZ, Unipetrol, and DIZ Bohemia), numerical modelling of underground gas storage tanks (Innogy Gas Storage) and radioactive waste repositories (Radioactive Waste Repository Authority (SÚRAO)). All these cases involve contractual research with high added value. Contractual research activities help to fulfil FM's mission, whereby the involvement of students and doctoral students helps to solve technically demanding and socially significant research tasks.

IEP 2020 recommendation: A clear spin-off strategy seems to be missing (but needs to be addressed on the TUL level).

FM response: Based on the recommendations of the International Evaluation Panel from 2020, TUL established a subsidiary company, The University Company, whose task is, among other things, to assist in the creation of university spin-off companies. In this sense, TUL further revised the Directive of the Rectors on the protection of intellectual property at the Technical University of Liberec and on the commercialisation of science and research results.

IEP 2020 recommendation: Faculty are not great at presenting a wider picture or sense of environment. Has lots of parts, mostly all seem useful in their own right and the faculty also seems to play a large role in undergraduate teaching? The smaller research groups with a focus are much better at presenting themselves.

FM response: In accordance with the new Science, Research And Innovation Strategy, research at FM is conducted within smaller and clearly thematically focused research teams. In this way, FM also presents its research areas externally, i.e. printed presentation sheets of research teams and

an electronic presentation were created. The next step will be to update the website, where this new structure has not yet been fully reflected.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Strategy of R&D at FM TUL	3.1	https://www.fm.tul.cz/en/document/2078
FM TUL organisational structure	3.1	https://www.fm.tul.cz/en/departments
The University Company TUL website	3.5, 3.7	https://tuctul.cz/en/

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Health Studies

FORD: 3 - Medical and health sciences

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term objectives in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Self-assessment:

The Faculty of Health Studies of the Technical University of Liberec (FHS) is the youngest faculty at the Technical University of Liberec. FHS was established in 2016 by transformation from the Institute of Health Studies. FHS focuses mainly on providing high-quality education for students in non-medical fields with an emphasis on practical studies and a strong connection to healthcare service providers.

The number of students increased mainly due to the opening of a new field of study (study programme Radiological Assistance in 2020). Every year, interest in studies exceeds the number of accepted students. FHS mainly explains the interest of the students by a tried and tested system of promotion and at the same time the high quality and attractiveness of the education provided. All its study programmes are vocational; therefore, students spend their studies not only on mandatory practice with health care providers, on trips with medical rescue services, in enterprises, but also various professional courses are organised for them during their studies. The professional courses and field trips offered were expanded in the period under evaluation for various study programmes. The Regional Office of the Liberec Region also expressed its support for the courses by signing a Memorandum on Mutual Cooperation with a regular annual financial support of 0.5 million. CZK. FHS is able to admit more students to the only follow-up study programme that FHS provides (biomedical engineering). In the other study programmes, not only FHS but also the capacity of

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

practice and professional courses has reached full capacity, so that the possibility of personal access, individuality and a wide range of professional events is still preserved.

Mission of the faculty:

- To provide high-quality education for non-medical health workers with an emphasis on a personal approach to students
- To inspire students to develop knowledge, critical thinking, social responsibility, and adherence to ethical principles
- To teach students how to practically use the most state-of-the-art devices and aids
- To contribute through its creative activity to the expansion of knowledge, the development of society and the practical use of new knowledge in the areas of robotics, infection prevention, development of contrast agents, and research in the field of education in non-medical fields.

Vision of the faculty:

- To become a renowned provider of education based on quality teaching using modern technologies and state-of-the-art equipment.
- To contribute through its creative activity to expanding knowledge in the field of patient care, improving the quality of services and the environment of health care providers, in the areas of simulation technology and the development of new samples and materials wherever health care intersects with technology.

Self-reflection on the social contribution of research

Unfortunately, FHS faced difficulties in obtaining international projects and establishing foreign collaboration. During the COVID-19 pandemic, as in other institutions, development of internationalisation stopped and FHS focused mainly on deploying its students to help in the fight against this pandemic in health care facilities. During and after the pandemic, research focused more on preventing the transmission of infectious diseases.

Research activities by type of research

FHS is a small and young faculty, gradually developing not only in the area of education, but also in the area of R&D. In the period under evaluation, FHS managed to stabilise its research teams, which are mainly focused on basic research. Applied research makes up a significantly smaller share of the R&D results generated.

Organisational structure

With the growth of the faculty, the following new departments were created:

- Institute of Nursing and Urgent Care
- Institute of Clinical Fields and Biomedicine
- Department of Science and Research in the Field of Biomedical Applications (original name Department of Science and Research FHS TUL)
- Department of Prevention and Education (established in 2019, replaced by the Department of IT and Simulation Techniques in 2022)

Personnel structure

In the period under evaluation, FHS grew not only in terms of the number of study programmes and the number of students studying in them, but also in the number of scientific workers and the use of specialised laboratories. The increase in the number of scientific and academic staff is related not only to the overall development of the faculty, but also to the effort to increase the R&D activity of

the faculty while simultaneously maintaining the quality of teaching. The faculty is aware of the low number of experts in medical and non-medical health fields who also have an academic degree and are employed full-time at FHS. The faculty holds these people in high esteem and is extremely happy that it can use their potential especially for high-quality and highly professional teaching of its students. Here, FHS is staffed to an above average level. Unfortunately, a large number of these experts are involved in research projects of other research organisations and within these organisations they also publish the results of scientific research work. FHS has responded to this fact in recent years not only by increasing the duties of some experts, but also by increasing the number of scientific and research workers working only at FHS. In the period under evaluation, scientific teams were established that cooperate not only with other TUL faculties, but also with other research organisations. The results of these teams will be more evident in the next evaluation period.

Long-term objectives of FHS in the area of R&DI

- To obtain international projects
- To strengthen the quality of results and outputs of scientific research activities
- To increase in the number of R&DI results and projects of its employees, who publish part-time and participate in projects with FHS affiliation
- To promote an innovative approach to education

To focus on research objectives using the new simulation centre, the construction of which will start in 2025. Therefore, FHS signed a Memorandum on mutual cooperation in the field of simulation teaching between FHS, Regional Hospital Liberec (Krajská nemocnice Liberec a.s.) and Medical Rescue Service of the Liberec Region (Zdravotnická záchranná služba Libereckého kraje p.o.) in 2023.

Table 3.1.1 - Staffing per FTE²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	2.36/0.00	2.43/0.00	2.42/0.00	3.56/0.00	3.63/0.00	14.40/0.00
Associate Professor	1.05/0.00	1.00/0.00	1.06/0.00	1.07/0.00	1.24/0.00	5.42/0.00
Assistant Professor	4.53/2.14	5.50/2.40	5.87/2.65	8.82/4.47	9.87/5.40	34.59/17.06
Assistant	2.93/1.00	4.69/1.49	7.12/3.22	8.06/3.37	7.52/2.87	30.32/11.95
R&D Personnel ³	0.67/0.00	0.57/0.57	0.60/0.26	1.45/0.20	2.20/0.20	5.49/1.23
Researchers in other categories ⁴	11.10/7.84	18.58/12.54	20.17/13.20	17.55/11.96	15.42/10.55	82.82/56.09
Technical and economic staff ⁵	6.50/6.50	6.73/6.65	6.93/6.69	8.29/8.09	8.63/8.57	37.08/36.05

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁵ Who participates in the management and support of R&D&I in the institution.

Scientific, research and development staff involved in teaching activities	21.97/10.98	31.69/16.34	34.55/17.97	36.85/18.60	35.26/17.39	160.32/81.28
Early career researchers ⁶	1.35/0.50	1.90/0.50	3.94/1.69	4.40/2.61	3.54/2.42	15.13/7.72
Total ⁷	29.14/17.48	39.50/23.65	44.17/26.02	48.80/28.09	48.51/27.59	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	0	0	1	0	3	0	1	0
Associate Professor	0	0	0	0	3	0	0	0	0	0	0	0
Assistant Professor	0	0	4	0	3	1	4	2	6	3	1	1
Assistant	2	0	4	1	1	0	0	0	0	0	0	0
R&D Personnel ⁹	0	0	0	0	0	0	0	0	0	0	0	0
Researchers in other categories ¹⁰	5	2	3	2	7	5	9	4	3	3	0	0
Technical and economic staff ¹¹	1	1	1	1	0	0	4	4	0	0	0	0
Scientific, research and development staff involved in teaching activities	7	2	11	3	14	6	14	6	12	6	2	1
Early career researcher ¹²	0	0	3	0	0	0	2	1	0	0	0	0
Total ¹³	8	3	12	4	14	6	18	10	12	6	2	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (excluding persons working on agreement on work activity or agreement on work performance).

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

¹² See Definition of Terms in Methodology HEI2025+.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	1	0	1	0	4	0	1	0
Associate Professor	0	0	1	0	3	0	1	0	0	0	1	0
Assistant Professor	0	0	5	3	12	4	8	2	8	4	0	0
Assistant	0	0	9	3	1	1	0	0	0	0	0	0
R&D Personnel ¹⁵	0	0	1	0	0	0	2	1	0	0	0	0
Researchers in other categories ¹⁶	0	0	12	3	16	13	9	6	3	2	0	0
Technical and economic staff ¹⁷	0	0	0	0	4	4	4	4	0	0	0	0
Scientific, research and development staff involved in teaching activities	0	0	25	8	31	16	19	8	15	6	2	0
Early career researcher ¹⁸	0	0	6	3	6	1	2	1	0	0	0	0
Total ¹⁹	0	0	28	9	37	22	25	13	15	6	2	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

¹⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	403	281	464	335	457	339	420	304	452	341	2196	1600
Master's ²⁰	16	12	22	14	24	14	20	11	21	12	103	63
Doctoral	0	0	0	0	0	0	0	0	0	0	0	0
Lifelong Learning Courses	0	0	0	0	0	0	0	0	0	0	0	0
Total	419	293	486	349	481	353	440	315	473	353	2299	1663

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	3/0	3/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	4/0	19/0	19/0
Master's	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	1/0	5/0	5/0
Doctoral	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Lifelong Learning courses	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Total	4/0	4/0	5/0	5/0	5/0	5/0	5/0	5/0	5/0	5/0	24/0	24/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	1	Basic Research	22
	1.2 Computer and information sciences	0	-	
	1.3 Physical sciences	2	Balanced basic and applied research	
	1.4 Chemical sciences	11	Basic Research	
	1.5 Earth and related environmental sciences	2	Basic Research	
	1.6 Biological sciences	5	Basic Research	
	1.7 Other natural sciences	1	Basic Research	

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

2. Engineering and Technology	2.1 Civil engineering	2	Applied Research	23
	2.2 Electrical engineering, Electronic engineering, Information engineering	4	Balanced basic and applied research	
	2.3 Mechanical engineering	0	-	
	2.4 Chemical engineering	0	-	
	2.5 Materials engineering	1	Basic Research	
	2.6 Medical engineering	9	Balanced basic and applied research	
	2.7 Environmental engineering	1	Basic Research	
	2.8 Environmental biotechnology	1	Basic Research	
	2.9 Industrial biotechnology	2	Basic Research	
	2.10 Nanotechnology	2	Basic Research	
	2.11 Other engineering and technologies	1	Basic Research	
3. Medical and Health Sciences	3.1 Basic medicine	3	Basic Research	53
	3.2 Clinical medicine	31	Basic Research	
	3.3 Health sciences	17	Basic Research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	2	Basic Research	0
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	
	4.4 Other agricultural sciences	0	-	
5. Social Sciences	5.1 Psychology and cognitive sciences	0	-	2
	5.2 Economics and Business	0	-	
	5.3 Education	1	Basic Research	
	5.4 Sociology	0	-	
	5.5 Law	0	-	
	5.6 Political science	0	-	
	5.7 Social and economic geography	1	Basic Research	
	5.8 Media and communications	0	-	
	5.9 Other social sciences	0	-	
6. Humanities and the Arts	6.1 History and Archaeology	0	-	0
	6.2 Languages and Literature	0	-	
	6.3 Philosophy, Ethics and Religion	0	-	
	6.4 Arts (arts, history of arts, performing arts, music)	0	-	
	6.5 Other Humanities and the Arts	0	-	
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

Position in the research community

FHS employees are highly recognised in their fields. A large number of them are employed at FHS, but also at health care providers or at renowned research institutions. Therefore, they have an ideal opportunity to pass on current information to students directly from practice. The professional portfolio of academic and scientific staff of FHS is really very broad. It mainly covers individual areas of medicine, non-medical fields, hygiene, electrical engineering, imaging systems in medicine, etc. In terms of the professional quality of its employees, FHS is on par with significantly larger faculties.

Individual and other prestigious R&D awards

Two prestigious awards were awarded in the evaluated period to doc. MUDr. David Astapenko, Ph.D., MBA. (see Table 3.2.1).

Participation of academic staff in editorial boards of international scientific journals

Not only the dean and vice-deans of FHS are members of editorial boards and scientific journals, but also other academic and scientific workers (see Table 3.2.2).

Elected memberships in professional societies

Elected members in professional societies from FHS are, for example, Dean Prof. MUDr. Karel Cvachovce, CSc., MBA, who is a member of the Committee of the Anaesthesiology Society, Vice-Dean prof. MUDr. Petr Suhomel Ph.D., who is a member of the committee of the Czech Neurosurgical Society and a member of the attestation examination committee for spondylosurgery and neurosurgery, MUDr. Petr Křepelka, Ph.D., who is a member of the Section for Contraception and Reproductive Health of the Czech Gynaecological and Obstetrical Society, Vice-Dean prof. Ing. Daniel Jiráček Ph.D., who is a member of the Czech Radiological Society and a member of the European Society for Molecular Imaging, prof. MUDr. Pavel Mohr, who was the Chairman of the Czech Psychiatric Society ČLS JEP in 2019-2022, or doc. MUDr. Igor Richter Ph.D., who is a member of the committee of the Czech Oncological Society. Doc. MUDr. Jaroslav Feyereisl, CSc. is the chairman of the Czech medial Chamber Departmental Commission for Gynaecology and Obstetrics, a member of the Medical Education Council of the Ministry of Health of the Czech Republic, an authorised commissioner of the EBCOG SCTR for the harmonisation of postgraduate education within gynaecology and obstetrics workplaces in the Czech Republic and the Slovak Republic and a member of the Committee of the European Society of Gynaecology and Obstetrics (EBCOG) - representative

for the Czech Republic. FHS employees are also members of scientific and branch councils at other universities.

The most important invited lectures of academic staff abroad

FHS academic staff are also invited to lectures at foreign institutions (see Table 3.2.3). Although, as mentioned above, activities in this area were affected by the COVID-19 pandemic, with very limited travel options in 2020 and 2021 and some conferences and workshops being cancelled or lectures taking place online.

The most important lectures by foreign scientists and other guests

Each year, FHS held its conference of non-medical fields on the theme of Multidisciplinary Cooperation in Non-Medical Health Fields, where the main aim was to establish cooperation and provide up-to-date information not only to students but also to members of professional teams. Foreign lecturers also participate in the conference, and a student scientific conference is organised at the same time. Therefore, in order to preserve the long-standing tradition of conferences, they also took place online in 2020 and 2021. Lectures by foreign scientists take place not only as part of the conference, but also as part of standard teaching (see Table 3.2.4). In 2021, FHS also organised the Trends in Biomedical Engineering conference. In the long term, FHS expects that holding its own scientific conference will contribute to the establishment of cooperation leading to the submission and successful acquisition of more international projects. FHS will continue to focus on this area in the following period.

Involvement in the evaluation of national or European project/programme calls

FHS employees are so recognised in their fields that some are also evaluators of project calls from the following listeners: Ministry of Education, Youth and Sports of the Czech Republic, Ministry of Health of the Czech Republic, Health Research Agency and Grant Agency of the Czech Republic

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
David Astapenko, doc., MUDr., Ph.D., MBA	Award of the Josef, Marie and Zdenka Hlávka Foundation	Foundation of Josef, Marie and Zdenka Hlávková
David Astapenko, doc., MUDr., Ph.D., MBA	Award of the Mayor of Hradec Králové for student creative activity	Municipality of Hradec Králové

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Věra Špatenková, MUDr., Ph.D.	BMC Neurology, ISSN 1471-2377, editor from 2023
Karel Cvachovec, prof., MUDr., CSc., MBA	Anaesthesiology and intensive medicine, ISSN 1214-215, member of the editorial board
David Astapenko, doc., MUDr., Ph.D., MBA	Anaesthesiology and intensive medicine, ISSN 1214-215, member of the editorial board
Petr Křepelka, MUDr., Ph.D.	Czech Gynaecology ISSN 1803-6597, member of the editorial board
Jana Loosová, Ing., Ph.D.	Hygiene ISSN 1210-7840, member of the editorial board

Petr Suchomel, prof., MUDr., Ph.D.	European Spine Journal, ISSN 0940-6719, Advisory Board Member
Petr Suchomel, prof., MUDr., Ph.D.	Czech and Slovak Neurology and Neurosurgery, ISSN 1210-7859, member of the editorial board
Jaroslav Feyereisl, doc., MUDr., CSc.	Modern gynaecology, ISSN 1211-1058, member of the editorial board
Jaroslav Feyereisl, doc., MUDr., CSc.	General practitioner, ISSN 1803-6597, member of the editorial board
Vladimír Černý, prof., MUDr., Ph.D., FCCM, FESAIC	Seminars in Cardiothoracic and Vascular Anaesthesia, ISSN 1089-2532, member of the editorial board

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Karel Cvachovec, prof., MUDr., CSc., MBA	Postoperative pain management in thoracoabdominal surgery	I8CCVA-ASCA, South Korea	2019
Jaroslav Šrám, MUDr. Ph.D.	Placas bioquedas para fracturas del anillo pelvico	LXIV Congreso Nacional de Ortopedia Y Traumatologia, Querétaro, Mexico	2019
Jana Prattingerová, MUDr.	Mandatory vaccination – The case for & against	NHS Foundation Trust 30th National Immunisation Conference for Health Care Workers, Manchester, UK	2019
Pavel Mohr, prof., MUDr., Ph.D.	Psychedelics revisited: therapeutic potential of pharmacological outcasts	EPA 2020, 28 th European Congress of Psychiatry (online).	2020
Marie Hubálek Kalbáčová, prof., RNDr., Ph.D.	Laboratory of interaction of cells with nanomaterials	Department of Biological Science and Technology, National Pingtung University of Science and Technology, Taiwan	2020
Renata Šimůnková, Mgr., Ph.D.	A contrastive study of means expressing necessity in English and Czech	"Modality, parallel corpora, translation" workshop, University of Neuchâtel, Switzerland	2021
Daniel Jiráček, prof., Ing., Ph.D.	Magnetic resonance and optical imaging of transplanted pancreatic islets	Molecular Imaging Centre, University of Bergen, Norway	2023
David Astapenko, doc., MUDr., Ph.D., MBA	Sepsis stewardship – The role of glycocalyx	13 th International Fluid Academy Days, Antwerp, Belgium	2023
David Astapenko, doc., MUDr., Ph.D., MBA	Approaches to glycocalyx protection – results from animal studies	3 rd world ESCHM JSCR ISB congress, Regensburg, Germany	2023
Tomáš Dudich, Mgr.	Single rescuer CPR and Trauma Guidelines in condition of Hungarian MRU	Ogólnopolska konferencja ratownictwa medycznego, Łódź., Poland	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Štefan Borik, doc., Ing. PhD. Patrik Průčka, Ing., Ph.D.	University of Žilina	Photoplethysmography imaging and its application in mapping the blood supply of subcutaneous tissue	2019
Jaroslav Madleňák, Mgr., PhD. Michaela Miertová, Mgr., PhD. Mgr. Ivana Bóriková, doc. PhD.	Comenius University in Bratislava	Analysis of risk factors for falling during hospitalization in patients with selected neurological diseases	2019
Jan Nikodem, dr, inž.	Technical University in Wrocław	POLTRIAGE system and computer medical simulation – safe teaching during the COVID-19 pandemic	2020
Andrea Ševčovičová, prof., RNDr., PhD.	Comenius University in Bratislava	Benefits of work from the point of view of retired nurses still active in the profession	2021
Lucia Dimunová, prof., PhD., PhD.	Pavel Jozef Šafárik University in Košice	Simulation technologies in nursing education	2021
Paweł Gawłowski PhD, EMT-P	Wrocław Medical University	The use of virtual reality and computer simulation to train personnel working at mass vaccination centres against COVID-19	2021
Edibe Pirincci, prof., Dr.	Firat University, Turkey	Problems associated with smoking and obesity	2021
Nestor Arana Arexolaleiba, prof.	Mondragon University, Spain	Signal processing	2022
Maroš Šmondrk, Ing., PhD.	University of Žilina	Numerical modelling of electromagnetic fields and their potential adverse effects on metal implants and tissues	2023
Branko Babušiak, doc., Ing., PhD.	University of Žilina	Modern trends in the sensing of electrical biosignals	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Aleš Richter, prof., Ing., CSc.	Expert Advisory Body for international projects, EUREKA – EUROSTARS international cooperation projects	Ministry of Education, Youth and Sports of the Czech Republic	2019-2023
Daniel Jiráček, prof., Ing., Ph.D.	Panellist of the Agency for Health Research of the Czech Republic, P08: Biomedical Technologies	Agency for Health Research of the Czech Republic	2019-2023
Petr Suchomel, prof., MUDr., Ph.D.	Chairman of the Ministry of Health accreditation commission for neurosurgery	Ministry of Health	2019-2023

Marie Hubálek Kalbáčová, prof. RNDr., Ph.D.	Panellist of the Grant Agency of the Czech Republic, P303: Cellular, developmental and evolutionary biology, regeneration and reproduction	Grant Agency of the Czech Republic	2020-2022

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the period of 2019–2023²³. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

FHS is characterised by a strong research potential focused on current issues in healthcare. Its scientific and research activities cover the fields of general nursing, medical rescue, biomedical technology, biomedical engineering and radiological assistance. FHS strives to systematically develop creative activity in cooperation with other faculties of TUL, health service providers and other research organisations, thereby contributing to innovation and improving the quality of healthcare. Below are several projects that FHS implemented or participated in during the period under evaluation. FHS strives to expand its scientific teams and will continue to do so for more research projects in the coming years.

1. SGS 2019 Cellular Imaging (2019, Ministry of Education, Youth and Sports of the Czech Republic)

The project focused on advanced cell imaging techniques to improve diagnosis and understanding of cellular processes. The result was the development of innovative methods allowing detailed analysis of cellular structures, which contributed to the progress of biomedical research. The project was implemented in cooperation with Masaryk University, specifically with the Centre for Cellular Imaging.

2. SGS-2020-7044 Use of shape memory materials and piezoelectric materials in biomedical sensors (2020, Ministry of Education, Youth and Sports of the Czech Republic)

The objective of the project was to apply shape memory alloys and piezoelectric materials in the construction of biomedical sensors. The result was the creation of sensitive and reliable sensors

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

for monitoring the physiological parameters of patients. The project contributed to the development of medical technologies and was implemented in cooperation with the Faculty of Mechatronics, Informatics and Interdisciplinary Studies of TUL.

3. SGS-2021-7004 Use of NiTi pressure sensors to determine the condition of a blood vessel (2021, Ministry of Education, Youth and Sports of the Czech Republic)

This project focused on the use of a nickel-titanium (NiTi) alloy in pressure sensors for assessing the condition of blood vessels. The developed sensors enable accurate measurement of the pressure inside the blood vessels, which helps in the early diagnosis of vascular diseases. FHS collaborated on the implementation of the project with the Faculty of Mechatronics, Informatics and Interdisciplinary Studies of TUL.

4. SGS-2022-7032 Use of NiTi sensors for bedside patient monitoring (2022, Ministry of Education, Youth and Sports of the Czech Republic)

The objective of the project was to implement NiTi sensors for monitoring the position and movement of patients on beds. The developed system improves patient care by providing medical staff with accurate information about the patient's position, which is key to preventing bedsores and other complications. FHS cooperated on the implementation of the project with other TUL components.

5. SGS-2023-7332 Design of a device for sensing the electromagnetic fields of patients with pacemakers (2023, Ministry of Education, Youth and Sports of the Czech Republic)

The project focused on developing a device capable of detecting electromagnetic fields in pacemaker patients. The developed device makes it possible to monitor the proper functioning of the pacemaker and detect possible interferences, thereby increasing the safety of patients. FHS cooperated on the implementation of the project with other TUL components.

These projects have not only produced significant scientific findings, but have also had a direct impact on the improvement of health care and technological advancements in biomedical engineering.

6. TL03000205 Personal learning environment of higher education medical students (2020-2023, Technology Agency of the Czech Republic)

This project focused on the development and implementation of a personalised learning environment for medical students. The aim was to increase the effectiveness of learning through individually adapted educational tools and methods. The project contributed to the modernisation of teaching in medicine and was carried out in cooperation with the Prague University of Medical Sciences, the Centre for the Study of Higher Education and the Association of Professional Tertiary Education.

7. TP01010031 Verification of the properties of the UV robotic system for applications in medical facilities, within the project PROSYKO - Proactive system of commercialisation at TUL (2021-2022, Technology Agency of the Czech Republic)

The objective of the project was to develop and verify the effectiveness of a UV robotic system for disinfection in medical facilities. The result was the creation of an automated system capable of effectively eliminating pathogens, which contributed to increasing hygiene standards in the healthcare sector. The project was implemented in cooperation with Regional Hospital Liberec (Krajská nemocnice Liberec a.s.).

Academic staff were also involved in cooperation in the following projects:

- Technology Agency of the Czech Republic Intelligent Health Promotion Service System, IHPSS, Technology Agency of the Czech Republic TM03000048 (Embitron, s.r.o., Czech Institute of Informatics, Robotics and Cybernetics, Czech Technical University in Prague, Faculty of Mechatronics, Informatics and Interdisciplinary Studies TUL)
- Agency for Health Research of the Czech Republic Catheter ablation vs. modification of risk factors, 2021-2024 (Krajská nemocnice Liberec a.s., 3rd Faculty of Medicine of Charles University, Faculty Hospital of Královské Vinohrady)
- H2020 EU Networking for Research and Development of Human Interactive and Sensitive Robotics Taking Advantage of Additive Manufacturing, no. 857061, R2P2 (Université Toulouse Paul Sabatier in France, Institut national polytechnique de Toulouse in France, Mondragon University in Spain, Aalborg Universitet in Denmark)
- Grant Agency of the Czech Republic Lens-free tomography of transparent materials with super-high resolution (fi TOPTEC), VH2017202, 2019-2021
- Technology Agency of the Czech Republic GAMA 2 PROSYKO, 2021-2022, TP01010031 (Institute for Nanomaterials, Advanced Technologies and Innovations TUL)
- Agency for Health Research of the Czech Republic Ministry of Health Treatment of diabetic wounds using nanofibrous dressings releasing platelet lysate components, No. NV18-01-00332, 2018-2021 (Institute of Physiology of the Academy of Sciences of the Czech Republic)
- Technology Agency of the Czech Republic An integrated solution in intensive care for monitoring the effect of positioning on lung function in real time, FW01010679, 2020-2022,
- PROGRESS Q34-LF3 Comprehensive study of selected complications related to the pathological course of pregnancy, 2017-2021
- Agency for Health Research of the Czech Republic Use of high-frequency ECG to predict negative left ventricular remodelling during chronic cardiac pacing, 2021-2024

In the framework of its project activities, FHS actively engages young talents, thereby supporting their professional growth and bringing new perspectives to research. FHS is aware of its unused potential in the form of staffing, where a certain percentage of experts work on projects for other institutions. In order to increase the number of acquired projects in the next period, FHS has strengthened its staffing with the position of a project manager, who provides academic staff with information about grants and helps with the preparation of project applications, and the position of an independent researcher with long-term experience in the field of biomedicine.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Support (in thousands CZK/EUR) ²⁶				
		2019	2020	2021	2022	2023
Ministry of Education, Youth and	Cellular imaging	95.2 /3.8				

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

Sports of the Czech Republic (SGS)						
Ministry of Education, Youth and Sports of the Czech Republic (SGS)	The use of materials with shape memory (smart) and piezoelectric materials in biomedical sensors		80.1 /3.2			
Ministry of Education, Youth and Sports of the Czech Republic (SGS)	Use of NiTi pressure sensors to determine the state of the blood vessel			75 /3		
Ministry of Education, Youth and Sports of the Czech Republic (SGS)	Use of NiTi sensors for monitoring recumbent patients				75 /3	
Ministry of Education, Youth and Sports of the Czech Republic (SGS)	Design of a device for sensing the electromagnetic fields of patients with pacemakers					120.8 /4.8
Total		95.2 /3.8	80.1 /3.2	75 /3	75 /3	120.8 /4.8
In the role of another participant						
Provider ²⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Technology Agency of the Czech Republic	Personal learning environment of higher education medical students.		168.9 /6.7	421.3 /16.6	401.3 /15.8	237.1 /9.4
Technology Agency of the Czech Republic GAMA	Verification of properties of a UV robotic system for applications in healthcare facilities			225.4 /8.9	397.5 /15.7	
Total		0 /0	168.9 /6.7	646.7 /25.5	798.8 /31.5	237.1 /9.35

²⁷ Ibid.

Table 3.3.2 - Contract research activities

Client ²⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Total		0	0	0	0	0

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

In the period under evaluation 2019–2023, a total of 112 results were created at FHS (most were impactful articles).

FHS mainly operates in the areas connecting medicine and technology. Therefore, the results of its work have a very positive impact on society. An example can be the prototype called Verification of the Properties of a UV Robotic System for Applications in Medical Facilities, which is the result of extensive research performed within the Technology Agency of the Czech Republic GAMA project **Verification of the Properties of a UV Robotic System for Applications in Medical Facilities**. It is a prototype of a UV automated robotic system that serves to effectively eliminate pathogens and was developed in cooperation with the Regional Hospital Liberec (Krajská nemocnice Liberec a.s.), and EMBITRON s.r.o. The system will be used to disinfect hard-to-reach places in operating theatres and places with high demands on environmental asepticity. The request for a robotic UVC lamp came directly from doctors in operating rooms.

FHS also closely cooperates with the Institute of Clinical and Experimental Medicine. Their joint research deals with the development of adjustable radiofrequency coils for magnetic resonance imaging and the development of new contrast agents for this imaging. In the future, these efforts lead to the possibility of improving the quality and accessibility of examinations using this imaging method, and thus can significantly increase the level of health care provided. Results of this collaboration are: the **prototype Dual 1H/19F radio frequency coil for magnetic resonance**

²⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

²⁹ See Terms definition.

imaging, which was preceded by the patent 307591 Adjustable radio frequency coil, which was evaluated as excellent by the International Evaluation Panel.

An example of inter-faculty cooperation is the **functional prototype Modular Platform for Autonomous Chassis of Specialised Electric Vehicles for Transporting Cargo and Equipment - Generation 0**, which was developed by a research team composed of scientists and students of four faculties. The autonomous modular electric platform is equipped with its own vision and senses, which can move by itself and avoid obstacles. It is an electric vehicle for special transport, which will help people and increase their safety during a wide range of activities (use for transporting cargo, aids, equipment, assistance services for disabled people, etc.). The functional sample of a modular platform with autonomous elements, designated as Generation 0, moves by itself and reacts to obstacles and is intended for large halls, warehouses, buildings, laboratories. This functional sample was rated as top by the International Evaluation Panel.

FHS mainly focuses on basic research, but certainly also sees potential in the field of application, especially in the areas of public health, improving the quality of medical and nursing care and imaging and robotic systems, magnetic resonance, biomedical applications.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ³⁰	Year of application	Name
Prototype	2020	Dual 1H/19F radio frequency coil for magnetic resonance imaging
Functional sample	2021	Surface NiTi strain gauge for biomedical application
Functional sample	2023	Organiser for cryopreservation in containers GT26.
Prototype	2023	Verification of the properties of a UV robotic system for applications in medical facilities
Functional sample	2023	A modular platform for autonomous chassis of specialised electric vehicles for transporting cargo and equipment - Generation 0

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

³⁰ Specify the specific type of result. Add rows as needed.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³²

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

FHS focuses on the effective transfer of scientific and research results into practice through active cooperation with application partners (health care institutions, industrial companies, universities).

Examples of the transfer of results into practice include:

- Design, testing, and application design of radio frequency coils for magnetic resonance (MR) imaging
- Design and testing of sample holders for optical imaging
- Development of software for analysis of image and relaxometric data from MR and spectroscopy
- Performing biological tests (determining the toxicity of various polymers and nanoparticles developed within TUL on cell lines)
- Consultation and testing of the electromagnetic compatibility of cardiac pacemakers, evaluation of critical places in the healthcare sector (e.g., in MR environments, linear accelerators, during electrostimulation, etc.), in everyday life in areas of strong electromagnetic fields
- Development and clinical verification of the application of assistive systems (mobile multi-axis robotic platforms) during disinfection using UV radiation.
- Testing of robotic platforms for possible use in physiotherapy and nursing
- Testing the assistive system for the locomotion of recumbent patients

FHS presents the results in professional publications. It also supports its employees in active participation in national and international trade fairs and conferences.

³¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³² If the commercialisation of R&D&I results is carried out in this way.

The most typical users of the results are health service providers. Examples of cooperation:

- Cooperation with the Institute of Clinical and Experimental Medicine - with the experimental department in the development of coils optimised for specific applications (prototype - dual 1H/19F radiofrequency coil for magnetic resonance imaging)
- Cooperation with Regional Hospital Liberec (Krajská nemocnice Liberec a.s.) – clinical verification of the robotic UV platform during disinfection of ENT operating theatres (prototype – verification of the properties of a UV robotic system for applications in medical facilities)
- Cooperation with Regional Hospital Liberec (Krajská nemocnice Liberec a.s.) – clinical verification, preparation of the approval process of the State Institute for Drug Control of the assistive system, physiotherapy – locomotion training of recumbent patients.
- Cooperation with Regional Hospital Liberec (Krajská nemocnice Liberec a.s.) – mapping of strong electromagnetic fields in radiology, identifying risks with regard to electrostimulation in cardiology

FHS searches for new users in the following ways:

- Monitoring the needs of the application sphere at trade fairs and professional conferences (e.g., INTEGRA 2024 Linz, Embitron, Therap Tilia, etc.)
- Cooperation with university technology centres (e.g., Czech Institute of Informatics, Robotics and Cybernetics)
- Direct contact with medical technology manufacturers and healthcare providers (Embitron, Therap Tilia).

FHS is active both in research activities and in communication with health service providers and listens to their requirements for development and innovation in the field of improving the quality of life, etc. FHS is also actively searching for potential new users. FHS expects more transfer of its results into practice in the next evaluation period.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Total	0	0	0	0	0

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

Due to the focus of FHS, its main focus in the area of communication with the general public is events that increase public awareness in various areas of healthcare.

1/ Professional events

- Organisation of first aid courses for TUL employees
- Annual conference of non-medical fields on the theme Multidisciplinary cooperation in non-medical health fields
- Independently or in cooperation with Regional Hospital Liberec annual organisation of educational activities and information campaigns on the topic (e.g., World AIDS Day, Stroke Day, Nurses' Day, Hypertension Day, etc.).

2/ Popularly oriented events

- Annual active participation in the nationwide event Researcher's Night;
- Events for children of preschool age in the form of entertainment-educational programmes (focused on proper brushing of teeth, safe movement near water, etc.)
- Education of the general public in the field of operation of automatic external defibrillators and provision of indirect cardiopulmonary resuscitation during open days and other promotional events

3/ Events for students

- Organisation of project days for secondary school students within the framework of the NAKAP II project. (Implementation of the regional action plan for the development of education in the Liberec region II) on the themes of "Medical rescue & following the traces of bacteria" and "Technology in medicine";
- Courses for TUL Children's University in the field of biomedicine and first aid.

4/ Events for graduates

- Annual active participation in the nationwide event Researcher's Night;

5/ Popularisation and communication

- Social networks: Instagram, Facebook, etc.

FHS also received very positive feedback on the practical demonstrations of its patient simulators and the ambulance simulator, where the general public is introduced to basic life-saving interventions. Simulators are also used in simulation teaching, which is the future of teaching, especially in the fields of nursing and rescue.

FHS is active in communication with the public, involves students in this activity and has very positive feedback in this area.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Recommendation:

1. Increasing the number of results in relation to other faculties

FHS succeeds in increasing the number of results of scientific and research activities. In 2023, 17 articles were published in journals listed in the Web of Science database (i.e., impact articles) with one or more authors affiliated with FHS. In contrast, In 2022 the number of articles was 16, in 2021 it was 14, in 2020 it was six and in 2019 it was five.

2. Cooperation on international projects

Unfortunately, in the period under evaluation, international cooperation and the mobility of scientific and research workers in general was very negatively affected by the worldwide COVID-19 pandemic. On the other hand, both the academic and applied spheres have shifted a lot in online communication. FHS strives to support the kind of international cooperation among its employees that results in the successful submission of international projects. During the period under evaluation, FHS submitted applications for projects, which, however, were not supported due to the large number of applications received.

3. Cooperation on inter-faculty projects, especially in the field of nursing and health sciences

FHS was awarded the Technology Agency of the Czech Republic project Verification of the Properties of a UV Robotic System for Applications in Medical Facilities, and in 2023 FHS took steps that led to the successful acquisition of the Technology Agency of the Czech Republic SIGMA 2024 project Degradable Sandwich Fibre Hydrogels for Moist Healing of DIFFICULT-TO-HEAL WOUNDS and the Technology Agency of the Czech Republic SIGMA project FibGels Degradable Sandwich Fibrous Hydrogels for Moist Healing of Difficult-To-Heal Wounds. In order to establish further international cooperation, a Blended Intensive Programme (2022-1-CZ01-KA131-HED-000063506-2) on the theme "Assistive technology in medicine" was implemented at FHS in 2024, which was intended for students in the upper years of the Biomedical Technology Bachelor's programme and had two parts: virtual (March 2024), during which three introductory theoretical lectures took place online, and physical (April 2024), when students participated in five different workshops in five days. A total of 30 students participated in the programme (10 students from the University of Žilina, 10 from the Berufsakademie Sachsen in Bautzen and 10 from FHS). Theoretical lectures and practical workshops were led by representatives of all three universities.

4. In the R&D strategy, include procedures for the use of research results within the health care system

The legislative and organisational framework ensures the revision of the Directive of the Rector No. 2/2015 on the protection of intellectual property at the Technical University of Liberec and on the commercialisation of science and research results. At the same time, the conditions of clinical research must be observed. Procedures such as approval by the Ethics Commission are in most cases, if they concern patients, performed in cooperation with healthcare facilities, which ensure this

approval. Experiments are conducted at FHS only with volunteers. In all these cases, GDPR personal data protection is ensured and specific results are not made public.

FHS strived to implement the recommendations for module 3. Many of its activities will be more visible in the longer term. Inter-faculty cooperation takes place e.g., in the areas of design and testing of sample holders for optical imaging, in the testing of electromagnetic compatibility of pacemakers, in the development and clinical verification of the application of assistive systems (mobile multi-axis robotic platforms), in disinfection using UV radiation, or in the testing of an assistive system for the locomotion of recumbent patients.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
FHS TUL website	3.1-3.7	https://www.fzs.tul.cz/en/
Personal Policy of FHS TUL 2022–2025, +2030	3.1, 3.7	https://www.fzs.tul.cz/en/document/1971
RDI Strategy of FHS TUL +2030	3.2, 3.3	https://www.fzs.tul.cz/en/document/1973
Strategic Plan of FHS TUL 2021–2025, +2030	3.1	https://www.fzs.tul.cz/en/document/1972
Research of FHS TUL	3.2	https://www.fzs.tul.cz/en/research

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Institute for Nanomaterials, Advanced Technologies and Innovations

FORD: 1 - Natural sciences

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Self-assessment:

Institute for Nanomaterials, Advanced Technologies and Innovations (CXI) was founded in 2009 as part of the ESF project "Centre for Nanomaterials, Advanced Technologies and Innovations. Its development continued as part of the project "Development of the Institute for Nanomaterials, Advanced Technologies and Innovations" (R&D&I project, 2014-2018, subsidy of over 7 million €). Since 2012, it has been operating in the newly built building L.

Mission and vision of CXI

- **Our mission** is, based on quality research and development, to transfer innovations to real life to solve specific issues important for public health, the environment, technological progress, and the economic development of enterprises. As part of TUL, we also strive to develop human potential, education, and the prosperity of society. Therefore, CXI contributes to educating a new generation of scientists and experts, raising public awareness of science, and developing scientific literacy.
- **Our vision** is to be an internationally respected workplace in the natural and technical sciences, specifically in water and environmental protection, additive technologies, and the application of modern IT methods, including AI. To fulfil this vision, we create scientific and technical solutions that respect environmental and social needs, develop technologies that change traditional ways of production, and introduce modern IT technologies. We cooperate with partners in the CR, the EU, and worldwide to build an open scientific environment and support creativity and excellence.

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

Inclusion of CXI in FORD and research activities

Due to the broad portfolio of our activities, it was not easy to include CXI in a single FORD. From the point of view of the number of projects and the profile of the scientists, the predominant research activities are in FORD 1 (Natural Sciences) in applied research, followed by industrial development, and basic research is third. In the following period, we want to support more activities from FORD 1 based on basic research (new findings from chemistry, physics, and biology and their subsequent application with the help of modern IT methods, environmental issues and sustainability).

Main activities of CXI in the period under evaluation

In 2019, as the sustainability period of the R&D&I project ended in 2018, it opened up the possibility of changing the direction of CXI's organizational structure. The changes, also recommended by the IEP's, aimed to provide individual departments with a clear, objective, and comprehensive professional profile and eliminate the existing overlaps in the scientific focus. The changes also aimed to reduce significant disproportions in their size. A third Research direction, "System Integration)" was added to the original two. The introduction of the third research direction was initiated by the growing need for IT expertise. Some of this expertise is provided for other organs of TUL (for example, the information system Grants and Projects - GaP). Financially, a new model of central handling of overhead funds at the CXI level was applied to support cooperation and limit competition between CXI departments. The research directions gained more importance in the following years (direct management), leading to a better focus on the strategic themes of the development of the research directions and the entire CXI (per the IEP recommendation). At the end of the period under evaluation, 164 people worked at CXI, with the share of women being 51%. CXI regularly employs around 25 Ph.D. students from TUL doctoral programs and other universities.

In March 2020, CXI received the HR Excellence in Research award. This year, the EU project LIFEPOPWAT started, the first EU research project in which CXI was the principal investigator. This project results from an effort based on the IEP's recommendations to acquire significant projects in the role of a principal investigator.

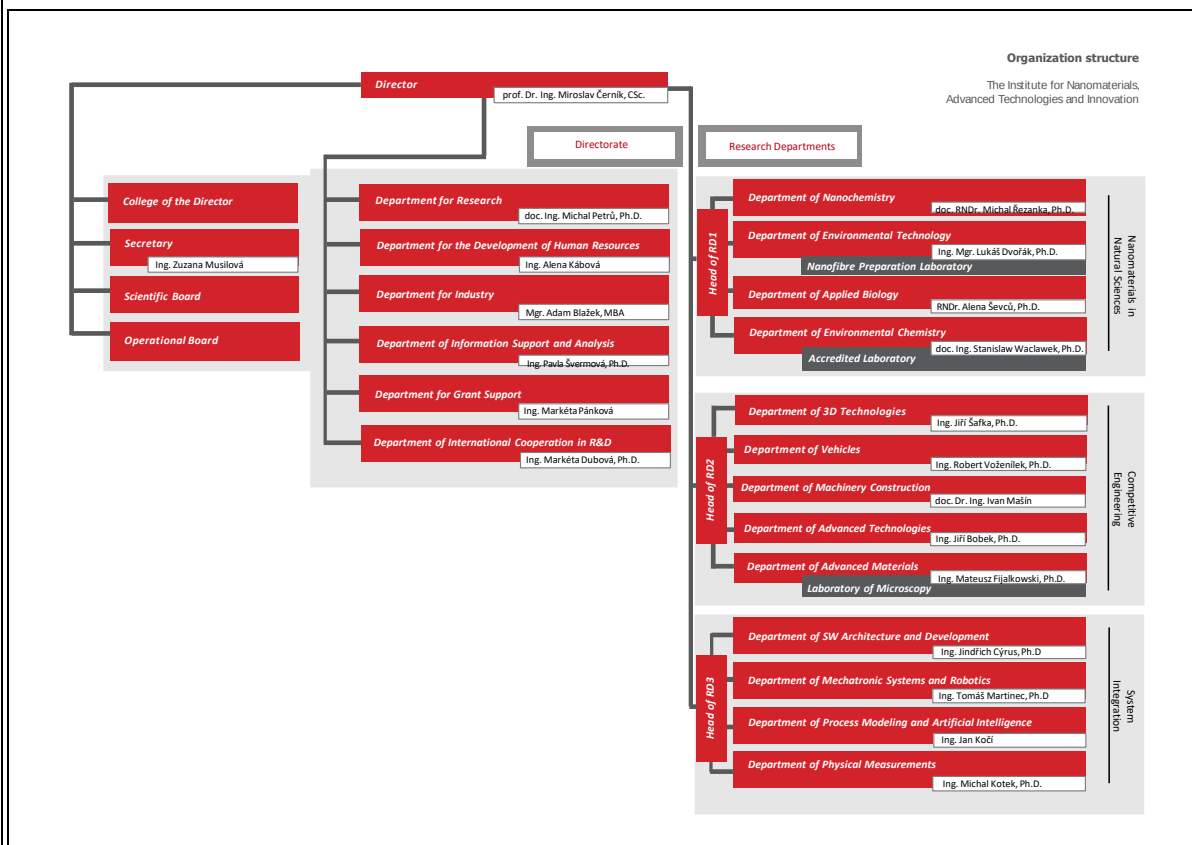
Since 2021, the new Director of CXI has been Prof. Dr. Ing. Miroslav Černík, CSc. A department for international cooperation in R&D was created to intensify the submission of international projects.

In 2022, CXI was awarded the "National Centre of Competence for Industrial 3D Printing" project. This activity also results from the IEP's recommendations, i.e., to acquire significant projects in the role of a leading researcher and, on the other hand, to intensify interactions with OEMs for a clear long-term strategy of CXI. A centre for the efficient use of raw materials, their recycling, and the use of waste natural and synthetic materials in production was established in Liberec. TUL faculties are also significantly involved in the project, again in line with the IEP's recommendation. Subsequently, a new research department called the Department of 3D Technologies was created.

In 2023, the Department of Information Support and Analysis was established to expand activities to include evaluation in the context of economic, environmental, and social responsibility. The department cooperates with the Faculty of Economics of TUL. Another essential cooperation with international partners took place through the OP R&DI project "International Research Laboratories," which led to the creation of joint research workplaces with the University of Girona and with two Fraunhofer Institutes, IWU and IMWS. Also, a project in the Horizon Twinning call, SURRI (Sustainable Remediation of Radionuclide Impacts on Land and Critical Materials Recovery) started.

Organisational structure

At the end of 2023, CXI had six directorate departments and 13 research departments divided into three research directions.



Self-reflection on the social contribution of CXI in R&DI in individual areas:

1. **High scientific contribution** is demonstrated by the research results (932 results in total, and 151 out of 471 impacted papers were in Q1 journals, respectively).
2. CXI **significantly impacts society** by developing technologies in the field of environmental improvement; CXI also emphasizes social responsibility by preparing CSR reports.
3. **The economic impact of CXI on society** is in very intensive cooperation with industry (654 partners).
4. **Education and development of human resources** are provided through cooperation with TUL faculties and the employment of doctoral students to solve R&D tasks.
5. **The CXI's ethical standards and gender issues** were confirmed by the HR Award that was received.
6. CXI actively **popularizes science for the public** and cooperates with public institutions.

Table 3.1.1 - Staffing per FTE²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	2.78/0.00	2.70/0.00	2.68/00.00	2.55/0.00	1.40/0.00	12.11/0.00
Associate Professor	9.25/1.93	8.53/1.60	7.01/1.12	5.77/1.33	6.09/1.30	36.65/7.28
Assistant Professor	40.80/13.18	42.77/14.64	40.51/13.38	38.09/12.32	33.49/10.94	195.66/64.46
Assistant						
R&D Personnel ³	34.97/18.65	40.75/19.47	34.54/17.87	36.89/18.40	31.61/16.11	178.76/90.50
Researchers in other categories ⁴	46.31/22.15	44.40/19.94	43.86/22.05	44.27/22.39	32.74/16.09	211.58/102.62
Technical and economic staff ⁵	30.06/28.75	32.62/30.97	29.70/28.36	28.60/26.90	25.45/25.45	146.43/140.43
Scientific, research and development staff involved in teaching activities						
Early career researchers ⁶	23.68/8.82	22.46/8.19	20.15/6.69	19.71/8.86	17.29/5.72	103.29/38.28
Total ⁷	164.17/84.66	171.77/86.62	158.30/82.78	156.17/81.34	130.78/69.89	781.19/405.29

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁵ Who participates in the management and support of R&D&I in the institution.

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor							1	0	2	0	1	0
Associate Professor			3	0	4	1	2	1	5	0		
Assistant Professor			42	12	13	5	5	1				
Assistant												
R&D Personnel ⁹	8	3	12	7	9	5	3	2	4	2		
Researchers in other categories ¹⁰	9	5	36	17	8	3	4	2	2	0		
Technical and economic staff ¹¹	1	1	20	19	13	12	2	1				
Scientific, research and development staff involved in teaching activities												
Early career researcher ¹²			35	10	3	1	2	0				
Total ¹³	18	9	113	55	47	26	17	7	13	2	1	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (excluding persons working on agreement on work activity or agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

¹² See Definition of Terms in Methodology HEI2025+.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor							1	0			1	0
Associate Professor			3	1	4	2	1	0	3	0		
Assistant Professor			21	9	20	6	5	3	1	0		
Assistant												
R&D Personnel ¹⁵	6	1	10	7	12	4	2	2	3	2	1	0
Researchers in other categories ¹⁶	5	2	21	8	10	6	3	0				
Technical and economic staff ¹⁷			10	10	18	17	3	3				
Scientific, research and development staff involved in teaching activities												
Early career researcher ¹⁸			20	6	3	1	2	2				
Total ¹⁹	11	3	65	35	64	35	15	8	7	2	2	0

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

¹⁴ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (excluding persons working on agreement on work activity or agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate												
Master's ²⁰												
Doctoral												
Lifelong Learning Courses												
Total												

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate												
Master's												
Doctoral												
Lifelong Learning courses												
Total												

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	0	-	36
	1.2 Computer and information sciences	3	Applied Research	
	1.3 Physical sciences	3	Applied Research	
	1.4 Chemical sciences	15	Applied Research	
	1.5 Earth and related environmental sciences	11	Balanced basic and applied research	
	1.6 Biological sciences	3	Applied Research	
	1.7 Other natural sciences	1	Applied Research	
2. Engineering and Technology	2.1 Civil engineering	2	Applied Research	61
	2.2 Electrical engineering, Electronic engineering, Information engineering	3	Applied Research	
	2.3 Mechanical engineering	8	Applied Research	
	2.4 Chemical engineering	2	Balanced basic and applied research	
	2.5 Materials engineering	23	Balanced basic and applied research	
	2.6 Medical engineering	1	Applied Research	
	2.7 Environmental engineering	6	Balanced basic and applied research	
	2.8 Environmental biotechnology	2	Balanced basic and applied research	
	2.9 Industrial biotechnology	1	Applied Research	
	2.10 Nanotechnology	8	Balanced basic and applied research	
	2.11 Other engineering and technologies	5	Applied Research	
3. Medical and Health Sciences	3.1 Basic medicine	1	Applied Research	2
	3.2 Clinical medicine	0	-	
	3.3 Health sciences	1	Applied Research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0	-	1
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	

	4.4 Other agricultural sciences	1	Applied Research	
5. Social Sciences	5.1 Psychology and cognitive sciences	0	-	0
	5.2 Economics and Business	0	-	
	5.3 Education	0	-	
	5.4 Sociology	0	-	
	5.5 Law	0	-	
	5.6 Political science	0	-	
	5.7 Social and economic geography	0	-	
	5.8 Media and communications	0	-	
	5.9 Other social sciences	0	-	
6. Humanities and the Arts	6.1 History and Archaeology	0	-	0
	6.2 Languages and Literature	0	-	
	6.3 Philosophy, Ethics and Religion	0	-	
	6.4 Arts (arts, history of arts, performing arts, music)	0	-	
	6.5 Other Humanities and the Arts	0	-	
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Self-assessment:

CXI was established as a regional centre for cooperation between academia and local industry. In the 12 years of its existence, it has gained a significant position in the research community both in the Czech Republic and abroad. This can be demonstrated by the number of cooperating academic as well as industrial entities (also from abroad), the volume and number of contractual relationships and R&D projects (including projects in the role of project leader, as well as international projects), but also by CVI's involvement in other activities. CXI had 471 scientific papers recorded in RIV database in 2019–2023, and of these, 8 % were papers in the first decile and 32 % in the first quartile of the most cited papers Q1. According to WOS, 9.4% belong to the top 10% of WOS cited papers and 1.3% belong to the top 1% of cited papers. Most of the CXI publications were prepared in international cooperation (77%). Four of the 10 most cited authors from TUL (according to WOS) worked at CXI during the period under evaluation, namely Miroslav Černík, Stanislaw Waclawek,

Vinod Padil, and Ivan Stibor. From the tabular evaluation of CXI below and other recognitions, we have selected ten items characterising the diversity of activities in this area.

1. Individual awards

In 2021, Ondřej Havelka received the Award of the Minister of Education, Youth and Sports for the year 2021 for his results obtained by synthesising advanced nanoparticles using pulsed lasers. The aim of his research is to prevent the development of superbacteria, which are becoming a major issue in medicine. Metal nanoparticles are used to fight these bacteria. The preparation of effective nanoparticles using laser synthesis is a more modern and effective method compared to their preparation by chemical synthesis methods.

2. Participation on editorial boards of international journals

Members of the CXI team regularly participate on the editorial boards of journals and special issue journals. An example is the journal Ecological Chemistry and Engineering S, where long-term members of the editorial board are Miroslav Černík, Stanislaw Waclawek, Vinod Padil, and Alena Ševců as section editors (Scienco, Opole, Poland).

3. Participation on conference organisation committees

Miroslav Černík is a long-term member of the Programme Committee of the international conference Nanocon (www.nanocon.eu), one of the most prestigious conferences on the theme of nanomaterials in the Czech Republic. The conference is attended by scientists not only from the Czech Republic, but to a large extent from abroad as well. The conference is also an opportunity for young scientists to present their results and compete for the award for young scientists.

4. Elected memberships in professional societies

Members of CXI are involved in various professional societies. An example is Lukáš Dvořák, who has been a member of the Board of Directors of the Czech Membrane Platform (CMP) since 2023. CMP is an association of enterprises and institutions dealing with membrane technologies, their research and applications.

5. Lectures by CXI academic staff abroad

CXI staff participate in many international conferences, where they present the results of their work and look for partners for joint research activities. An example can be the organisation of a special section at the 14th International HCH & Pesticides Forum conference (Zaragoza, Spain, 2023), where the LIFEPOPWAT project was presented and Miroslav Černík and Jan Němeček were section chairs (<http://www.hchforum.com/schedule/>).

6. Lectures by academic staff at CXI

At the invitation of CXI and Faculty of Science, Humanities and Education (FSHE), Jean-Marie Lehn, winner of the Nobel Prize for Chemistry in 1987 came to TUL. He received the Nobel Prize together with Donald J. Cram and Charles J. Pedersen for the discovery of synthetic macrocyclic compounds with selective properties for binding ions and molecules. As part of his visit (28 June 2019), he gave a lecture on “Chemistry for life”, about the laws of living matter and the universe, as well as the responsibility of science. He talked about the milestones in the field of chemistry from antiquity to the present day and emphasised mainly the theories of philosophy and science that clarified the composition of matter from particles and elements. Jean-Marie Lehn also toured the CXI laboratories and held discussions with the institute’s management and staff.

7. Involvement in the evaluation of GACR calls

In the period under evaluation, Alena Ševců, Miroslav Černík and Michal Petrů were members of GACR evaluation panels. Since 2021, Alena Ševců has been active on panel P504 “Landscape Management, Forestry and Soil Biology, Ecosystem Ecology” and Miroslav Černík on panel P108 “Materials Science and Engineering”. As of 2022, Michal Petrů is a member of panel P101 “Mechanical Engineering”.

8. Other services for the scientific community – National repository

CXI team is part of the MATECH working group, which has the task of coordinating the preparation of the National Repository (NRP) for open data within the framework of EOSC-CZ, solving specific metadata requirements for the field of materials science. Within national project OpenScience1 (OS1), CXI as part of the team of the ASCR coordinator solves sub-tasks ensuring the automation of data collection and storage from instruments to NRP. Data Driven Research (DDR) system developed at CXI should become a solution that will be available to the scientific community as an open source (data standard).

9. Responses to scientific articles

Most cited scientists: Vinod Padil, Fatma Yalcinkaya, and Stanislaw Wacławek were featured in 2% of the world’s most cited scientists by a group of authors associated with PLoS Biology, Elsevier, and Stanford University in 2021, 2022, and 2023, respectively.

10. Methodology M17+

Miroslav Černík is (and was for the entire period 2019-2023) a member of Expert Panel 2 “Engineering and Technology” within the “Methodology of evaluation of research organisations and evaluation of targeted support programmes for research, development and innovation”. He was and still is a panellist in field 2.11. “Nanotechnology”, and is responsible for the preparation of a field commentary on bibliometric data on the position of nanotechnology in the Czech Republic in an international comparison.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit’s staff member	Name of the award	Awarding institution
CXI	HR Excellence in Research award	European Commission
Ondřej Havelka, Ing.	Czech Minister of Education Award in higher education, science and research - 2019	Ministry of Education, Youth and Sports
Ondřej Havelka, Ing.	Czech Minister of Education Award in higher education, science and research - 2023	Ministry of Education, Youth and Sports
Fatma Yalcinkaya, doc., Ph.D., M.Sc.	2% top scientists in various disciplines, released by Stanford University and published by Elsevier for the years 2019, 2020, 2021, 2022, and 2023.	Stanford University, Elsevier
Muhammad Tayyab Noman, Ph.D.	Young Scientist Award for the year 2019	International Association of Advanced Materials (IAAM)
Michal Petrů, doc., Ing., Ph.D.	Regiostars 2023 - project award Project OP R&DI CZ.02.1.01/0.0/0.0/16_025/0007293 selected by the European Commission among the 30 best completed projects in Europe that were supported by European funds. The project was in the final of the prestigious “Regiostars 2023” competition.	European Commission

Vinod Padil, Dr., MSc., Ph.D.	2% of the World's most cited scientists by a group of authors associated with PLoS Biology, Elsevier, and Stanford University in 2021, 2022, and 2023, respectively	Stanford University, Elsevier
Stanislaw Waclawek, Dr. hab., Ing., Ph.D.	2% of the World's most cited scientists by a group of authors associated with PLoS Biology, Elsevier, and Stanford University in 2021, 2022, and 2023, respectively	Stanford University, Elsevier
Hadi Taghavian	Student Lecture Presentation Award at the International Conference for Membrane and Electromembrane Processes	MELPRO 2022
Stanislaw Waclawek, Dr. hab., Ing., Ph.D.	Publons 2019 award: Top reviewers in Environment and Ecology – September 2019 and Top reviewers in Cross-Field – September 2019.	Publons, Web of Science Group
Jiří Šafka, Ing., Ph.D.	Technology Agency of Czech Republic 2022 award in the "Partnership" category for cooperation on the National Centre of Competence project for materials, advanced technologies, coatings and their applications, TN01000038	Technology Agency of the Czech Republic

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Stanislaw Waclawek, Dr. hab., Ing., Ph.D.	Desalination and Water Treatment, ISSN: 1944-3986
Michal Řezanka, doc., RNDr., Ph.D.	Advances in Organic Synthesis of Functionalised Nanomaterials and Their Application, MDPI Materials, ISSN: 1996-1944 (Guest Editor, Special issue)
Fatma Yalcinkaya, doc., Ph.D., M.Sc.	Advanced Nanofibers: Production, Characterization, and Applications, Journal of Engineered Fibers and Fabrics, ISSN: 1558-9250.
Mateusz Fijalkowski, Ing., Ph.D.	Advances in Nanomaterials and Coatings for Solar Cells, MDPI Coatings, ISSN: 2079-6412, (Guest Editorial for the special issue)
Alena Ševců, RNDr., Ph.D.	Frontiers in Toxicology, ISSN 2673-3080.
Alena Ševců, RNDr., Ph.D. Stanislaw Waclawek, Dr. hab., Ing., Ph.D. Vinod Padil, Dr., MSc., Ph.D. Miroslav Černík, prof., Dr., Ing., CSc.	Ecological Chemistry and Engineering S (ECE S), ISSN 1898-6196, ISSN 2084-4549 (Online).
Vinod Padil, Dr., MSc., Ph.D.	Polymer Materials in Environmental Chemistry, Polymers Journal, ISSN: 2073-4360 (Guest Editorial for the special issue)
Rafael Torres, doc., Ing., Ph.D.	Chemical Engineering Journal, ISSN: 1385-8947, ISSN: 1873-3212 (Online)
Stanislaw Waclawek, Dr. hab., Ing., Ph.D.	Polymers, MDPI – 1 special issue, ISSN 2073-4360, (Guest Editorial for the special issue)
Michal Petrů, doc., Ing., Ph.D.	Associate editor Frontiers in Materials, ISSN 2296-8016, (2021-2023)

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Michal Řezanka, doc., RNDr., Ph.D.	Synthesis of cyclodextrin derivatives	University of Turin, Turin, Italy	2020
Stanislav Petrík, doc., Ing., CSc.	Hybrid Nanofiber/Fiber Optic Sensors	Institut d'Électronique et des Systèmes (IES), UNIVERSITÉ DE MONTPELLIER, Montpellier, France	2023
Stanislav Petrík, doc., Ing., CSc.	Nanomaterials for Fiber Optic Sensors	Universidad Catolica de Murcia (UCAM), UCAM HiTech Sport & Health Innovation Hub, Guadalupe, Spain	2023
Pavel Kejzlar, Ing., Ph.D.	SEM/EDS/EBSD characterisation of nanomaterials at the Institute for Nanomaterials, Advanced Technologies and Innovation, TUL	European EM User Meeting 2023, Zeiss- Oberkochen, Germany	2023
Rafael Torres, doc., Ing., Ph.D.	On the Laser-Mediated Generation of Nanoalloys from Immiscible Elements like FeCu	12 th Annual World Congress of Nano Science and Technology, Japan	2023
Michal Petrů, doc., Ing., Ph.D.	Smart agriculture with advanced IoT communication and sensing unit	UC Davis, Davis, USA	2020
Rafael Torres, doc., Ing., Ph.D.	Bacterial growth suppression by biofilm deterioration through magnetic element-doped silver nanoparticles	Innovative biomedical applications of laser-generated colloids, Padova, Italy	2023
Stanislaw Wacławek, Dr. hab., Ing., Ph.D.	Cyclodextrin-based materials for water treatment	7 th European Cyclodextrin Conference, Budapest, Hungary	2023
Vinod Padil, Dr., MSc., Ph.D.	Green Chemistry Approaches Towards the Fabrication of Nanostructures	Recent Advances in Chemical Science, Habibpur Koodi, India	2021
Miroslav Černík, prof., Dr., Ing., CSc.	Electrokinetic remediation	Keynote speaker ECOpole'19, Torun, Poland	2019

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Jean-Marie Lehn, prof. Dr.h.c.	University of Strasbourg, France	Chemistry for life	2019
Luís De Cola, prof.	Università degli Studi di Milano, Italy	Hybrid materials for biomedical applications.	2022
Christopher Rock, assoc.prof., Ph.D.	North Carolina State University, USA	Materials and Process Research at the Centre for Additive Manufacturing and Logistics North Carolina State University	2018, 2022

Christian Karl, Dr.	SINTEF, Oslo, Norway	Characterisation of Mechanical Properties of Polyolephine Aerogels	2023
Tham Tham Chung Hoang, assoc.prof., Ph.D.	Auburn University, USA	Environmental toxicology-from fundamentals to applied science: case studies with heavy metals and insecticides	2022
Fazel A. Monikh, Dr.	Leiden University, Netherlands	Analytical challenges in analysing nanomaterials in organisms and possible solutions	2021 - online
Michael Gelinsky, prof. Dr. rer. nat.	TU Dresden, Germany	Fabricating scaffolds for biomedical applications using textile technologies and additive manufacturing	2023
Marek Bryjak, prof., Dr hab.ing.	Wroclaw University of Science and Technology, Poland	Salinity Gradient Energy	2022
K. R. S. Sambasiva Rao, prof., D.Sc.	Mizoram University, India	Novel Technological Advances for Utilisation of Bioresources in Northeast India	2022
David Leonard Nelson	The Nonwovens Institute, USA	Industry/University collaboration models and current research focus areas of common interest	2022

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Stanislaw Wacławek, Dr. hab., Ing., Ph.D.	Member of the expert committee of the European Commission in the evaluation of Horizon Europe Cluster 6 calls	European Commission	2022
Stanislav Petřík, doc., Ing., CSc.	Programme Johannes Amos Comenius (OP JAK)	Ministry of Education, Youth and Sports	2023
Mateusz Fijałkowski, Ing., Ph.D.	Panels ST5 and ST8	National Science Centre Poland	2019-2023
Alena Ševců, RNDr., Ph.D.	Standard projects, incoming and outgoing projects, LA projects, P504	Grant Agency of the Czech Republic	2021-2023
Miroslav Černík, prof., Dr., Ing., CSc.	Standard projects, incoming and outgoing projects, LA projects, P108	Grant Agency of the Czech Republic	2021-2023
Michal Petrů, doc., Ing., Ph.D.	Standard projects, incoming and outgoing projects, LA projects, P101	Grant Agency of the Czech Republic	2022-2023
Miroslav Černík, prof., Dr., Ing., CSc.	M17+ panellist	Research Development and Innovation Council, Government of CR	2019-2023

Michal Řezanka, doc., RNDr., Ph.D.	Inter-Excellence, Inter-Action	Ministry of Education, Youth and Sports	2023
Klára Kalinová, doc., Ing., Ph.D.	Sigma, Trend	Technology Agency of the Czech Republic	2023
Serhii Petrushenko	Various calls	National Research Foundation of Ukraine	2019- 2023

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the period of 2019–2023²³. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

Self-assessment:

In the years 2019–2023, CXI contributed significantly to the implementation of key national and international projects and contractual research focused on the strategic areas of FORD1 and FORD2. Among these projects, there are some highly significant ones that contribute to strengthening scientific excellence and international cooperation in various fields, such as nanomaterials, sustainable materials, 3D printing or industrial IT. However, the greatest scientific and social impact was achieved by projects and contract research in the area of FORD1, which brought fundamental technological innovations and scientific and technical progress, which is confirmed by the achieved results and the identified potential. The following are the most important projects:

1. Project **Innovative technology based on constructed wetlands for treatment of pesticide contaminated waters** (LIFEPOPWAT, EU LIFE programme, ENV/CZ/000374, 2020-2023) was focused on the development and implementation of innovative technologies for the treatment of pesticide contaminated water. This approach uses close-to-nature solutions to reduce the environmental risks associated with pesticides. In the case of the Hájek quarry waste heap, where 3-5 thousand tons of HCH isomers (lindane pesticide) are deposited, the technology was used in a full-scale flow rate. The second location was in Jaworzno in Poland. The modern system Wetland+[®] combines a PRB wall with microFe, a biosorption unit and an aerobic wetland, that enable the effective removal of pesticides and other harmful substances from water. The technology is scalable and has the potential to be widely used in the protection of water sources from various types of POP substances. The application potential lies mainly in the ability of these

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

passive natural technologies to replace active treatment plants, which require energy, raw materials, and staff, and often produce hazardous waste. The research results support cooperation of the academic and industrial spheres, which is one of the key objectives of CXI. With its outputs, the project contributed to an increase in environmentally friendly practices and also sustainable water management and fulfils CXI's mission to be an "internationally respected multidisciplinary centre of science and research". CXI's role as the project principal investigator included coordination of the project and construction and monitoring of both pilot installations. Other co-researchers were DIAMO s.p., PWT from the Czech Republic, the city of Jaworzno and GIG from Poland, the University of Aarhus from Denmark, and SERPOL from France. FSHE TUL also participated in the project for plant identification. The project was very multidisciplinary, including chemistry, biology, physics, environmental sciences, geology, and other natural sciences.

2. Project **LIFE: Water Resources Management in Visitor Attractions - FIT4USE Water Recirculation Technology** (LIFE4ZOO, EU LIFE programme, 01114509 LIFE22-ENV-CZ-LIFE4ZOO, 2023–2027). The project objective is to develop and implement innovative technologies for sustainable management of water resources in leisure and visitor centres, especially in zoos and zoo parks. The project focuses on efficient recirculation and reuse of water, which contributes to reducing drinking water consumption and minimising environmental impacts. The result is the creation of technological systems that ensure economical management of water and its recycling and use, e.g., for feeding animals. The technology is designed to be easily adaptable to different types of water. The application potential includes the reduction of operating costs and higher environmental sustainability of these devices, which fulfils the growing demands for the protection of natural resources. LIFE4ZOO supports the mission of CXI as an "internationally respected multidisciplinary research centre" established to transfer innovation to real life. Research activities focusing on water management strengthen the transfer of results into practice and contribute to building a circular economy in the public sector and the tourism industry. CXI acts as the project coordinator ensuring the management of research and development activities and close cooperation between partners (ZOO Liberec and Photon Water Technology from the Czech Republic, ZOO Barcelona, Universitat de Girona and Fundacio Solidaritat UB from Spain). In addition to the development of technology, the project focuses on the dissemination of results through professional publications, online information, workshops and training (through the Visitor Centre of ZOO Liberec). The project connects chemistry, biology, physics and mathematics with technical sciences (construction of treatment technologies).

3. Project **Sustainable Remediation of Radionuclide Impacts on Land and Critical Materials Recovery** (SURRI, Horizon Europe Twinning, 101079345, 2023-2025) aims to create an international virtual centre for solving the issues after the extraction of raw materials, especially uranium. The theme is highly relevant for facilitating the circular use of land, water, and key materials. Issues with sites after uranium mining are solved comprehensively in the project, including an assessment of the economic return of technologies. In the Czech Republic and other Central European countries, the sites after uranium mining are extensive and difficult to deal with. Today, obtaining raw materials from old mine dumps and other locations is especially important for achieving the "green deal" and raw material independence. The research concept is based on the integration of electrochemical and microbiological methods, which can be applied in-situ or ex-situ, with the aim of providing new tools for site remediation and facilitating the recovery of material resources. The project is coordinated by CXI with the participation of University of Granada (Spain), Universita La Sapienza Roma (Italy) and University of Southampton

(UK). The project fulfils CXI's mission to be an "internationally respected multidisciplinary centre of science and research". FSHE employees from the Department of Biology and Chemistry also participate in the project. The foreign partners will help CXI to achieve five specific objectives, i.e., advance the excellence of its research in the field of the mentioned theme, develop a common research vision, support the research agenda for the virtual centre of research and innovation, increase the research profile of CXI employees, and develop an international network of supporters, contributors, and participants in the proposed virtual hub. The result will be technologies applicable to similar locations throughout the EU. The project is multidisciplinary and includes chemistry, biology and environmental protection.

4. Project **Hybrid materials for hierarchical structures** (Ministry of Education, Youth and Sports of the Czech Republic, OP R&DI, CZ.02.1.01/0.0/0.0/16_019/0000843, 2018-2022) focused on the development of new materials that combine different material systems to form hierarchical structures that can be used in a wide range of applications, including nanotechnologies, energy, and biomedicine. The project objective was to support problem-oriented materials research, especially research of an interdisciplinary nature, and to contribute to the achievement of internationally competitive research quality in this area (in line with the mission of CXI). To achieve this objective, the research plan was divided into three interconnected research programmes, where CXI was responsible for Programme 3: Functionalised nanomaterials. As part of the implementation of the programme, CXI actively cooperated with the employees of the Faculty of Mechanical Engineering (FME), who significantly participated in its activities. CXI employees also participated in the activities of two other programmes led by the Faculty of Textile Engineering (FTE) and the FME, respectively. This collaboration emphasised an interdisciplinary approach that brought together expertise and skills across individual faculties, which contributed to the effective sharing of experience and innovative solutions. As it was a basic research project of an excellence science, it ultimately contributed to the development of new hybrid materials that have a wide application potential in environmental protection, machine, and textile technologies. For example, higher mechanical strength, wear resistance and better electrochemical properties are ensured, which has wide applications in industries such as batteries, sensors, biomaterials and advanced construction materials. The project significantly supported the mission of CXI, which focuses on the development of materials research, innovation, and applied technologies. This multidisciplinary research brought together different expertise at the university, including engineering, chemistry, materials research, and biomedicine.

5. Project **NanoEnvi.cz – Nanomaterials and nanotechnology for environmental protection and a sustainable future** (Ministry of Education, Youth and Sports of the Czech Republic, Large Infrastructures, 2016 – 2026). The objective was to create a research infrastructure integrating the capacities of several research organisations in the Czech Republic in the field of nanomaterials and nanotechnologies. The project participants are the Institute of Physical Chemistry J. Heyrovský ASCR, v.v.i. (project leader), CXI, Jan Evangelista Purkyně University in Ústí nad Labem, Palacký University in Olomouc, Institute of Inorganic Chemistry ASCR, v.v.i., and the Institute of Experimental Medicine ASCR, v.v.i. The NanoEnviCz research infrastructure was created as a platform that enables effective collaboration between partner organisations and external users. The platform offers research capacities in an open access mode and provides services for internal and external users. The platform offers services in the areas of heterogeneous (photo)catalysis, technologies for sustainable energy acquisition and storage, nanotechnology for the capture, detection and chemical degradation of contaminants, and

technologies associated with the detection and monitoring of contaminants. In the development of new nanotechnologies, attention is always paid not only to the estimation of benefits, but also to the study of possible health and environmental risks that may be associated with the application of nanomaterials. Subsequent projects are focused on the modernisation of the large research infrastructure with the aim of expanding the application possibilities of the developed nanomaterials and further optimisation of research methods for a wide range of environmental applications. The NanoEnvi.cz project significantly contributed to the fulfilment of CXI's mission, which consists in supporting sustainable research and development of new technologies for industrial partners. This is a multidisciplinary project, enabling the characterisation of nanomaterials from the point of view of chemistry, physical properties, health, and the environment.

6. Project **National Centre of Competence for Industrial 3D Printing** (Technology Agency of the Czech Republic, TN02000033, 2023-2028) is a strategic project focused on the development and support of additive manufacturing in the Czech Republic. The project objective is to develop cooperation in 3D technologies and increase competence in these technologies. In addition to CXI, the project has approximately 30 other partners bringing together research institutions (e.g., CEITEC), universities (e.g., CTU – CIRC center), industrial partners (e.g., Prusa polymers) and public sector (e.g., regional hospital Liberec). Key activities include:

- Development of new materials: Research and preparation of innovative materials that will expand the possibilities of 3D printing in various applications.
- Optimisation of production processes: Improving 3D printing technologies to achieve higher quality and production efficiency.
- Integration into industry: Introduction of additive manufacturing into production processes across disciplines, for example in the automotive or aerospace industries.
- Digital technology: Creation of software tools for product design, simulation and inspection.

The project fulfils CXI's mission to "bring innovation to real life together with our industrial partners". The project supports interdisciplinary cooperation, connects the academic sphere with business practice, and contributes to a faster transfer of innovations to production. CXI is the coordinator of the project and plays a key role as a research partner of the project, focused on the development of new materials and the optimisation of technologies for 3D printing. The activities are the creation of a centre in Liberec, which focuses on the effective use of raw materials, their recycling and the incorporation of waste natural and synthetic materials into production processes. The project is highly multidisciplinary (chemistry, physics and other natural sciences, materials research, engineering) and, in addition to CXI, NCC's activities involve other TUL faculties (Faculty of Mechatronics, Informatics and Interdisciplinary Studies - FMIIIS, FME).

7. Project **International research laboratories** (Ministry of Education, Youth and Sports of the Czech Republic, CZ.02.2.69/0.0/0.0/18_054/0014685, 2020-2023). The objective of this strategic project was to develop the capacities, knowledge, and skills of managerial, research, and other staff of a research organisation in the field of strategic management of research and development and its implementation within the organisation. The main focus was setting up the strategic management of CXI in accordance with the terms of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers. To achieve the objectives the activities were (i) the formulation of a new strategic objective of CXI, i.e., the establishment of joint research laboratories with a partner from abroad and its incorporation

into existing documents of the institute, (ii) the development of knowledge and awareness of researchers, managers, and R&D economists at CXI with the aim to increase the skills and competences required for the highest possible form of international cooperation, i.e., joint research workplaces with one or more foreign partners. The result of the project was the establishment of two joint research facilities with the University of Girona (Spain) and with two Fraunhofer institutes, IWU and IMWS (Germany). The project contributed to CXI mission by the development of CXI strategic tools for the establishment and management of joint research laboratories with foreign partners. TUL faculties did not participate in the project, and cooperating foreign institutions were not financially supported either. The project is highly multidisciplinary (chemistry, physics and other natural sciences, materials research, engineering).

8. Project **Inherently Flexible Aerogels for energy effiCient structurES** (i-FACES, Technology Agency of the Czech Republic, KAPPA “Norwegian funds”, TO01000311, 2020-2024) focuses on the development of flexible aerogels using advanced materials for energy efficient applications. Aerogels are characterised by an extraordinary nanoporous structure, which predetermines their use as optimal materials for thermal protection. However, aerogels are mostly mechanically fragile and therefore unsuitable for thermal insulation of geometrically complex structures that require flexibility of insulating materials. Instead of “forcing” flexibility into the structure, i-FACES developed single-component “inherently flexible aerogels” based on the properties of polyolefins and polyvinyl, which are inherently mechanically flexible under normal temperature conditions. The project, whose coordinator is CXI, contributed to strengthening the capacities and research competence of CXI in the field of nanomaterials and supported international cooperation, which complies with the CXI mission. The partners are industrial companies such as SINTEF AS and POLPUR, spol. s.r.o. Also TUL faculties, FME, FMIIS, Faculty of Health Studies - FHS, and FTE TUL participated in the project. The project also helps to transfer innovations to real life based on quality research and development. This is again a multidisciplinary project involving chemistry, materials research, and physics.

9. **Long-term contractual research between CXI, ÚJV Řež, a.s., Czech technical university in Prague (CTU) and SÚRAO** in relation to the public tender “Pilot Corrosion Experiment in the Bukov Underground Research Facility”, commissioned by the Czech Radioactive Waste Repository Authority (SÚRAO), represents significant collaboration focused on research and analysis of microbiological and corrosion processes that have a key impact on the long-term safety of the nuclear repository and environmental protection. This contract includes several sub-tasks, which include the processing of research, microbiological reconnaissance, regular sampling of groundwater and microbial characterisation of materials. For CXI, this contract represents a significant opportunity to strengthen capacities in the field of microbiology, corrosion chemistry, and applied research in the field of nuclear safety. CXI’s involvement in groundwater microbial screening and materials characterisation contributes to the development of professional skills and knowledge in this specialised area. Contract further supports cooperation with leading research institutions, such as CTU and ÚJV Řež, and helps to strengthen international scientific and research ties, which complies the CXI mission. The long-term nature of the contract, lasting 12 years, also allows CXI to expand research infrastructure and provides the necessary expertise for sustainable and safe applications in the field of environment and nuclear technology. FMIIS TUL (mathematical modelling of storage processes) also participates in the project.

10. Project Who is responsible? Linking the transformation of organochlorine compounds with specific bacterial populations (Grant Agency of the Czech Republic, 22-00150S, 2022-2024). Organochlorine compounds, such as chloroethenes and polychlorinated biphenyls, still pose a serious environmental issue due to existing or potential contamination of soil and drinking water sources. The objective of the project is therefore to describe the distribution of biodegradation functions and the phylogenetic origin of the bacteria that carry these functions. Specifically, it deals with a study of the distribution of selected biodegradation genes (bphA and rdhA) in microbial communities at contaminated sites and their connection with phylogenetics; the role of extrachromosomal DNA in the distribution of biodegradation genes in the environment; elucidating the ability of bacterial consortia to adapt to increased concentrations of organochlorine compounds by regulating and spreading specific rdhA genes. The project is an example of basic research that is in the minority at CXI. Even so, the results of the project have application potential in the more effective removal of organochlorine compounds from the environment. The project fulfils the mission of CXI to “strive for the development of human potential, education and prosperity of society”, which of course includes basic research. CXI is the principle investigator and cooperates with University of Chemistry and Technology, Prague (VŠCHT Prague), whose role is in the use of the epicPCR technique to connect information about rdhA genes and specific bacteria. This is again a multidisciplinary project (chemistry, microbiology, genetics, and ecology).

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Support (in thousands CZK/EUR) ²⁶				
		2019	2020	2021	2022	2023
		CZK/EUR	CZK/EUR	CZK/EUR	CZK/EUR	CZK/EUR
Technology Agency of the Czech Republic	PROSYKO - Pro-Active System of Commercialisation at TU Liberec (2014-2020, Public support:19 596 CZK / 773 EUR)	2 059 /81				
Ministry of Education, Youth and Sports	Design, optimisation and application of smart thermal storage nano-layers (2017-2019; Public support: 6 906 CZK / 272 EUR)	2 127 /84				
Technology Agency of the Czech Republic	Advanced additives implementation into production of extruded composite profiles used by progressive additive technologies in area of 3D printing (2017-2019; Public support: 8 328 CZK / 329 EUR)	2 710 /107				
Technology Agency of the Czech Republic	Broadband components with resonant nanofibrous membrane for room acoustics	2 147 /85				

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

	(2017-2019, Public support: 6 330 CZK / 250 EUR)					
Regional office of the Liberec Region	Assistance vouchers of the Liberec Region - Preparation of the LIFEPOPWAT project application (2018-2019, Public support: 247 CZK / 10 EUR)	247 /10				
Ministry of the Environment	Support from national resources allocated to LIFE Programme for the preparation of project documentation (2018-2019, Public support: 185 CZK / 7 EUR)	185 /7				
Technology Agency of the Czech Republic	Filtration systems with biocatalytically active nanofiber materials for drinking water treatment (2016-2020; Public support: 6 817 CZK / 269 EUR)	1 980 /78	542 /21			
Technology Agency of the Czech Republic	Nanofibrous systems for drug delivery with sustained released (2016-2020; Public support: 6 208 CZK / 245 EUR)	1 933 /76	390 /15			
Technology Agency of the Czech Republic	Wound cartridge filters from nanofibrous composite yarns (2017-2020, Public support: 5 359 CZK / 212 EUR)	1 716 /68	344 /14			
Technology Agency of the Czech Republic	Low-cost water treatment systems (2017-2020, Public support: 10 566 CZK / 417 EUR)	3 633 /143	2 810 /111			
Ministry of Education, Youth and Sports	Professional Contact Organisation of the Safety and Risk of Nanomaterials in the Environment (2017-2020, Public support: 9 436 CZK / 372 EUR)	2 523 /100	2 274 /90			
Technology Agency of the Czech Republic	Antimicrobial plasters based on nanofibers modified by nanoparticles (2017-2020; Public support: 3 909 CZK / 154 EUR)	1 299 /51	1 078 /43			
Technology Agency of the Czech Republic	Food Industry Wastewater Treatment Using Membrane Filtration (2017-2020, Public support: 7 072 CZK / 279 EUR)	2 064 /81	1 052 /41			

Technology Agency of the Czech Republic	Regeneration of wells - new targeted regeneration processes, regeneration and monitoring systems, and preventive diagnosis of the state of wells (2017-2020, Public support: 7 376 CZK / 291 EUR)	2 360 /93	2 360 /93			
Technology Agency of the Czech Republic	Software for the evaluation of radionuclide migration on the geosphere - biosphere interface and its impact on a man (2017-2020, Public support: 3 432 CZK / 136 EUR)	1 169 /46	951 /38			
Technology Agency of the Czech Republic	Technology of de-icing and mobile antiicer for tram and trolleybus trolley wires in city transport (2017-2020, Public support: 5 885 CZK / 233 EUR)	1 779 /70	578 /23			
Technology Agency of the Czech Republic	Operational diagnostics of tram track profile and gauge under load (2018-2020; Public support: 3 507 CZK / 138 EUR)	1 271 /50	1 176 /46			
Technology Agency of the Czech Republic	Biodegradable silk fibroin based materials for orthopaedics (2017-2021; Public support: 2 753 CZK / 109 EUR)	857 /34	825 /33	128 /5		
Technology Agency of the Czech Republic	Autocalibration early warning system against the effects of the increasing groundwater level during the flood (2018-2021; Public support: 9 093 CZK / 359 EUR)	2 579 /102	1 949 /77	2 062 /81		
Technology Agency of the Czech Republic	Technology of microorganism-free surfaces of nanotechnological materials for biotechnology applications (2018-2021; Public support: 8 824 CZK / 348 EUR)	2 155 /85	2 335 /92	2 220 /88		
Ministry of Education, Youth and Sports	Tree Gum Polymers and their Modified Bioplastics for Food Packaging Application	383 /15	378 /15	397 /16		
Ministry of Education, Youth and Sports	CxI TUL Management Mechanisms with a focus on increasing the quality of the results of R&D&I activities (2017-2022, Public support: 19 525 CZK / 770 EUR)	5 500 /217	2 845 /112	3 669 /145	1 /0	

Ministry of Education, Youth and Sports	Hybrid Materials for Hierarchical Structure (2018-2022, Public support: 73 175 CZK / 2 886 EUR)	16 686 /658	21 000 /828	14 000 /552	822 /32	
Ministry of Education, Youth and Sports	Modular platform for autonomous chassis of specialised electric vehicles for freight and equipment (2018-2022; Public support: 73 058 CZK / 2 882 EUR)	33 230 /1 311	24 659 /973	843 /33	889 /35	
Technology Agency of the Czech Republic	The research and development of the new electromagnetic heat meter with extreme low power consumption (2018-2022, Public support: 4 760 CZK / 188 EUR)	1 185 /47	1 197 /47	1 173 /46	622 /25	
Ministry of Education, Youth and Sports	Micro-struCTural imaging as a Tool for modelinG fibrOus materiALS (μ-CT GOALS)	1 881 /74	1 600 /63	1 937 /76	1 800 /71	
Technology Agency of the Czech Republic	Higher quality and energetically more effective production of cables using advanced materials and nanotechnologies	1 920 /76	1 979 /78	2 205 /87	2 193 /87	
Technology Agency of the Czech Republic	Advanced Self-Sensing Materials for Critical Components of Rail Vehicles	1 895 /75	2 668 /105	2 969 /117	2 013 /79	
Ministry of Education, Youth and Sports	Exploring the role of ferrates and modified nano zero-valent iron in the activation process of persulfates	1 180 /47	2 022 /80	2 347 /93	1 242 /49	
Technology Agency of the Czech Republic	Total Removal of Nitrogen and Phosphorus from wastewater using tailor-made textile biomass carriers	2 369 /93	2 688 /106	2 575 /102	1 257 /50	
Technology Agency of the Czech Republic	Limiting Factors for Survivability and Proliferation of Microorganisms Significant for Corrosion of Deep Geological Repository Barrier Systems	2 460 /97	4 863 /192	5 680 /224	4 614 /182	2 497 /99
Regional office of the Liberec Region	Methods and means for measuring heat flux through insulation layers - technology voucher		250 /10			
Regional office of the Liberec Region	Methods and means for bonding plastic films - technology voucher		250 /10			
Regional office of the	Fire protection coatings for polymeric and other materials - technology voucher		200 /8			

Liberec Region						
Regional office of the Liberec Region	Research in the field of production of engine parts using additive technologies - technology voucher		250 /10			
Grant Agency of the Czech Republic	Nano Zero-Valent Iron and Cyclodextrins – Their Synergistic Action for Water Purification		1 282 /51	1 245 /49	1 195 /47	
Ministry of Education, Youth and Sports	Bio-based Porous 2D Membranes and 3D Sponges Based on Functionalised Tree Gum Polysaccharides and their Environmental Application		2 131 /84	2 131 /84	2 131 /84	
Technology Agency of the Czech Republic	Pro-Active System of Commercialisation at TU Liberec 2		3 339 /132	7 457 /294	5 723 /226	
Technology Agency of the Czech Republic	Development of electro-post-denitrification system for complete reduction of nitrate		881 /35	2 352 /93	1 207 /48	
Ministry of Education, Youth and Sports	International Research Laboratories		3 619 /143	3 511 /139	1 823 /72	
Technology Agency of the Czech Republic	inherently Flexible Aerogels for energy efficient structures (i-FACES)		0 /0	8 263 /326	7 361 /290	8 130 /321
Technology Agency of the Czech Republic	Ceramics with sensing capabilities for high temperature applications		663 /26	1 995 /79	2 011 /79	1 052 /41
Technology Agency of the Czech Republic	Sensor Materials and Systems for Distributed Condition Monitoring of Energy Cables		1 029 /41	2 625 /104	2 624 /104	2 393 /94
EU - LIFE	Innovative technology based on constructed wetlands for treatment of pesticide contaminated waters		43 805 /1 728			
Ministry of the Environment -LIFE	Innovative technology based on constructed wetlands for treatment of pesticide contaminated waters - state co-financing		8 561 /338			

EU - H2020	Networking for Research and Development of Human Interactive and Sensitive Robotics Taking Advantage of Additive Manufacturing		19 900 /785			
International Visegrad Fund	Visegrad individual grants		79 /3	194 /8	189 /7	147 /6
Regional office of the Liberec Region	Assistance voucher: Preparation of a project for the call HE - TWINNING focusing on modern technologies for wastewater treatment			276 /11		
Regional office of the Liberec Region	Assistance voucher Preparation of a project for the HE - TWINNING call focusing on sustainable smart materials and technologies			214 /8		
CESNET	Data Drive Research				264 /10	
Grant Agency of the Czech Republic	Who is responsible here? Linking transformation of organochlorines with specific bacterial populations				2 980 /118	4 446 /175
Ministry of Education, Youth and Sports	Design and synthesis of functionalised magnetic nanoparticles for effective removal of novel per- and polyfluorinated compounds (PFAS) from water					1 117 /44
Regional office of the Liberec Region	Assistance voucher - Preparation of the project application for the Horizon Europe - Excellence Hubs call					275 /11
Regional office of the Liberec Region	Assistance voucher - Preparation of the project application for the call of the National Centre of Competence for Industrial 3D Printing					129 /5
Regional office of the Liberec Region	Modification of natural materials to increase retention capacity - technology voucher					200 /8
Technology Agency of the Czech Republic	HyLife – Microbial risks associated with hydrogen underground storage in Europe					728 /29
Technology Agency of the Czech Republic	NCC for industrial 3D printing					26 073 /1 029

Ministry of Education, Youth and Sports	Textile-derived microplastics in aquatic ecosystems: identification, characterisations, and effect assessment					2 371 /94
CESNET	Web application for accessing and managing CESNET S3 using federation identity, S3Point					195 /8
Technology Agency of the Czech Republic	Development of advanced technology for the removal of pharmaceuticals and other micropollutants from wastewater produced by medical facilities					2 416 /95
EU - HE	Sustainable Remediation of Radionuclide Impacts on Land and Critical Materials Recovery					32 828 /1 295
EU - LIFE	Water Resources Management in Visitor Attractions - FIT4USE Water Recirculation Technology					42 208 /1 665
Ministry of the Environment - LIFE	Water Resources Management in Visitor Attractions - FIT4USE Water Recirculation Technology – co-financing					14 059 /555
EU – Interreg Czech - Saxony	Cross-border support for SME involvement in future materials research (2024: 61 905 CZK/ 2 442 EUR)					0 /0
EU – Interreg Czech - Saxony	Interdisciplinary Bridge – InterBridge (2024: 24 133 CZK/ 952 EUR)					0 /0
MSCA4 Ukraine	Microstructural evolution and atmospheric oxidation of nanocrystalline films, as a way to create functional structures					1 382 /55
Total		105 482 /4 161	170 805 /6 740	72 468 /2 860	42 961 /1 695	142 646 /5 629

In the role of another participant						
Provider ²⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
		CZK/EUR	CZK/EUR	CZK/EUR	CZK/EUR	CZK/EUR
EU-H2020	Development and Demonstration of monitoring strategies and technologies for geological disposal (2015-2019, Public support: 1 952 CZK / 77 EUR)	0 /0				

²⁷ Ibid.

EU-H2020	Development of the safety case knowledge base about the influence of microbial processes on geological disposal of radioactive wastes (2015-2019, Public support: 7 047 CZK / 278 EUR)	0 /0				
EU-H2020	Nanomaterial FAtE and Speciation in the Environment (2015-2019, Public support: 2 535 CZK / 100 EUR)	0 /0				
EU - Interreg CE	Integrated Approach to Management of Groundwater quality In functional urban Areas (2016-2019, Public support: 5 070 CZK / 200 EUR)	0 /0				
Technology Agency of the Czech Republic	Environmentally friendly nanotechnologies and biotechnologies in water and soil treatment (2012-2019, Public support: 37 772 CZK / 1 490 EUR)	5 055 /199				
Technology Agency of the Czech Republic	Nanomaterials for water remediation (2016-2019, Public support: 6 016 CZK / 238 EUR)	900 /36				
Ministry of Education, Youth and Sports	Research Infrastructure for Geothermal Energy (2016-2019, Public support: 4 141 CZK / 163 EUR)	1 314 /52				
Ministry of Trade and Industry	Test sites for precertification testing of internal (2016-2019, Public support: 1 720 CZK / 68 EUR)	860 /34				
Ministry of Education, Youth and Sports	Nanomaterials and nanotechnologies for environment protection and sustainable future (2016-2019, Public support: 11 973 CZK / 472 EUR)	2 944 /116				
Ministry of Trade and Industry	Effect of long-term heat pumps operation on the sustainability of rock environment energy potential (2016-2019, Public support: 3 948 CZK / 155 EUR)	1 222 /48				
Ministry of Trade and Industry	Development of polymer solution and technique of preparation of unique membrane utilised for water treatment, air conditioning and air filtration (2016-2019, Public support: 8 494 CZK / 335 EUR)	1 830 /72				

Ministry of Trade and Industry	Highly active nanofibrous wound dressing material with barrier function and active drug release (2016-2019, Public support: 9 404 CZK / 371 EUR)	2 776 /110				
Grant Agency of the Czech Republic	Interaction of heterogeneous liquid with flexible wall (2017-2019, Public support: 3 072 CZK / 121 EUR)	970 /38				
Technology Agency of the Czech Republic	The development of advanced variable membrane technology for treating various types of industrial wastewater with poor bio-treatability (2017-2019, Public support: 3 241 CZK / 128 EUR)	1 044 /41				
Technology Agency of the Czech Republic	Functional development of bi-system liquid filter for recycling of process water using modern methods of modelling (2017-2019, Public support: 3 516 CZK / 139 EUR)	1 083 /43				
Ministry of Trade and Industry	Modular system of wastewater treatment (2017-2019, Public support: 8 192 CZK / 324 EUR)	4 096 /162				
Ministry of Trade and Industry	Development and application of multicomponent (2017-2019, Public support: 1 638 CZK / 65 EUR)	1 412 /56				
Technology Agency of the Czech Republic	Development of quick changeover means for sorting screens production preparation machine (2017-2019, Public support: 3 235 CZK / 127 EUR)	975 /38				
Technology Agency of the Czech Republic	Research of the blades fluttering of hydraulic turbine in order to extent turbine control for ensuring stability and safety of electric grid (2017-2019, Public support: 2 656 CZK / 105 EUR)	900 /36				
Technology Agency of the Czech Republic	Research of the systems for increasing soil tillage energy efficiency (2018-2019, Public support: 1 320 CZK / 52 EUR)	665 /26				
EU - Interreg CE	Alliance for Advanced Manufacturing in Central Europe (AMiCE) (2017-2020, Public support: 4 512 CZK / 178 EUR)	0 /0	0 /0			

Ministry of Trade and Industry	Research and development of innovative cutting tool surfaces using carbon nanoparticles (2017-2020, Public support: 700 CZK / 28 EUR)	0 /0	0 /0			
Ministry of Education, Youth and Sports	RINGEN - Research Infrastructure Upgrade (2017-2020, Public support: 6 817 CZK / 269 EUR)	0 /0	0 /0			
Ministry of Trade and Industry	Nanofibers with Immobilised Proteases for Healing of Hard Healing Wounds (2016-2020, Public support: 9 037 CZK / 357 EUR)	2 551 /101	0 /0			
Ministry of Trade and Industry	Innovative photocatalytic screeds and concrete admixtures (2017-2020, Public support: 2 500 CZK / 99 EUR)	805 /32	622 /25			
Technology Agency of the Czech Republic	Additive tools of wastewater bioremediation (2017-2020, Public support: 4 539 CZK / 179 EUR)	1 350 /53	650 /26			
Technology Agency of the Czech Republic	Development of tools for studying contaminant transport in fractured rock environment (2017-2020, Public support: 2 689 CZK / 106 EUR)	670 /26	670 /26			
Ministry of Education, Youth and Sports	Completing and upgrade RI Nanomaterials and nanotechnologies for environment protection and sustainable future (2017-2020, Public support: 4 433 CZK / 175 EUR)	372 /15	120 /5			
Ministry of Trade and Industry	Smart textiles (2017-2020, Public support: 1 809 CZK / 71)	709 /28	1 284 /51			
Technology Agency of the Czech Republic	Protocol development on highly effective nitrogen removal process from waste and underground water based on denitrification exogenous substrates (2017-2020, Public support: 4 625 CZK / 182 EUR)	1 425 /56	455 /18			
Technology Agency of the Czech Republic	Implementing of the advanced augmented reality methods as one of the Industry 4.0's pillars into designing and developing an industrial product (2017-2020, Public support: 3 548 CZK / 140 EUR)	1 343 /53	985 /39			

Ministry of Trade and Industry	Research and development of innovated surfaces of cutting tools using carbon nanoparticles		6 263 /247			
Grant Agency of the Czech Republic	Hybrid organosilica nanomaterials for heterogeneous catalysis of enantioselective reactions (2018-2020, Public support: 2 389 CZK / 99 EUR)	862 /34	876 /35			
Technology Agency of the Czech Republic	Development of autonomous IoT equipment for the evaluation of operating data of suspension agricultural (2018-2020, Public support: 5 446 CZK / 214 EUR)	1 807 /71	1 833 /72			
Technology Agency of the Czech Republic	Development burner gas infrared heater on the principle of kinetic combustion (2018-2020, Public support: 4 030 CZK / 159 EUR)	1 452 /57	1 324 /52			
Ministry of Trade and Industry	Sorption module for nuclear power plant severe accident mitigation (2017-2021, Public support: 6 716 CZK / 265 EUR)	1 770 /70	1 711 /67	869 /34		
Ministry of Trade and Industry	Industrial research and experimental development of small city electromobile and tools for production (2017-2021)	0 /0	3 028 /119	0 /0		
Ministry of Trade and Industry	Knowledge base for decommissioning of nuclear energy (2015-2021, Public support: 2 097 CZK / 83 EUR)	728 /29	671 /26	686 /267		
Technology Agency of the Czech Republic	Advanced real-time controlling and monitoring of remediation technologies (RealControl) (2018-2021, Public support: 3 851 CZK / 152 EUR)	974 /38	978 /39	984 /39		
Technology Agency of the Czech Republic	Robotic device for bipedal locomotion re-education (2018-2021, Public support: 4 447 CZK / 175 EUR)	1 141 /45	1 141 /45	1 141 /45		
Ministry of Trade and Industry	Use of the short lived radiotracers and development of their detection methods to describe processes influencing migration of contaminants in the environment (2018-2021, Public support: 3 373 CZK / 133 EUR)	1 228 /48	1 228 /48	288 /11		
Technology Agency of the Czech Republic	Adaptive extruder-based 3D printing technology for precise and efficient series production	1 417 /56	1 812 /71	1 276 /50		

Technology Agency of the Czech Republic	Device for contactless evaluation of the shape accuracy of automotive glasses	1 192 /47	1 339 /53	714 /28		
Technology Agency of the Czech Republic	Photoactive nanocomposite systems for improvement of the environment	663 /26	718 /28	704 /28		
Ministry of Trade and Industry	Conversion of Mercury to Solidified Mercury Sulphide	636 /25	914 /36	0 /0		
Technology Agency of the Czech Republic	Use of modern recording and calculation methods for the optimisation of the production technology of nanofibrous materials	907 /36	963 /38	929 /37		
Technology Agency of the Czech Republic	Centre of Advanced Materials and Efficient Buildings - STD 4.0	2 023 /80	3 471 /137	1 694 /67	1 288 /51	
Technology Agency of the Czech Republic	Compact filtration cartridge for application in the systems of water filtration and beverage and food preparation	1 106 /44	1 135 /45	1 324 /52	471 /19	
Ministry of Trade and Industry	Modularity of agricultural machinery with the support of advanced production technologies	443 /17	1 059 /42	1 059 /42	1 059 /42	
Ministry of Trade and Industry	Microfluidic dosing system optimisation for the purpose of highly sophisticated nanofiber wound covers preparation	1 071 /42	1 597 /63	1 592 /63	541 /21	
Technology Agency of the Czech Republic	Development and testing of a combined remediation method of reductive-oxidative in-situ bioremediation of chlorinated solvents (BIOREDOXX)	777 /31	742 /29	712 /28	809 /32	
Technology Agency of the Czech Republic	Development of intelligent gas air-heater for industrial halls using advanced mathematical modelling of temperature distribution and air flow	684 /27	1 583 /62	1 464 /58	595 /23	
Technology Agency of the Czech Republic	Development of a mobile unit and new cleaning protocols for the regeneration of filter membranes used in wastewater treatment	868 /34	846 /33	840 /33	390 /15	
Technology Agency of the Czech Republic	The development of technology for effective suppression of mycolytic foams in activation systems of wastewater treatment	797 /31	646 /25	896 /35	358 /14	

Ministry of Trade and Industry	Research into the conditions and forms of the application of products lignite as a sorbent of ammonia, and as stimulators of biological activities in vegetable cells	1 114 /44	1 272 /50	1 272 /50	1 249 /49	
Technology Agency of the Czech Republic	National Centre of Competence for Materials, Advanced Technologies, Coatings and their Applications	2 630 /104	3 443 /136	2 486 /98	1 102 /43	
Technology Agency of the Czech Republic	CeO ₂ Nanoparticles-assisted stem-based cell therapy: an innovative nanopharmaceutical approach to treat retinal degenerative diseases.		566 /22	885 /35	885 /35	
Technology Agency of the Czech Republic	Innovative glass encapsulation technology		2 157 /85	2 240 /88	2 323 /92	
Ministry of Education, Youth and Sports	Modernisation and upgrade of large research infrastructure "Nanomaterials and nanotechnologies for protection of the environment and sustainable future"		0 /0	14 163 /559	0 /0	
Ministry of Education, Youth and Sports	Nanomaterials and Nanotechnologies for Environment Protection and Sustainable Future		4 845 /191	4 455 /176	4 367 /172	
Technology Agency of the Czech Republic	Development of a seeding machine for major cropping and intercropping		2 089 /82	2 253 /89	1 909 /75	
Technology Agency of the Czech Republic	Development of novel components for electromembrane modules using additive technologies		2 781 /110	2 832 /112	3 006 /119	
Technology Agency of the Czech Republic	ALternative infill MATerials for disposal of NPP decommissioning RAdioactive waste		1 222 /48	1 477 /58	1 530 /60	1 489 /59
Technology Agency of the Czech Republic	Biologically active materials for application in medical devices		1 570 /62	2 147 /85	2 933 /116	3 010 /119
Ministry of Trade and Industry	STIMUL20 - Selection pressure and nanomaterials as effective tools for stimulation of biotechnology systems		0 /0	790 /31	1 098 /43	1 345 /53
Technology Agency of the Czech Republic	Technology for high-throughput production of drug delivery systems		887 /35	978 /39	1 165 /46	1 199 /47

Technology Agency of the Czech Republic	Influence of radiolysis and bacterial extremophiles on lifetime of the canister for deep geological repository		375 /15	994 /39	1 021 /40	596 /24
Technology Agency of the Czech Republic	Development of innovative solitary acoustic elements with implemented nanofibrous structures		1 856 /73	2 084 /82	2 084 /82	2 061 /81
Technology Agency of the Czech Republic	Development of glass jewellery components for circular economics		160 /6	1 064 /42	1 173 /46	1 088 /43
Technology Agency of the Czech Republic	Development of heat exchangers for moisture recovery		2 017 /80	2 077 /82	2 111 /83	2 008 /79
Technology Agency of the Czech Republic	Research and development of composite nanofiber structures for microorganism's technological applicability enhancement		994 /39	1 185 /47	1 174 /46	1 091 /43
Technology Agency of the Czech Republic	Research into increasing groundwater volume by intensifying the infiltration of purified surface waters		1 265 /50	1 601 /63	1 594 /63	1 102 /43
Ministry of the Interior	Development of a mobile energy-independent unit of a drinking water treatment plant for emergency use in crisis situations			1 457 /57	1 291 /51	
Ministry of the Interior	Development of the smart breathing mask with the system of exchangeable nanofiber filters			1 670 /66	1 666 /66	
Ministry of Trade and Industry	The development of advanced treatment technology for highly mineralised water based on membrane distillation			1 028 /41	532 /21	803 /32
Ministry of Trade and Industry	Hybrid optical fibre sensor for sensing the level and quality of vehicle operating fluids			0 /0	591 /23	0 /0
Technology Agency of the Czech Republic	Innovative methods of exploration and remediation of vertically stratified inorganic groundwater contamination			1 244 /49	1 433 /57	1 408 /56
Ministry of Trade and Industry	New possibilities of increase in efficiency of membrane systems operation: retentate recycling from reverse osmosis units and innovative methods of membrane backwash			0 /0	301 /12	578 /23

Ministry of Agriculture	Approaches for design and realisation of complex effective measures for tile drained agricultural catchments by land consolidations			918 /36	936 /37	972 /38
Technology Agency of the Czech Republic	Technology for remote monitoring and control of electrokinetically enhanced chemical-biological in situ remediation - EBioChem			2 240 /88	2 429 /96	2 388 /94
Ministry of Trade and Industry	Development of Electro-mechanical Brake for Tram Transport			225 /9	503 /20	847 /33
Technology Agency of the Czech Republic	Research and development of shape moulds made of H-13 and HEATVAR for die casting of aluminium alloys in application of modern technologies of additive production, heat treatment, surface treatment and numerical simulations			2 036 /80	2 071 /82	1 884 /74
Technology Agency of the Czech Republic	Research and development of shaped moulds from hardenable steels for casting zinc alloys in the application of modern technologies of additive production, heat treatment, surface treatment and numerical simulations			1 564 /62	1 590 /63	1 498 /59
Technology Agency of the Czech Republic	Research of stability and modification of sealing barriers based on clay minerals under thermal and biological stress			1 331 /53	1 423 /56	1 470 /58
EU - H2020	European Joint Programme on Radioactive Waste Management			4 893 /193	0 /0	0 /0
EU - H2020	Enhanced In Situ Bioremediation for Contaminated Land Remediation			5 070 /200	0 /0	0 /0
EU - H2020	Distributed Artificial Intelligent Systems			3 727 /147	0 /0	0 /0
Ministry of Trade and Industry	Development of a hybrid sprinkled bioreactor				0 /0	1 428 /56
Ministry of the Interior	Encapsulation of bacteriophages into nanostructures and their use in the production of special filters with antibacterial protection				1 759 /69	1 787 /70
Technology Agency of the Czech Republic	Graphene / graphite-filled carbon fibre-reinforced composite designed especially for battery protection boxes in electric cars				1 977 /78	2 052 /81

State Environmental Fund / Norwegian funds	Reduction of pollution of surface water with pharmaceutical substances in the biologically treated wastewater				1 558 /61	1 496 /59
Technology Agency of the Czech Republic	Research and development of ecological drinking water filter using a graphene nanolayer				2 608 /103	2 792 /110
Ministry of Trade and Industry	Electrodialysers for effective recycling of valuable components from industrial wastewaters (2026: 8 087 CZK / 319 EUR)					0 /0
Technology Agency of the Czech Republic	Elimination of PFAS in the environment - development of innovative in-situ remediation methods and advanced technologies for water applications					1 007 /40
Ministry of Trade and Industry	Innovation of flotation through implementation of nanobubbles and optimisation of flotation process for water management applications (2026: 6 309 CZK / 249 EUR)					0 /0
Ministry of Trade and Industry	Innovative ways of energy-performance optimization of membrane bioreactors (2026: 6 537 CZK / 258 EUR)					0 /0
Ministry of Trade and Industry	Innovative 3D structure of biomass carrier with nanofibrous and biological component for biotechnological applications in the field of water purification (2026: 2 582 CZK / 102 EUR)					0 /0
Ministry of Trade and Industry	Integrated samplers for water treatment plants and wastewater treatment plants (2026: 3 319 CZK / 131 EUR)					0 /0
Ministry of Trade and Industry	A modular platform for complete wastewater treatment					222 /9
Ministry of Education, Youth and Sports	Nanomaterials and Nanotechnologies for Environment Protection and Sustainable Future					2 950 /116
Technology Agency of the Czech Republic	National centre of competence for Materials, Advanced Technologies, Coatings and their Applications					5 143 /203

Ministry of Education, Youth and Sports	Influence of Microbial Activity on DGR Canister Lifetime					951 /38
Ministry of Trade and Industry	Development of biodegradable fibre carriers for dermocosmetic applications					225 /9
Technology Agency of the Czech Republic	Development of innovative hybrid technology for recycling wastewater from steel and metal pickling processes					1 394 /55
Technology Agency of the Czech Republic	Development of submicron particle separator for spray nebulisation dryer					1 538 /61
Ministry of Trade and Industry	Research and development of multi-purpose automated filling equipment with production software and disposable capsules made of fully biodegradable material based on the principle of circular economy (2024: 4 861 CZK / 192EUR)					0 /0
EU - Interreg CE	Management of urban water resources in Central Europe facing climate change					5 324 /210
Ministry of Regional Development	Management of urban water resources in Central Europe facing climate change - additional financing					659 /26
EU - HE	EDIH Northern and Eastern Bohemia					6 363 /251
Ministry of Trade and Industry	EDIH Northern and Eastern Bohemia – national co-financing					6 363 /251
Total		63 561 /2 507	68 163 /2 686	89 558 /3 533	58 903 /2 322	68 531 /2 703

Table 3.3.2 - Contract research activities

Client ²⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Air-lab s.r.o.	Production of parts, database, definition of SW functionalities, electricity meter, source, switchboard, SW preparation of measurements		778 /31	303 /12		
ALUKOV a.s.	Conducting testing of sealants					90 /4
Aquagen s.r.o.	Sampling and analysis of sediment from Olešský pond			50 /2		

²⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

AQUATEST a.s.	Supply of an electrical support system for ferrous particles, monitoring of pilot systems	85 /3				
AURA-engineering Hranice s.r.o.	Temperature control and radiator detection system	612 /24	788 /31	950 /37		
BEDNAR FMT s.r.o.	Construction of parts	30 /1				75 /3
Bene Meat Technologies a.s.	Production of nanofibrous tubes			20 /1		
Betele Maschinenbau CZ s.r.o.	Working prototype of a controller			104 /4		
Bioinova, s.r.o.	Innovation of preparation and application of functional nanostructures		300 /12			
BOSCH DIESEL s.r.o.	Modification of a measuring device for flow indication, design of equipment for measurement of fuel overflow quantity		445 /18		57 /2	
Centrum výzkumu Řež s.r.o.	Supply of ceramic plates and their connection and certification of the quality of the joints, production of complete samples of plate heat exchangers with a fusible core made of corundum material	200 /8	150 /6			
COALIMEX EUROPE s.r.o.	Analysis of WO ₃ and WC nanopowders			21 /1		
Continental Automotive Czech Republic, s.r.o.	Development and application of surface treatment reducing the coefficient of friction of the parking brake component			125 /5	125 /5	
CRYTUR, spol. s r.o.	Sample analysis - gloves and non-woven napkins			10 /0		
Czechia Moravia s.r.o.	Evaluation of innovativeness		15 /1			
CTU Prague	Coating of an exchanger made of aluminium alloy with a layer of amorphous porous SiO ₂ silica gel, preparation of material mass and coating of exchangers with a layer of silica gel, analysis of samples according to Raman microscopy, using infrared spectroscopy, FTIR analysis, characterisation of samples, microbiological analyses	141 /6			876 /35	2 062 /81
DAKO-CZ, a.s.	Motor wiring assessment, rail brake calculation, automatic testing of new aggregates, expansion of functions, development of iRB-03 units	87 /3	100 /4		495 /20	891 /35
Dallmayr Vending & Office, k.s.	Application and preparation of an emulsion on supplied coffee machine parts, cleaning and application of impregnation on coffee machine equipment, preparation of test samples					130 /5
DEKONTA, a.s.	CIE and gas and TOC analysis			102 /4		
DONALDSON CZECH REPUBLIC s.r.o.	Synchronising the speed of conveyor belts, upgrading gas detection equipment, design solutions for devices	80 /3	903 /36			

Doosan Bobcat EMEA s.r.o.	Testing and calibration of sensors, production and supply of devices for measuring the position of a control joystick	100 /4				
DOPLA PAP a.s.	Research activity		510 /20			
ELPA KUPEČEK, spol. s r.o.	Pressure test, structural solution and production of parts, strength analysis, technical documentation	1 388 /55	1 104 /44	375 /15		
EPS biotechnology, s.r.o.	Optimisation of nanocarriers within the laboratory system + modular autotrophic denitrification bioreactor, consultation and methodical supervision of the isolation and section of autotrophic denitrifiers	120 /5				
EXAC, s.r.o.	SW work on mVIS				68 /3	
Faurecia Interior Systems Bohemia s.r.o.	Experimental production of parts	3 /0				
Fraunhofer-Gesellschaft (Germany)	REBID programming software, program analysis			162 /6		972 /38
Galvanoplast Fischer Bohemia s.r.o.	Anti-corrosion surface treatment				41 /2	
GD Druckguss s.r.o.	3D printing					43 /2
GOTTSCHE LOWE CZ, spol. s r.o.	Verification of the presence of TUL-E4 coating on valves by liquid contact angle method, valve coating, joint development and testing of product surface treatment		154 /6			
Grammer Automotive CZ s.r.o.	Pilot research – demoulding agent				105 /4	
H-R-H PATENT s.r.o.	Lamination of non-woven fabric surfaces, verification of the technological process of production of face mask prototypes	100 /4				
Chart Ferox, a.s.	Development of an anti-freeze emulsion		55 /2			
ING MEDICAL s.r.o.	Extension of a machine to control a spray module		50 /2			
Institut mikro-elektronických aplikací s.r.o.	Witol innovation study	34 /1				
IPR Aqua s.r.o.	Creation of a series of samples of nanofibrous materials					18 /1
Jablotron Alarms a.s.	Simulation of the thermal behaviour of a building	30 /1				
Keramo plus, a.s.	Work on a corrosion-resistant pan lining					50 /2
KEYDESIGN s.r.o.	Material model definition, numerical simulation	116 /5				
KOPOS KOLÍN a.s.	Innovation of cable support systems, cable bridge with a circular rim				85 /3	202 /8
KOSTAL Connectors GmbH	HW completion, SW development, SW expansion, measurement of lever connector torque		129 /5	78 /3		

organizační složka						
LADEO Lukavec s.r.o.	Preparation and analysis of leachate, percolation tests	140 /6				
LASTIME PRO spol. s r.o.	RealWear					30 /1
LOKNI s.r.o.	CAD model, adjustment in the model					30 /1
Magna Exteriors (Bohemia) s.r.o.	Modification of L1 encoding, SEM analysis of saturation and affinity,	30 /1	9 /0			
MemBrain s.r.o.	Contract outputs No. 1, 2, 3	150 /6				
MODUS, spol. s r.o.	Load test, mechanical resistance test of glued joints	29 /1			38 /1	18 /1
NAFIGATE Corporation, a.s.	Contractual research for project CZ.01.1.02/0.0/0.0/17_176/0015664	4 /0				
Nanopharma a.s.	Testing polymeric substances, testing the flexibility of polymers, production testing of optimized nanofibre carrier and lidocai	187 /7				
NANOPROGRESS , z.s.	Linear 3D and 2D nanomaterials, nanofibrous yarns, selection of suitable nanoparticles with antimicrobial effects and hybrid polymer matrix composition, hybrid membrane testing with dosing of solid metal oxide nanoparticles, laboratory equipment, research study, research report	10 066 /397	27 755 /1 016	13 106 /517	9 227 /364	8 095 /319
Narran s.r.o.	Analysis and evaluation of suitable material, 3D printing based on material	115 /5		431 /17	680 /27	900 /36
OKO-OPTIK, a.s.	3D printing based on material, analysis and testing of JetFusion technology	100 /4				
ORLEN UniCRE a.s.	Development and delivery of a 3D printer			420 /17	495 /20	
OTIS a.s.	Vibration measurement					87 /3
Pavliš a Hartmann, spol. s.r.o.	Fire hose testing		14 /1			
PFNonwovens Czech s.r.o.	Numerical modelling	108 /4				
PRAKAB PRAŽSKÁ KABELOVNA, s.r.o.	Development of an impregnation emulsion		100 /4			
Preciosa a.s.	Experimental production of parts, creation of samples of nanofibrous materials, oleophobic surface treatment	11 /0			20 /1	71 /3
PRECHEZA a.s.	Analysis of TMP and polymer on the surface of pigments			29 /1		
Prettl Automotive Czech s.r.o.	EDS analysis, fractographic analysis of welds, measurement of technical cleanliness of parts, optical microscopy, sample preparation, preparation of cutting edge, numerical simulation	82 /3	91 /4		5 /0	
RIETER CZ, s.r.o.	Detection of plastic adhesion on twindisk camera discs - production and commissioning of two devices			204 /8		
Sellier&Bellot a.s.	Analysis of zinc	13 /1				

SINETA s.r.o.	Development work					179 /7
SKLOPAN Liberec a.s.	SW cooperation, Denso visio RAD radiators, data storage, indication of the presence of a screws, service intervention on a tachometer at Adler Polska, SW – modification of a loading robot on the Pyrobatys line, SW for a control line, Ethernet camera, SW modification of DIM JIG MQB1 and MQB2, control and vision system training on line 44E, SW modification, modification of radiators for the addition of Keyence stoves, SW creation, glass plating line, development of electronics for e-paper for ŠKODA AUTO, hardware change of the MFS master computer, SW settings for automatic MFS output to two stations, SW modification of 2D blanks, manual modification, SW modification of PORSCHE 513 cubing, implementation of Bently into line 44E, Preymesser service Lipovka-Rychnov nad Kněžnou, SW for Cubing Porsche 455	75 /3	465 /18	304 /12	101 /4	221 /9
STI Development s.r.o.	Design solution of BeatFit exercise equipment			107 /4		
Strojírny Bohdalice, a.s.	Temperature resistance testing	65 /3				
SURAO - Radioactive Waste Repository Authority	Installation of a SGI system at Bukov URL, modification of the system on site, connection of SGI 1 to the Internet, test operation, partial evaluation reporting, chemical analysis, microbiological analysis of water samples,	4 326 /171	1 115 /44	1 395 /55	900 /36	
Systematic a.s.	Modelling, microbial screening of Bukov URL and Rožná mine, THMC modelling	567 /22	22 /1	12 /0		
ŠKODA AUTO a.s.	IIoT Unit 4 pcs, IIoT Unit 5 pcs, planning algorithm optimisation, information system expansion, warehouse automation, system modifications	10 216 /403	9 674 /382	12 794 /505	15 165 /598	9 293 /367
ŠKO-ENERGO, s.r.o.	Škoda e-charge, user manual, iV Click support, MFA service update	632 /25	39 /2	348 /14	659 /26	96 /4
Štěpán Berný	Model creation	62 /2				
TECHNOSKLO s.r.o.	Production of new machines, adjustable for other types, connection of machines to a PC, electronics for two new machines, repair of the electronics of a measuring machine, construction of prefabricated machine No. 2, repair of prefabrication machine parts – replacement of thermocouples, cable repair - control unit	110 /4	90 /4	1 150 /45	6 /0	
TEDOM a.s.	Elemental analysis of deposits found on engine pistons, analysis of solid deposits			15 /1		
TRASK SOLUTIONS a.s.	IIoT units for SKUD overhaul workplaces, support and project management on ŠKODA AUTO projects, development work, HW + installation, mapping,	4 759 /188	4 350 /172	4 258 /168	3 459 /136	4 867 /192

	development work, consultation, AMS Škoda Click support, building creation					
ÚJV Řež, a.s.	Modification of heating elements for a meter, provision of samples, development of thermally conductive and insulating ceramics, provision of ceramic elements for HT measurement, microbial expertise, production of samples from three types of ceramics, microbial expertise and evaluation, trials and tests on D28 mm samples, Al2O3 96 material, cooperation in the development of micro exchangers using fusible core technology	2 264 /89	1 109 /44	932 /37	2 174 /86	2 417 /95
Charles University	Characterisation of the polydispersity of atb+atx formulation particles			221 /9		
Technical University in Brno	Measurement of PIV - velocity profiles, measurement of flow fields in a bioreactor using laser anemometry, measurement of the velocity of two-component immiscible liquids	45 /2	129 /5			
YOUR SYSTEMS, s.r.o.	Technical consultation			296 /12		
ZANAP Liberec s.r.o.	SW for a cutting table			50 /2		50 /2
University of West Bohemia in Pilsen	Contractual research, nonwovens		8 /0			
Zentiva, k.s.	Work in the field of orodispersible film development	298 /12	280 /11			
ZF Automotive Czech s.r.o.	Offer to research the possibilities of changing the technological process in a paint shop					178 /7
Total		37 580 /1 482	48 731 /1 926	38 372 /1 514	34 781 /1 372	31 065 /1 226

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Self-assessment:

²⁹ See Terms definition.

In the period under evaluation, CXI produced 51 utility models (FORD1 representation 10), 27 prototypes (9), 79 functioning samples (15), 18 patents (2), 1 pilot plant (0) and 31 verified technologies (15). Despite the fact that most of the applied results are FORD2 in nature, their application in the field is mainly FORD1. The dominant link according to RIV is to 1.5 "Earth and related environmental sciences", specifically DA - Hydrology and limnology, DK - soil contamination and decontamination including pesticides, DL - nuclear waste, DI - air pollution and control and DJ - water pollution and control, and 1.6 "Biological sciences" EB - genetics and molecular biology, EF - microbiology, DA - hydrology, EH - ecological communities, 1.4 "Chemical sciences" CF - Physical chemistry, CG - electrochemistry, and 1.2 "Computer and information sciences", IN - informatics, AF - work with information. For a more detailed description, the results that are the most significant from this point of view have been selected.

1. Combined filter element - utility model No. 35466 registered 12 October 2021. The result represents the area DJ - pollution and water control. The result was created within the project Compact Filter Cartridge For Application in Water Filtration Systems and the Preparation of Beverages and Food, TH04030511. This utility model closely follows a series of national and international patents protecting the unique principle of nanofibrous yarn production. The presented result represents filtration-sorption carbon elements with a nanofiber component and their use for efficient and effective treatment of drinking water, or for effective removal of present micropollutants from drinking water. An initial series (500 pcs) of combined filter elements was produced and the resulting economic benefit, according to the signed Agreement on the Use of Results, is approximately 3 thousand € (invoicing in 2024). The combined filter element is currently included in the standard range of filters sold by Bonno s.r.o., including in its e-shop. The current productivity and market applicability of the combined filter element is expected to be in the range of hundreds to thousands of pieces per year. If there is an increase in sales of filter elements above TUL's capacity (i.e., above approximately 5000 pieces per year), TUL and Bonno s.r.o. pre-negotiated and prepared a Technology Transfer Agreement and the related sale of technological know-how in the form of a license agreement. The result makes it possible to improve the quality of drinking water for general public by removing micropollutants. We also expect an economic effect from the production and sale of additional units. The result is gender neutral, its use has no gender dimension. Impact of the result regarding sustainability is in mitigation of climate change through the provision of sufficient drinking water.

2. Development and testing of verified combined anaerobic-aerobic in situ biodegradation technology for chlorinated ethenes (BIOREDOXX) - verified technology TH04030225. The result represents the area DK - contamination and soil decontamination including pesticides and was created as part of the project "Development and Testing of a Combined Redox-Oxidative Method for In-situ Bioremediation of Chlorinated Solvents". The technology combines the application of an optimised organic substrate to start the process of biological reductive dechlorination and the formation of the anaerobic zone, in which anaerobic microbial processes dominate and sequential dechlorination of chlorinated ethenes takes place. Subsequently (or in the direction of groundwater flow), the rock environment is supplied with oxygen (either by applying oxygen-releasing substances or by injection air/oxygen into the groundwater), which leads to the establishment of aerobic conditions and the aerobic decomposition of less chlorinated ethenes by bacteria. Thanks to this, it is possible to perform remedial of chlorinated ethenes from groundwater faster and cheaper. During 2023, the technology was used in the operational remediation at the TDV Duchcov site and then Zbrojovka Brno sites. The implementation of the result enabled DEKONTA a.s. to succeed in a tender procedure in a highly competitive environment and to successfully implement this tender. The expected positive impacts on society

are associated with cost savings within the current and future remediation activities performed by DEKONTA a.s. in the range of millions of €. The result of these activities is an increase in the quality of groundwater and a reduction in the threat to drinking water sources near contaminated sites. The result is gender neutral, its use has no gender dimension. The result is gender neutral, its use has no gender dimension. Impact of the result regarding sustainability is in mitigation of climate change through the provision of sufficient drinking water.

3. Utilisation of nanoscale zerovalent iron particles with biodegradable shell for in situ groundwater treatment via combination of nano-bio processes - verified technology. The result has prospective impact to society and represents field of the application of zero-valent nanoFe, in which CXI belongs to European leaders. The result is typically multidisciplinary and represents areas DJ, CF, and CG. The method can be made cheaper by simultaneously applying a DC electric field. The solution presented in the article opens a new approach to the theme. This new improvement, with the simultaneous application of a DC field, leads to an increase in the efficiency of the method (up to 7 times). The new method represents a breakthrough in the application of zero-valent nanoFe for remediation, leading to an economic, ecological, and rapid remediation method that has a huge application impact. The technology follows on from the patent (Reg. 306838) and is based on the project (TA04020431 – Advanced In-situ Remediation Technologies Supported by an Electric Field). However, only the repeated presentation of the patented technology to the scientific public and the mentioned article led to its expansion. Currently, it has several full applications in the Czech Republic and abroad (contracts with AQUATEST a.s. to a total amount of 237 thousand €; contract with Photon Water Technology to a total amount of 4,3 thousand €; contract with Photon Water Technology to a total amount of 10 thousand €). The result is gender neutral, its use has no gender dimension. Impact of the result regarding sustainability is in mitigation of climate change through the provision of sufficient clean groundwater sources.

4. Equipment for remote monitoring and control of remediation using the EBioChem method - functioning sample, FW03010071. The result is typically and represents areas DK, CG, and AF. It is a system for remote control and real-time monitoring of remediation technologies using Fe nanoparticles supported by a DC electric field. It enables automatic sampling of groundwater and subsequent measurement of its physical and chemical parameters, real-time transmission of these data and a suitable remote response consisting in adjusting the parameters of the applied electric field, or application of biological substrates. The basic elements of the system are a centrally located unit with technology (modules: measuring, control, communication, DC current sources, etc.), distribution of water samples through a system of lines (automatic control of pumps) and the possibility of real-time communication and remote control of DC systems (GSM protocol, web interface). The modular structure of the device allows configuration directly for the needs of a specific site. The technology has already been applied to a number of sites in the CZ and abroad, e.g., MEGA (Narex Česká Lípa, Metra Blansko, Červený Kostelec sites), PWT (Ford Bordo, France; Zurzach Solvay - Switzerland, Jesenný - CZ, Solvay Torrelavega - Spain), EPS biotechnology, s.r.o. (Svetlá nad Sázavou site). The latest installation of this technology is at a PFAS-contaminated site in Australia, in collaboration with PWT and MEGA. The market price of the offered equipment is 16 thousand € and it is a matter of implementation. The result of these activities is an increase in the quality of groundwater and a reduction in the threat to drinking water sources near contaminated sites. The result is gender neutral, its use has no gender dimension. Impact of the result regarding sustainability is in mitigation of climate change through the provision of sufficient water.

5. Innovative cleaning protocols suitable for the regeneration of membranes (including methods of their application) - verified technology 17105_2022_ZB_01. The result was created as part of the project Development of a Mobile Unit and New Cleaning Protocols for the Regeneration of Filter Membranes Used in Wastewater Treatment (TH04030037) and consists of a set of innovative cleaning protocols suitable for the regeneration (chemical cleaning) of clogged filter membranes. It represents area DJ and provides detailed instructions on how to clean clogged filter membranes efficiently, gentle, and economically. This has a fundamental effect on the operational efficiency as well as the costs. We estimate that the lifespan of the membranes is extended by approximately 20%. The result is actively used by ENVI-PUR s.r.o. Applications are implemented both in the Czech Republic and abroad. Specifically, for example, a drinking water membrane treatment plant in Slovakia with a total filtration area of 30,000 m² (equivalent to an output of 140 l/s), where the consumption of chemical agents has been reduced by 30%. The annual financial savings (economic benefit of this result) is estimated to 15 thousand €. Another application is planned for wastewater treatment in Sweden, where the economic benefit is estimated to be approximately 4 thousand €/a. The result is gender neutral, its use has no gender dimension. The high social relevance and sustainability of this result lies both in the area that the result targets, i.e., efficient water management, its saving and the possibility of re-use, extending the service life of membranes, reducing the operating costs of membrane systems, as well as in the way of the presented solution, since the emphasis is on reducing the amount and concentration of chemical agents used in the regeneration of membranes and limiting their negative impact on the environment.

6. Early warning system for ground buoyancy near a watercourse - utility model No. 33591. This utility model is connected to the verified technology "Technology of a Self-Calibration Early Warning System Against the Effects of Groundwater Upswelling During flooding", integrates the utility model and prediction algorithm. The complex of technologies was developed within the project TH03030500, led by the CXI in cooperation with EKOHYDROGEO Žitný s.r.o. The result represents area DA - Hydrology and limnology. The technical solution for monitoring the levels of groundwater and surface water flow is a key part of a complex system of early warning against the negative effects of groundwater upswelling nearby watercourses. The system is characterised by energy-saving intelligent probes with two-way communication, advanced self-calibration, and machine learning algorithms, and a universal structure that is scalable. The system presents measurable benefits in the reduction of operating costs by up to 50%, the extension of the prediction time of critical conditions up to six hours, the increase of the accuracy of predictions to 95%, and the reduction of demands on professional staff by 20%. EKOHYDROGEO Žitný s.r.o. has fully implemented the system and it is included in its portfolio. Over the course of 2022-23, the technology saved the company an estimated 400 working hours, which in many cases resulted in a competitive advantage that was decisive in winning contracts. Thanks to this, contracts with a total value of approximately 110 thousand € were implemented in 2022-23. The result is gender neutral, its use has no gender dimension. Impact of the result regarding sustainability is in protection of people and property from the negative effects of increased groundwater levels and surface water flows.

7. Variable membrane unit for treating hardly biologically treated wastewater - utility model 33233, registered 23 September 2019. The variable membrane unit for the treatment of difficult to biologically treat wastewater is the result of collaborative research between TUL and ENVI-PUR s.r.o. The result was created as part of the project Development of Advanced Variable Membrane Technology for the Treatment of Various Types of Difficult to Biologically Treat Industrial Wastewater (TH02030527) and represents area DJ. The developed unit enables effective cleaning of a wide range of difficult to biologically treat wastewater, e.g., wastewater

with a high fat content, wastewater containing surfactants and dyes, cutting emulsions originating mainly from engineering, textile, and food industries. The result is actively used by ENVI-PUR s.r.o. in pilot projects with customers from various industrial enterprises (e.g., textile, food, engineering industry). So far, the result has been used during five pilot projects for a total duration of 30 months. The economic benefit of using the results consists in a direct profit for ENVI-PUR s.r.o., whereby the price for a one-month pilot project, depending on the complexity of the order, ranges from 1 to 3 thousand €. However, the economic benefit also lies in the precise parameterisation and verification of the design of the final fully operational technology for the end customer, thereby saving the investor's investment and operating costs. These can be estimated to be up to 50% per order. The unit has so far only been used in the Czech Republic, but with regard to the foreign business activities of ENVI-PUR s.r.o., we expect its use in foreign markets in the near future. The result is gender neutral, its use has no gender dimension. Impact of the result regarding sustainability is in mitigation of climate change through the provision of sufficient clean water.

8. Biodegradation agent for anaerobic degradation of BTEX in rock environment, method of production of this agent and its use - national patent No. 307 964, granted 7 August 2019. The result represents multidisciplinary research in DK, DJ, EF, and DA. The subject of the invention is a preparation based on nanoparticles of ferrihydrite, which are naturally formed by the slow oxidation of dissolved iron in places where mine or seepage water springs up at a neutral pH. The patent contributes to the removal of old environmental liabilities with high social relevance, as it represents an environmentally friendly solution and fulfils the character of natural based systems (NBS), the importance of which is clearly accentuated in environmental technologies today, especially in relation to the Green Deal programme with regard to reducing energy demands, reducing the consumption of chemicals, and thereby reducing the production of greenhouse gases. The product has been verified and is used at contaminated sites in the Czech Republic, in the case of use by environmental companies, in particular Dekonta a.s., its application has potential also in other countries of the former Eastern bloc, where BTEX contamination persists and where Dekonta a.s. operates (Bulgaria, Moldova, Kazakhstan), or where it has branches (EPS Biotechnology – Slovakia). The developed preparation has found application in the portfolio of the remedial technologies applied by AQUATEST a.s. in a volume of 40-80 thousand € per year. The result is gender neutral, its use has no gender dimension. The result is gender neutral, its use has no gender dimension. Impact of the result regarding sustainability is in mitigation of climate change through the provision of sufficient clean water.

9. Established and validated approach combining verified technology for the pre-treatment of sterile compacted bentonite materials for the subsequent study of microbial and an approved methodology for the study of limiting factors for the survival and proliferation of microorganisms in a bentonite barrier of a deep geological repository. This result was created within the project TK02010169 – Limiting Factors for the Survival and Proliferation of Microbial Communities, Important for the Corrosion of Barriers of a Deep Radioactive Waste Repository in 2022 and represents activities regards to Deep Radioactive Waste Repository. The result represents microbiological research in areas EB, EF, EH. The aim of the technology was to design a complete procedure for the preparation of sterile compacted samples ensuring a) sterile work under the conditions of a non-sterile geotechnical laboratory, b) sterilisation of bentonite, c) compaction of bentonite, i.e., preparation of a compacted sample of the required bulk density in an experimental cell, and d) saturation of a sterile samples of compacted bentonite. The use of the verified technology will enable the preparation of sterile compacted bentonite, which will serve as an ideal input material in experiments focused on the issue of microbial influences in the engineering barrier of a spent nuclear fuel repository. An evaluation of the effects of

microbial activity on the stability of compacted bentonite will lead to the modification of the data needed for the safety assessment of the deep repository. The methodology is used as part of the long-term contract with ÚJV Řež (until 2034) and will enable future comparability of results between individual experiments performed on the same type of bentonite, or between different types of bentonites. The result is gender neutral, its use has no gender dimension. Impact of the result regarding sustainability is in reducing the carbon footprint by securing nuclear power.

10. Functional sample of adaptive IoT platform and corresponding technical equipment for AUE administration and management - functional sample. The result represents areas of Informatics and was obtained in a connection to the project “Modular platform for autonomous chassis of specialised electric vehicles for the transport of cargo and equipment” (EF16_025/0007293). Based on the functional sample the ŠKODA CLICK internal carsharing system was developed and implemented in cooperation with ŠKODA AUTO a.s. and Trask Solutions a.s. The system uses state-of-the-art industrial IoT and artificial intelligence technologies, supplemented by a robust cloud platform, and is used to optimise and plan vehicle sharing in production plants in Mladá Boleslav, Vrchlabí, and Kvasiny. By applying this result, the use of company fleet vehicles was saved by approximately 20%, while the number of users using company vehicles increased by approximately 30%. This has an economic benefit as well as an environmental one, and the result represents CXI’s focus on better use of resources, saving materials and energy, and greener production. In addition to technological design, CXI also provides management, support and further development of the system. CXI has become a long-term partner of both ŠKODA AUTO a.s. and Trask Solutions a.s. in the field of automation and digitalisation. Moreover, the result has an impact regarding sustainability is in reducing the carbon footprint by energy-efficient applications. It is in the directions of automation in Industry 4.0 - Human Centred AI (HCAI), which, in contrast to the vision of total automation and the elimination of human influence, strives to develop human potential. The result is gender neutral, its use has no gender dimension.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ³⁰	Year of application	Name
Utility model	2019	Variable membrane unit for treating hardly biologically treated wastewater
Utility model	2019	Early warning system for ground buoyancy near a watercourse
Patent	2019	Biodegradation agent for anaerobic degradation of BTEX in rock environment, method of production of this agent and its use.
Verified technology	2019	Utilisation of nanoscale zerovalent iron particles with biodegradable shell for in situ groundwater treatment via combination of nano-bio processes
Utility model	2021	Combined filter element
Functioning sample	2021	Equipment for remote monitoring and control of remediation using the EBioChem method
Functioning sample	2021	Functional sample of adaptive IoT platform and corresponding technical equipment for AUE administration and management
Verified technology	2022	Innovative cleaning protocols suitable for the regeneration of membranes (including methods of their application)
Verified technology	2022	BIOREDOXX “Verified combined anaerobic-aerobic in situ biodegradation technology for chlorinated ethenes”

³⁰ Specify the specific type of result. Add rows as needed.

Approved methodology	2023	Methodology for the study of limiting factors for the survival and proliferation of microorganisms in a bentonite barrier of a deep geological repository

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³²

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Self-assessment:

System for transferring R&D results into practice.

TUL has an established system for transferring R&D results into practice, and CXI uses this system. At CXI, this transfer of knowledge and technology into practice is ensured by the Department for Industry. The process of transferring knowledge to users involves several levels that effectively link academia with industry and the public sector. We successfully commercialise our results with both large and small enterprises. In the period of evaluation, we cooperated with 654 industrial partners (joint research projects and contracts).

Acquisition of new partners:

CXI has a system for acquisition of new partners for projects, for the commercialisation of results or for long-term collaboration. The basis of the system is

1. the establishment of cooperation (at conferences, trade fairs, or by direct contact), where we provide companies with the first contact (or service) free of charge (depending on the size of the company and the scope of work).
2. We then mark to establish cooperation in the form of e.g. an innovation voucher, where we cooperate on a very specific task in a limited scope.

³¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³² If the commercialisation of R&D&I results is carried out in this way.

3. The next step is to prepare a joint project or contract for the partner. This is usually a recurring activity.

The system considers specifics for different entities:

- Cooperation with large companies requires long-term building of mutual trust and acceptance of all internal systems in terms of information classification, data management, quality systems, etc.
- Working with medium-sized companies requires a personal approach and offering solutions with a medium-term impact for the company.
- Working with small businesses requires offering solutions to the company's problems with immediate impact or offering solutions for free. Only after the first implementation can a longer-term cooperation be established.
- Cooperation with government bodies is through tenders for certain work where CXI tries to apply the results of its work. This is again a long-term process where we use cooperation with other research institutions or universities.

Specific examples of attracting new partners:

1. One of the main channels of knowledge transfer is the participation of CXI researchers in various prestigious events such as conferences, workshops, and trade fairs, where CXI scientists present the results of their research in order to find new users. An example can be the conference "New Methods and Procedures in the Operation of WWTP 2022", where we acquired a new project partner Pražská vodovody a kanalizace, a.s., and submitted a successful joint project application to the Technology Agency of the Czech Republic project Environment for Life: Optimisation of the Denitrification and Post-Denitrification Process from the Point of View of Eliminating the Formation of Nitrites and Nitrogen Oxides.
2. The second channel is the AMIA consortium of companies, which has been established at CXI for a long time. AMIA is a group of enterprises with common objectives in the field of basic research. The mission of this proven form of cooperation is to constantly listen to the needs of our industrial partners, to enable them to actively influence the direction of our research, and to build a productive environment and relationship. Our aim is to create a common basis for individual cooperation on the specific technical issues of individual enterprises. Examples of themes addressed are 3D printing of ceramic materials, hydrophobic surface treatments, inorganic nanofibers for drug delivery, preparation of nanoalloys using lasers, research into waste glass recycling and strengthening of nanofibers using natural substances. Enterprises pay 2-5 thousand €/year for participation. The main aim, of course, is to establish cooperation and develop it in the form of contracts or joint R&D projects. For example, Preciosa a.s., which is a member of the AMIA consortium, ordered the testing of the surface properties of the delivered products (stones).
4. CXI is also a member of the large research infrastructure of the Czech Republic NanoEnviCz, which connected the capacities of several scientific organisations of the Czech Republic in the field of nanomaterials and nanotechnology research and provides open access to the use of its experimental facilities and to professional qualified services. Infrastructure customers turn to CXI for other scientific issues as well. For example, NanoPharma, for which we determine and analyse composite materials as a form of contract.

5. **Project eDIH** The European Digital Innovation Hub - Northern and Eastern Bohemia aims to provide consulting services of professional and technological know-how of advanced digitisation technologies for industrial partners. The aim is to help small and medium-sized enterprises and public institutions in the field of digital transformation, innovation, technical education, and basic and applied research, all linked to artificial intelligence and cyber security. In this way, customers can verify the quality of services provided by CXI and contact them with further requests. An example is VODACZ, which deals with the construction and servicing of water management equipment. As part of our multidisciplinary collaboration in the eDIH project we analysed and prepared a proof-of-concept (PoC) in the area of using machine learning and artificial intelligence to monitor and predict the status of a wastewater treatment plant. Since the PoC verification was successful, we established standard commercial contracts for the implementation of the method at two pilot sites and submitted a project application under the Technology Agency of the Czech Republic programme.
6. **Vouchers** - CXI makes very intensive use of Innovation and Technology Vouchers provided by the Ministry of Trade and Industry and the Liberec Region. In total, in the period under evaluation, we participated in 55 vouchers, of which 31 were from the Ministry of Trade and Industry, 21 from the Liberec Region, and three from the Operational Programme Prague. These were mostly innovation vouchers (46 in total) and technology vouchers to support the start-up of new innovative companies and projects. CXI established cooperation with local companies that have not previously cooperated with CXI and are distrustful of cooperation in the form of a project. The Ministry of Trade and Industry and the Liberec Region have been supporting these business activities for a long time, and CXI has excellent experience with them. An example can H2O nanotech, which, after using the voucher, submitted a successful joint project with CXI to the Technological Newcomers call (FW04020064 - Research and Development of an Ecological Drinking Water Filter Using Graphene Nanolayers).

The five typical users of the results are e.g.:

1. **ŠKODA AUTO a.s.** An example of a large multinational company is ŠKODA AUTO a.s., for which we designed and developed a complete system using IoT and AI, including an entire cloud platform for optimisation and planning of internal carsharing at the Mladá Boleslav, Vrchlabí, and Kvasiny plants (in connection with the functional sample Functional sample of adaptive IoT platform and corresponding technical equipment for AUE administration and management). The system won an award in the 17th annual IT Project of the Year Competition (Cacio) - competition finalist 2020. By the end of 2023, the system has been installed on 150 cars. In the following years, as part of the support contract, we further expanded and managed the system (another 100 installations in 2024). The total cooperation with the company was more than 2 million €.
2. **DEKONTA a.s.** is an example of a medium-sized enterprise we work with. Dekonta uses the results of CXI's research in the field of environmental technologies, especially methods of remediation of contaminated land and technologies for monitoring and detecting contamination. This cooperation contributes to the development of ecological solutions for environmental protection. An example is the BIOREDOXX technology, which was applied by the company at various locations (in connection with verified technology Development and testing of a combined redox-oxidative method for in-situ bioremediation of chlorinated solvents). Positive impacts are associated with cost savings in current and future remediation

activities carried out by DEKONTA a.s. in the order of millions of €. The total cooperation with the company was almost 30 thousand €.

3. **Dřevoplast Ludvík s.r.o.**

An example of a small enterprise is Dřevoplast Ludvík s.r.o., where we first implemented machine learning algorithms in the logistics planning process as part of an innovation voucher and subsequently became a long-term partner for the enterprise in the area of automatization and digitisation, including regular revenue from the development and support of the proposed solution. The total cooperation with the company was 1,3 thousand €.

4. **Nanoprogress cluster:**

An example of cooperation with consortia and clusters is a participation in the cluster Nanoprogress. This European cluster focuses on the research and development of nanomaterials, especially nanofibres, with wide application potential, for example in medicine and technical applications. CXI contributes to their projects through nanotechnology expertise, development of advanced materials, and construction of unique nanofiber-based manufacturing equipment. An example of this long-term cooperation is the Work Contract for the Research of technology of coiled candle filters based on nanostructures for pool water filtration (in connection with utility model, A filter for filtration of contaminated, in particular process water, and the filter vessel of this filter,). Where the developed filters are commercialized by the Nanoprogress cluster. The total cooperation with the cluster was 2,7 million €

5. **SÚRAO:**

An example of state administration bodies with which we cooperate in the application of our results is the Radioactive Waste Repository Authority SÚRAO. As part of a long-term contract focused on the issue of nuclear waste disposal, CXI collaborates on a pilot corrosion experiment, which includes microbiological research and groundwater analysis (in connection with approved methodology, Methodology for the study of limiting factors for the survival and proliferation of microorganisms in the bentonite barrier of a deep repository). This cooperation supports the safe and efficient management of radioactive waste in the Czech Republic. The total cooperation with SÚRAO was more than 300 thousand €.

Comments to funds raised from non-public, non-grant sources for the period 2019-2023:

Revenue from other sources such as income from licenses, donations, etc. (see the table) do not represent a significant financial item of the CXI budget. The largest item is additional activities and vouchers, which serve primarily to establish initial cooperation with enterprises.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Additional activities - microscopy and chemical and biological analyses, educational lectures, training, service and construction work, 3D printing	13 672 /539	12 663 /500	12 105 /478	14 716 /581	14 742 /582

License agreements / Agreements on the use of results	216 /9	216 /9	81 /3	28 /1	26 /1
Donations	371 /15	955 /38	140 /6	616 /24	0 /0
Innovation vouchers	3 253 /128	4 134 /163	3 138 /124	1 628 /64	2 348 /93
Proceeds from conferences	443 /17	0 /0	0 /0	10 /0	0 /0
Received rental payments	701 /28	701 /28	701 /28	707 /28	711 /28
Total	18 656 /736	18 669 /736	16 165 /638	17 705 /698	17 827 /703

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF VAVAI

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Self-assessment:

Although CXI was created as a centre for cooperation with industry and is not involved in teaching activities, it still pays great attention to the popularisation of science. This is for reasons of spreading awareness of CXI's scientific activities and seeking new customers and cooperating entities. Popularisation and communication with the public is also important for attracting young new workers (graduates).

In 2020, the **Strategy for Popularisation, Communication and Marketing** was created as part of the OP R&DI project Mechanisms for the Management of CXI with an Emphasis on Increasing the Quality of the Results of RD&I Activities. The aim of this strategy is to popularise the results of CXI's scientific research activities with the public, to motivate elementary, secondary, and vocational school students to study technical and science-oriented fields at university and to support individuals in acquiring advanced knowledge in their chosen fields with the help of experts from practice, using the state-of-the-art facilities and staff expertise of CXI.

Scientific and research staff of CXI cooperate with the Department of Information Support and Analysis (formerly the Department of Technical Support of CXI) and the Department of Promotion and Advertising of TUL on the systematic provision of information to the public about scientific and research activities. Even though the period under evaluation was partially affected by the COVID-19 pandemic, when TUL was partially closed or closed to the public, many popularisation events took place. As part of the promotion of its activity and natural and technical sciences, various popularisation activities are organised at CXI, which can be divided into the following general types:

- Open days and researchers 'nights
- On-line and printed educational materials for general public
- Media involvement informing about science

- Exhibitions and fairs
- Public discussions and commented site visits.

Here we provide ten examples of such CXI activities:

1. Open Days for general public. Events for the public are events for the general and professional public and for students. For the general public, there are regular Open Days and irregular events held when a new device or technology is acquired, etc. CXI organises an **Open Day** once per year all friends of science, innovation, and research. For example, in 2023 (1 June 2023), visitors could see and try a machine for the production of nanofibers in action, an autonomous vehicle in motion, or the cooperation between a robot and a human. The staff of CXI guided the visitors through their laboratories and showed where they work, what equipment they have, and how research changes the world for the better.

2. Researchers' Nights. Even though education is not the primary mission of CXI, CXI is part of TUL, and therefore there are also events for students. These are mainly excursions for secondary and elementary school students to the CXI premises with the aim of showing the students contemporary science and attracting them to study natural sciences and technical fields (42 excursions in the period). The typical events for preschool and school children, as well as parents and others are the Researchers' Nights. CXI regularly participates in the Researchers' Night organized by TUL. For example, in 2023 (6 October 2023) Researchers' Night took place with the theme of Secrets, where it presented the secrets of science and technology for both children and adults, i.e., an autonomous vehicle, 3D printing, biological and chemical quizzes, or experiments with light, laser demonstrations and looking through a unique microscope. The main attraction was the 3D chocolate printer, where you could get your initials on an edible wafer. In the evening, CXI was visited by at least 400 children accompanied by their parents. A wheel of fortune rewarded those who saw at least four of the attractions.

3. 10-year anniversary of CXI in building L events. For the professional public, we organise open days for industrial partners once per year, where we invite existing and potential industrial partners.

In 2022, CXI celebrated ten years of our full activity, which was launched after the opening of building L of TUL. As part of this anniversary, several events took place, the most important of which was an 10-year Anniversary Open Day held on 6 October 2022, which aimed to show the current CXI to the professional public and local government representatives. The event included keynote speeches by guests, a tour of the laboratories, a scientific show by IQ Landia and a concert by the Super Hero Killers. The event was attended by representatives of the municipal and regional authorities, partner universities, the Scientific Council of CXI TUL, and representatives of CXI's industrial partners. Local journalists were also in attendance.

4. Creation of educational materials for the general public. As part of principal projects (especially international projects), information materials about new technologies or procedures are created, which are intended for the general public (e.g., Layman's reports). These materials are distributed through partners from local authorities or information centres of towns and cities. They are also available in an online version on the project websites (www.cxi.tul.cz). An example can be the EU project LIFEPOPWAT, which dealt with the issue of pesticides from landfills and within which the Layman's report was created for the general public in Czech, Polish, and English. The report presents contaminants and why they are dangerous, where they come from, what their global occurrence is, what methods of their disposal exist and how the LIFEPOPWAT project

solves these issues. These materials were distributed to local public on the project sites (Hroznětín, Jaworzno) and were also available at the City Hall in Hroznětín.

5. Online communication. CXI places emphasis on online presentations and communication. This is not only because these technologies are modern and attractive to the younger generation, but also because they are faster and knowledge is instantly transferred to specific communities and does not require printing materials (a social responsibility that is pursued at CXI). CXI uses its website, the YouTube channel of TUL, its LinkedIn profile, and its Twitter (now X) profile. An example is again the website of the **LIFEPOPWAT project**, which deals with the treatment of water contaminated with pesticides (Lindan). The website contains information for the general public (Layman's report, videos from sites) as well as technical reports for the professional public. The website has a total of more than two thousand visits during 2020-23. The largest number of visitors are from the Czech Republic (965), Poland (210), Denmark (105), and France (102), but also from other countries, e.g., Spain (122), USA (119), Netherlands (76), and Mexico (43). (<https://cxi.tul.cz/lifepopwat/home>).

6. Presentation of science for EU journalists. CXI regularly presents its results, key equipment, and new discoveries in the media (press, radio, and TV, e.g., technical weekly). An example is the Presentation of science for EU journalists held on 9 July 2022. CXI prepared a scientific exhibition for journalists from leading European media. It was an event during the Presidency of the Czech Republic in the Council of Europe and the event for strongly supported by Liberec Region. During the meeting, which was attended by almost 50 journalists, unique results of science and research at TUL were presented.

7. IQ Landia. CXI (and faculties of TUL) have a permanent exhibition at IQ Landia scientific parc in Liberec. There, we present scientific research activities and interesting experiments for all age categories. The exhibition shows e.g., preparation and use of nanofibers for water filtration. The exhibition is regularly supplemented and updated.

8. Exhibition at the CXI lobby. Some exhibits are permanently installed in the CXI lobby to illustrate our activities. Currently, there is a 1:50 scale model of the Wetland+ wetland system, a passenger car for "two drivers", as a result of the work of Ph.D. students, and a working model of a device for the treatment of contaminated industrial water based on biofilm production on nanofibrous carriers enclosed in 3D printed spherical carriers.

9. Round table on artificial intelligence as an example of engaging in public discussion. CXI scientists participate in round tables or other events with the possibility of commenting on scientific aspects of social issues. An example can be a round table on artificial intelligence. Experts from Škoda Auto, Fraunhofer Institute, CIIRC CTU, and CXI discussed the development and applications of machine learning and artificial intelligence principles in the production of components with the audience at a joint workshop on Thursday 21 September 2023.

10. Climate boiler - an example of Networking for popularisation. CXI deals with environmental issues and informs the public. An example is the climate "boiler" will not go out and the effects of climate change are palpable in the Czech Republic and Germany. That is why both countries organised the Czech-German Climate Dialogue, a series of expert meetings in Prague, Brno, České Budějovice, and Liberec. In Liberec at the end of November 2023, climate adaptation of cities was lectured and discussed, several lectures were given by experts from practice e.g., cities, universities, and zoos from the Czech and German sides of the border.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Self-assessment:

1. **CXI should try to get significant projects in the role of project leader:** CXI focused on acquiring important projects in the role of a project leader. CXI worked on a total of 63 projects in the role of project leader out of 172 projects. Similarly, 6 international projects out of 17 international projects (e.g. LIFEPOPWAT, LIFE4ZOO and SURRI). CXI succeeded in acquiring the National Centre of Competence for Industrial 3D Printing in 2022, which brings together 27 partners.
2. **Commercialisation of R&D results in the form of spin-off companies:** CXI has not established any spin-off companies for several reasons:
 - The R&D results are mainly created based on projects, where the industrial partner is the project leader. Such a result cannot be commercialised in the form of a spin-off, because the agreement on the use of results is in hands of the partner.
 - CXI maintains a very high volume of contractual research. This form is established and, from a legal and financial point of view, simpler than an independent spin-off company. CXI Grant Support Department provides the administrative activities for projects, which is a very friendly model for researchers.
 - CXI's broad portfolio of activities gives more stability than a narrowly focused spin-off company, especially in the period of COVID-19, post-COVID-19 and the period of unclear prices (energy, raw materials, sales).
3. **Increase the emphasis on long-term building of knowledge and its transfer to the younger generation:** CXI does not have its own Ph.D. programme, but CXI habilitated staff lead Ph.D. students at the faculties and these students participate in CXI's R&D activities. Here, they get not only professional knowledge, but also managerial knowledge and foreign experience. Approximately 30 Ph.D. students worked at CXI. CXI has maintained a young age of its employees (average 42 years). There was also a generational change in the position of the Director of CXI and in some department heads.
4. **Organise and hold staff exchanges with academic and industrial partners:** In the projects HRA and HRA2, there was a significant increase in the exchange of R&D personnel, both with academia and industrial partners. The management of CXI also supports internships staff abroad more (especially young R&D staff in cooperation with faculties, e.g., Ph.D. students of faculties employed to implement R&D projects at CXI are sent abroad as part of these projects). The management also supports foreign cooperation with short-term and long-term trips to partners with the aim of joint research, joint publications and the submission of joint R&D projects. Annually, CXI organises more than a hundred trips.
5. **Greater interaction with OEMs for a clear long-term strategy:** CXI has been working with instrument manufacturers for a long time, mainly from the Liberec region. Greater interaction is through large projects, and the National Centre of Competence for Industrial 3D Printing plays a leading role, where leading manufacturers of 3D printers, 3D inks, and other equipment are involved. The aim is to participate in the development of basic materials and equipment for these manufacturers.
6. **Explore the possibilities of synergy with other TUL faculties (except FME and FTE) and Strengthen the position of the connecting link between the faculties:** Cooperation with

FMIIS was deepened in joint projects (the most significant was the Modular Platform for Autonomous Chassis of Specialised Electric Vehicles for Transporting Cargo and Equipment (CZ.02.1.01/0.0/0.0/16_025/0007293), which involved 18 scientists from FMIIS. FSHE shares scientists with CXI in the fields of chemistry and biology. They were involved in project activities (e.g., LIFEPOPWAT). Cooperation was established with Faculty of Economics (FE) in the area of circular economy, social sustainability, and life cycle assessment, where FE assesses the technologies developed at CXI from an economic point of view. With Faculty of Arts and Architecture (FAA) we cooperated in the field of technology design. For example, a working model was created for the Dubai World Expo (which is located in the lobby of Building L). We also cooperate with FMIIS and FE within the eDIH project with the aim of helping small and medium-sized enterprises with digitisation.

- 7. Become part of a wider network of research centres at the national and international level:** The CXI Director is in contact with the directors of similar centres (ČVUT, UPOL - RCPTM, Plzeň - NTC, Ostrava - CEET, IT4Innovations) and together they discuss issues of university institutes. We also participated in 4 National Centres of competence. At the international level, we are members of various associations (e.g., International Water Association).
- 8. Broad coverage of contractual research themes and focus more on strategic themes:** The reorganisation changes made are aimed at focusing research activities narrowly. CXI Strategy until 2025 defines three strategic themes. Three research directions (VS) have been defined, which are supported by three leaders. In the area of VS1, these are environmental technologies, in VS2 additive manufacturing and in VS3 it is digitalization.
- 9. Achieving a balance between basic and contractual research.** CXI was created as a centre for the transfer of R&D results into practice, and therefore the focus of its activity is on applied research and industrial development. However, CXI also realises that basic research is important to be leaders in research themes. Therefore, CXI strives to motivate young scientists to implement basic research projects in the form of special scholarships. The result are also four projects financed by the Grant Agency of the Czech Republic.
- 10. Continue to improve the staffing policy.** CXI defended its HR Award Excellence in Research, and prepared and implemented an action plan in the area of staffing policy, gender equality, and employment of foreigners, etc. A re-evaluation and site visit will take place in 2025.
- 11. Clarify the long-term mission of CXI within the university:** CXI strives to expand to the European region, and to cooperate with R&D organisations and enterprises outside the EU as well. Based on quality research and development, our mission is to transfer innovations to real life together with our industrial partners. The fact that CXI fulfils this role is demonstrated by this presented report.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
CXI TUL website	3.1-3.7	https://cxi.tul.cz/en/
Strategy of CXI 2025	3.1-3.7	https://doc.tul.cz/en/10773
CXI TUL Annual Reports 2019-2023	3.1-3.7	Annual Financial Report CXI 2019 Annual Activity Report CXI 2019 Annual Financial Report CXI 2020 Annual Activity Report CXI 2020 Annual Financial Report CXI 2021 Annual Activity Report CXI 2021

		Annual Financial Report CXI 2022 Annual Activity Report CXI 2022 Annual Financial Report CXI 2023 Annual Activity Report CXI 2023
CXI TUL Codes	3.1-3.7	https://cxi.tul.cz/en/about-us/notice-board/codes
CXI TUL Sustainability Report for 2023	3.7	https://udrzitelnost.cxi.tul.cz/assets/img/csr_report_cxi_2023 - _final_%20elektro_en.pdf

SELF-EVALUATION REPORT FOR MODULES 4 AND 5

HIGHER EDUCATION INSTITUTION NAME:

TECHNICAL UNIVERSITY OF LIBEREC

COMPANY REGISTRATION NUMBER (CRN):

46747885

MODULE 4 – VIABILITY

ORGANISATION AND MANAGEMENT OF R&D&I

4.1 Organisation and management of R&D&I

The HEI will briefly describe its organisational structure¹ and describe the R&D&I management system including the role of the HEI's central management, the management of faculties, and the HEI's institutes in organizing and managing R&D&I. It should also describe the role and structure of the technical and economic apparatus.

Maximum 1000 words.

Organisational structure

TUL consists of eight separate units, seven faculties and one institute. TUL is headed by the Rector, the faculties by the Dean, and the Institute by the Director. The university has vice-rectors who are in charge of agendas related to defined areas and activities. Similarly, the faculties and the institute have vice-deans and deputy directors, respectively. The various units of TUL are vertically subdivided internally into departments, chairs, and institutes. Horizontally, within the faculties and institutes there are research teams or interdisciplinary and inter-faculty research teams.

The key advisory and controlling body of TUL is the Scientific Council, the International Council and the Commercialisation Council. Similarly, there are also Scientific Councils of individual faculties and institutes of TUL. The procedural set-up and financial management at TUL is overseen by the Academic Senate of TUL and at the faculties by the Academic Senates of the faculties.

R&D management system

TUL has a robust and proven system of management of scientific research, innovation and creative activities (R&D&I), which ensures effective organisation and support of research and development. In the process of R&D&I management, the role of TUL management is to define the mission framework, vision and strategy for the near and longer time periods so that the existing R&D themes are maintained and developed, while at the same time giving room for the development of new themes. Similarly, TUL units have their R&D&I Strategies with defined research programmes and R&D&I strategies for longer time periods with the aim of maintaining and developing core themes while allowing for the emergence of new research areas. In terms of management of individual projects, TUL and TUL's units have a hierarchical system of management and responsibility in the roles of project investigator, project principal and control, and administrator.

¹ A graphical representation of the organisational structure will be provided as an annex.

A key task of TUL management in the R&D management process is setting rules, implementing internal processes and cultivating the environment. The responsible person is the Rector and the Vice-Rector for Science and Research, in terms of finance the Bursar. At the units, the key person is the Dean and the Vice-Dean for Science and Research. A key strategic advisory body to the TUL management is the Scientific Council, which provides feedback on strategic and procedural settings for R&D management at TUL. Feedback, especially on the international overlap of research themes cultivated at TUL, is provided by the TUL International Council.

Knowledge transfer is ensured in cooperation between the TUL management, the TUL TUC and the TUL advisory body the Commercialisation Council. All key procedural settings, the division of the R&D budget into individual units, are subject to approval by the Academic Senate of TUL, which guarantees the high stability of the R&D management system at the University.

As the TUL units cover a wide range of disciplines and expertise, it is not possible to use only one management model for effective R&D&I management. Depending on the characteristics of the field, types of projects and challenges, autonomous development of research teams and departments, etc., there are several models of R&D&I management at TUL units. These models enable effective coordination of research activities of TUL units, support academic freedom of research of individual departments and create conditions for long-term and sustainable development of scientific and creative activities at TUL.

- The TUL management provides complete project support (financial management and methodological support) in the preparation of university-wide projects in close cooperation with teams at individual units. This type of R&D management has an advantage in the implementation of the university strategy and development of TUL and TUL units and also in terms of administration at the institutional level.
- The management of the TUL units provides complete project support (financial management and methodological support), most often implemented by the administrative team of the unit or unit department. The project teams are formed according to the needs of the current projects (e.g., TACR, GACR, MIT, MEYS, MH, MI, etc.) across departments and are not institutionalised in any way. This type of R&D management is characterised by a great flexibility of individual staff members who, based on their specialisation, also participate in interfaculty cooperation tasks, and has a highly innovative potential.
- The management of the unit again provides complete project support, but the departments are separate units guaranteeing R&D activities in the respective R&D areas. There are research teams in the department, which can be interdisciplinary in their focus and therefore interdepartmental or interfaculty. The activities of research teams are defined by the research programme. Methodological support is provided by the Vice-Dean for Scientific Research and Cooperation with Industry and the Vice-Dean for Doctoral Studies and Development. This type of R&D&I management relies on the stability of the field built by tradition and strong links with industry, which presupposes balanced staffing and a quality base of technical equipment.

The role and structure of THP

The technical and economic apparatus, comprising administrative and technical staff, provides key support for research activities, including project management, financial planning and the operation of specialised laboratories and departments, thereby enabling the smooth running of research projects and grants.

Through the Operational Programmes Unit (OPO), the Rector's Office not only provides direct project, methodological and administrative support to institutional projects from national and international funds, but also searches for new projects in international and national calls for proposals (OPO Newsletter). The Rector's Office for Science and Research (OVV) provides methodological and administrative support in the field of knowledge transfer and the provision of R&D incentive and support tools used by the individual units of the University.

Project support at the units is provided by the Project Units, which similarly provide project, methodological, organisational and administrative support to the research teams and departments of the unit. At the same time, they also provide assistance and support for contractual research and complementary activities.

In addition to the technical and economic staff, TUL has set up internal systems for managing and recording projects (GaP) and research results (<https://publikace.tul.cz/?lang=en>).

R&D&I QUALITY MANAGEMENT AND SUPPORT SYSTEM

4.2 System of support for a quality R&D&I environment and incentive measures for quality science

The HEI will briefly describe the systemic incentive measures/tools to support quality R&D&I (if applicable). For each measure/tool described, an example will be provided to illustrate the effectiveness of the measure/tool in practice (e.g. number of projects supported by internal grants, statistics on the use of advisory systems, number of newly established research teams, etc.). The description will pay particular attention to:

- A system of support for attracting national and international projects of projects.
- A system for project consultancy/management/administrative support.
- Science management (e.g., personnel and financial capacity for R&D&I transfer, personnel and financial capacity of the project acquisition support system, science managers, data analysts, business and innovation advisors, etc.).
- The existence of internal funding schemes.
- Strategy/opportunities for establishing new research teams (including international ones) and supporting them within the HEI (e.g. sharing of R&D&I equipment, laboratory and information facilities, administrative support, etc.).
- Support system for students and early career researchers².
- a system to support excellent science (e.g. support for excellent scientists, research teams, PhD students, collaborations, infrastructure, etc.).
- A system of support for interdisciplinary research and collaboration within the HEIs.
- The concept of providing conditions for the emergence of new, high quality research directions/topics, especially those with application potential.

Maximum 300 words per point.

Systemic incentive measures/tools to support quality R&D&I

TUL implements several systemic measures to promote high-quality R&D&I:

- One of the key tools is the TUL Grant Programme (GP TUL), which allocates part of the institutional support (DKRVO) to enhance research quality. Its goals include supporting basic research, increasing the international prestige of scientific teams, improving success rates in competitive grant calls, and funding high-value research outputs. Project selection emphasizes research excellence, proposal quality, and international-level outputs.

² Student grants, support for PhD students, postdocs and early career scientists.

- The Student Grant Competition (SGS) is another major instrument. It supports the quality of doctoral students' R&D outputs and also engages Master's students in research activities, encouraging future doctoral enrolment. A central database of SGS projects has been maintained since 2022.
- Since 2022, TUL has applied a new DKRVO Methodology for fund distribution, prioritizing performance and excellence. It considers both bibliometric and applied research outcomes.
- TUL also strengthens internationalisation through OP RDE projects, e.g., CZ.02.2.69/0.0/0.0/16_027/0008493 such as "International Mobility of Researchers at TUL", providing funding for outgoing and incoming research mobility. Additional international cooperation is supported through Horizon Europe (WIDERA, MSCA) and Visegrad Fund projects.
- In 2022–2023, TUL units underwent a revision of their R&D strategies, aligned with the overall university strategy and the TUL Career Code. Strategic planning now guides the allocation of DKRVO funds.
- Other supportive tools include international and national project collaborations, interdisciplinary research, growing contractual research, industry-linked research development, and hosting international conferences at TUL.

Statistics/examples:

1. In the period under review, 7 projects were supported under the PURE programme, 5 under RISING-STARs and 17 under ENAGO.
2. A total of 323 projects were supported under the SGS in the period under review.
3. In 2022, 1 Methodology was created.
4. In the period 2022-2023, 8 R&D&I Strategies have been developed or revised.
5. More than 100 international projects were submitted in the period under review

Project acquisition support system (national and foreign) and project consultancy/management/support administration system

TUL has a comprehensive support system for project solicitation and research project administration, available both centrally and at the faculty level.

At the university level, the Department of Science and Research (OVV) and the Department of Projects (OPO) are responsible for identifying funding opportunities and preparing national, European, and international projects. They manage project administration during implementation and after completion, and support teams during audits and evaluations. These departments also issue a monthly newsletter with current calls and opportunities, and provide methodical guidance to grant support staff across all TUL units. They operate under the Vice-Rector for Science and Research.

At the faculty level, Grant Support Units (OGP) report to the Vice-Dean for Science and Research. OGP staff actively identify relevant national and international calls and distribute information to specific departments and research teams. They assist with project proposals, administrative support during the entire lifecycle of a project, including formal requirements, funder rules, and budgeting. They also guide departmental and institute staff through the grant process.

To strengthen expertise, administrative teams are regularly trained in TUL's internal systems (e.g., file service, GAP database), as well as national and international funding schemes (e.g., TACR, MIT, MoI, Technology Centre, CzeLO, European Commission).

From 2019 to 2022, TUL participated in the “Regional Contact Organisation Liberec – Contact for the European Research Area III” (LT119003) project. Its goal was to enhance researcher involvement in international projects and build project management skills. Following the project’s completion, a dedicated staff member at OVV continues to provide methodological support for international applicants.

Statistics:

1. Around 250 projects are submitted at TUL annually.
2. There are 9 project support departments across TUL (1 central + 8 unit-level).

Science management system (e.g., personnel and financial capacity for transferring R&D&I results to society, personnel and financial capacity of the project acquisition support system; science managers, data analysts, business and innovation advisers, etc.

TUL is a research organisation with a dedicated structure for managing science and research. This includes specialised departments, staff, financial resources, administrators, IT and data specialists, and data stewards.

TUL’s science management system is strategic and systemic, involving the entire university and reflecting the specific legal and operational needs of research. Management is structured both vertically and horizontally.

Vertical management runs from the Vice-Rector for Science and Research at the university level to Deans and Vice-Deans for Science and Research at faculty level. Horizontal coordination occurs at both levels: centrally (Vice-Rectors, Science and Research Department, Projects Department, TUC TUL, councils, and commissions), and at unit level (Deans, Vice-Deans, Grant Support Units, departments).

In addition to university and faculty leadership, several advisory and operational bodies support science and research management. These include:

- TUL Grant Programmes Council
- RIV Results Coordinators Council
- International Council
- M1 Results Commission (M17+)
- Ethics Committee in R&D
- Open Science Coordinators
- Data Stewards
- Commercialisation Council
- SGS Commission

For research application and knowledge transfer, The University Company TUL (TUC TUL) was established in 2022.

TUL also operates a set of internal information systems and databases to support science and research management:

- GaP.tul (project database)
- publikace.tul (results and outputs)
- pristroje.tul (equipment)
- mobility.tul (mobility tracking)
- sgs.tul (internal competitions and SGS projects)

Statistics:

1. *Science management departments at central level: 2 departments, 11 FTE staff*
2. *Internal science management systems: 7*
3. *Units for results transfer to business: 1 unit, 3 FTE staff*

Internal grant

At the university level, TUL Grant Programmes (GP TUL) were established to strengthen the quality of scientific work, particularly in basic research. The aim is to raise the international prestige of research teams, improve success in competitive grant calls, and provide short-term funding for high-value results.

The main GP TUL schemes include:

- **PURE:** Supports the long-term development of basic research and internationally competitive results. It targets talented researchers and teams with original projects that have strong international impact potential. The programme runs from July 2019 to December 2025.
- **RISING-STARs:** Focuses on junior researchers (within seven years of earning a PhD), with similar goals to PURE. Also active from July 2019 to December 2025.
- **ENAGO:** Aims to improve the quality and scientific impact of publications by doctoral students and academic staff. It supports better articulation of research ideas and aligns with the M17+ evaluation criteria.
- **SGS (Student Grant Competition):** Supports the research activities of Master's and doctoral students.

In addition to university-wide programmes, TUL units manage their own internal funding schemes, financed by DKRVO funds. These are allocated by faculty leadership and allow department heads to apply for support in the following areas:

- Excellent research projects
- Infrastructure development
- Emerging research lines
- Formation or growth of research teams
- Quality projects that were unsuccessful due to limited external funding

Statistics (review period):

1. *7 projects supported under PURE*
2. *17 projects under ENAGO*
3. *323 projects under the SGS programme*

Strategies/opportunities for establishing new research teams (including international) and supporting them within the university (e.g., sharing of R&D&I equipment, laboratory and information facilities, administrative support, etc.

TUL follows a strategy similar to that of leading international universities to identify and develop new research themes and teams. Key tools include:

- Participation in prestigious international conferences
- Joint publications and research projects
- Continuous monitoring of current trends through literature in top journals
- Research stays, internships, and seminars at leading foreign institutions
- Membership in international scientific associations and societies

When a promising new research theme is identified, TUL takes steps to support its development. A central approach is establishing international cooperation with top European institutions active in

the same field. If the theme shows commercial potential, the next step is to secure an industrial partner interested in applying the research results.

In the early stages - before external funding is secured - the team may be supported by departmental budgets (mainly from DKRVO) or may apply for TUL Grant Programmes.

New research teams have access to both their host department's equipment and TUL's shared instrumentation, managed through an internal instrumentation database. High-performance computing and data servers are also available. Teams benefit from full access to international scientific databases via the TUL Library.

Administrative, technical, and methodological support is provided by the unit where the team is based, with access to university information systems for all employees. TUL and its faculties assist researchers with project preparation and submission.

Statistics/examples:

1. EU Twinning project *"Sustainable Remediation of Radionuclide Impacts on Land and Critical Materials Recovery (SURRI)"*.
2. See Chapter 4.9 for examples of shared infrastructure.
3. Examples of new research teams in the evaluation period: *"Sustainable Textiles and Clothing"*, *"Hydrogen Technology"*, *"Semiconductors"*, *"Nanomaterials in Medicine"*, *"Environmental Technology"*, etc.

Support system for students and early career researchers

TUL has a comprehensive support system for doctoral students (DSP) and early career researchers, detailed in Chapters 4.13 and 4.6. Beyond onboarding and adaptation, TUL has long supported the academic and professional development of students and young scientists.

They can gain experience through participation in research projects, involvement in SGS projects, and engagement in departmental activities. Administrative support is available at all TUL units.

There are currently four main funding sources supporting students and early-stage researchers:

- State funding for educational activities and scholarships for DSP students
- Institutional support through DKRVO
- Targeted support via Specific Undergraduate Research (SGS projects)
- Public sources, such as national and international research grants (e.g., GACR, TACR, MIT, MI, MH), development programmes (IP, OP)
- Non-public sources, including collaborative and contractual research
- Reserve funds from TUL departments

TUL also offers additional scholarships under its [Scholarship Regulations](#) to encourage participation in research, creative activities, and mobility.

International experience is supported through internships and exchange stays at prestigious foreign institutions, promoting global research engagement.

Young researchers benefit from flexible study and working conditions that support work-life balance. TUL recognises career breaks and offers mentoring programmes and career counselling for doctoral students and postdocs.

Collaboration with industry and the public sector is a key aspect of TUL's strategy, helping young researchers prepare for careers not only in academia but also in applied and industrial environments.

TUL thus provides a strong framework for students and young scientists to grow professionally, conduct high-quality research, and build sustainable careers.

Support system for excellent science (e.g., support for excellent scientists, research teams, doctoral students, collaborations, infrastructure, etc.)

The system of support for science and research, support for scientists, research teams, doctoral students, infrastructure sharing, etc. has been described in the previous text and chapters or will be described in the following text and chapters.

In addition to the above information, the TUL funding distribution system is targeted at supporting excellent science and scientific teams, where results published in the most prestigious journals, international cooperation projects, and excellent applied results with transnational reach and commercialisation success are significantly rewarded.

In addition, TUL uses the European Commission's instruments in the form of Horizon Europe WIDERA and MSCA projects and Visegrad Fund projects to support and establish excellent international cooperation.

In the evaluation period, three ERC projects were submitted, one of which received a B rating in the international peer review panel of the European Research Council, but due to lack of funds did not receive financial support from the ERC (the project met the conditions for support from the Ministry of Education, Youth and Sport under the ERC CZ programme).

System of support for interdisciplinary research and collaboration within the units of TUL

TUL and its units support interdisciplinary research to the maximum extent possible, which is widely developed at TUL due to the knowledge of the focus of research teams and research activities at individual units and departments of TUL. The size of TUL plays an important role in this system.

Interdisciplinary research, a teamwork between departments, components and scientists from close or distant disciplines, is generally a more complex area in terms of personnel, time and money than research within a single discipline. Moreover, even the 17+ Methodology does not take into account interdisciplinary and multidisciplinary research.

On the other hand, TUL is very successful in this area and we can therefore conclude that cooperation in the framework of interdisciplinary research is widely developed within TUL and TUL units. This is due to the size of the research teams, knowledge of the focus of the research teams, knowledge of laboratory equipment and infrastructure, sharing of infrastructure, working atmosphere, etc.

The vast majority of the major projects at TUL or at TUL units were interdisciplinary (e.g., EF16_019/0000843 "Hybrid materials for hierarchical structures", EF16_025/0007293 "Modular platform for autonomous chassis of specialised electric vehicles for transport of cargo and equipment", EF16_025/0007424 "3D printing in construction and architecture", etc.).

Another example was the preparation of projects in the evaluation period for the OP R&D Spitz Research and OP R&D Intersectoral Cooperation, which were again prepared as interdisciplinary projects involving most of the TUL units. Currently, interdisciplinary cooperation between the fields

of textile engineering, nanotechnology, medical applications and sustainability (FT, FHS, FME), etc. is developing rapidly.

The concept of providing conditions for the emergence of new quality research directions / themes, especially with application

TUL has a strong focus on applied research, with a long tradition of supporting creative activities for various industries. It has developed effective conditions for launching new research directions with strong potential for practical use.

The strategy for identifying and establishing new application-oriented research themes is based on:

- The strategies of TUL and its units
- The National RIS3 Strategy and the RIS3 Strategy for the Liberec Region

New directions are targeted at priority areas with high potential to contribute to the Czech Republic's long-term industrial competitiveness.

An important role is played by AMIA (Association of Industry Partners) at CXI, which funds early-stage basic research themes. Its members select themes for support. One example includes research on nanoalloys using lasers, which led to the project *“High throughput nanoparticle production technology for controlled drug delivery.”*

New research directions with application potential typically emerge through:

- Industry-driven needs
- Joint research projects with industry
- Development of contractual research themes
- Initiatives by TUL departments with targeted outreach to industrial partners
- Active participation in clusters and industry associations

When a promising theme is identified, TUL initiates its development, explores commercialisation possibilities, and engages industrial partners for collaboration and future exploitation.

In early phases, before external funding is secured, research is supported from departmental budgets. Administrative support is provided by the host department.

Statistics/examples:

1. *Examples of TUL's involvement in clusters include Nanoprogress, Clutex, CTPT, ATOK, etc.*
2. *Examples of TUL's involvement in associations: Transfera, Hydrogen Platform, Electromobility, ...*
3. *Involvement of CXI TUL in AMIA.*
4. *Selected example of a new research direction: Sustainability in architecture by using the roofs of logistics complexes to grow vegetables (FAA).*

4.3 Quality control system for R&D&I environment

The HEI will briefly describe the system of internal and external evaluation of research units, including the following aspects:

- Internal and external evaluation of R&D&I quality: This includes the evaluation of R&D&I by the HEI's authorities, the evaluation of research teams (if such a system exists), and the involvement of international scientific councils or other independent advisory bodies in quality control and of R&D&I management.
- The ethical aspects of research: This includes adherence to ethical principles and good scientific practice, compliance with related legislation (codes of ethics, ombudspersons, ethics committees and ethics hotlines, and systems for reporting whistleblowing and ethical misconduct).

The HEI shall demonstrate the functioning of the quality control systems in the R&D&I environment by examples (e.g., brief information on the evaluations carried out and their results, specific examples of the use of whistleblowing or the handling of ethical violations, etc.).

Maximum 500 words plus 200 words for each example described (max. five).

Self-assessment:

TUL has set up a comprehensive system of internal and external evaluation of research units at the level of TUL, or parts of TUL. The system combines both performance and motivational aspects, including R&D excellence. The system evaluates bibliometric results as well as applied research results, submitted and ongoing projects, ethics in R&D, involvement of the ethics committee and the ombudsman. Based on the evaluation, the funds to the different components are allocated. TUL components have their own internal allocation systems.

Internal and external evaluation of quality

Since 2017, the "Rules of the Quality Assurance System and Internal Quality Assessment of TUL" have been in force at TUL. Based on it, individual organisational units create their own quality assessment systems that correspond to their specific requirements and characteristics and which include the assessment of not only research activities. The results of the evaluation are used to provide feedback to the units, to innovate the R&D strategy of the TUL units and to develop excellent R&D directions.

The regular systems of R&D&I quality assessment at TUL, in addition to the above mentioned guidelines, include:

- Ongoing evaluation of research teams and research programmes, R&D results, which is performed at individual units of TUL according to internal methodologies and processes,
- Systematic evaluation of research units at TUL using internal methodology,
- Evaluation of the quality of R&D&I by the university authorities, the Scientific Council of TUL and the scientific councils of individual TUL units,
- Evaluation of R&D quality using internal systems Publikace.tul and GAP.tul, etc.,
- Evaluation of TUL R&D in the framework of the M17+ Methodology within the M1, M2, M3 modules,
- Quality Assessment of R&D&I by the International Council <https://www.tul.cz/en/research/international-board/>,
- Annual reports on the activities of TUL and TUL units,
- The quality of R&D is secondarily assessed as part of the evaluation of accreditation applications submitted to The National Accreditation Bureau for Higher Education, where the creative activities of the guarantors are evaluated,
- Evaluation of TUL in international rankings,

- Success in project calls and competitions,
- Evaluation of the projects and the fulfilment of the indicators by the providers, expert evaluators and opponents, including the quality and economic benefits of the results obtained,
- TUL Career Regulations,
- Methodology for the distribution of DKRVO funds at TUL,
- Methodology (metrics) of evaluation of TUL trainers,
- Employee satisfaction survey,
- Industry Council (FME, FM).

Examples:

1. The elf-driving vehicle developed at TUL is one of the best projects in Europe

The ANTeTUL project has made it to the finals of the prestigious Regiostars 2023 competition among 220 European competitors. The multifaculty and interdisciplinary team at TUL has been working on the project for four years, developing an autonomous commercial vehicle for transporting cargo in difficult conditions as part of the ANTeTUL Electromobility project. The ANTeTUL project was selected by the European Commission as one of 220 finalists in the prestigious "Regiostars 2023" competition, which recognises the best projects supported by European funds. ANTeTUL is included in the "A Connected Europe" category, where it is joined by four other international projects - Danube Cycle Plans (Interreg Danube), Diglogs (Interreg Italy-Croatia), Dynaxibility4CE (Interreg Central Europe) and Interreg Central Baltic - in the Regiostars competition. In total, the project produced 276 results. The team has developed 2 demonstrators/functional samples, registered 5 international patents, written 136 scientific publications and signed 19 Memorandums of Understanding, which, among other things, allow for the sharing of the results achieved in the project. He was rated 1 in the M17+ Methodology in Module M1.

2. Patent Awards at Invent Arena 2024

TUL won two gold medals and one silver medal for three patents (porous glass plasticine for fashion or design; mobile softening device that can quickly produce nano- and microfibres anywhere; autonomous utility vehicle for transporting cargo in difficult conditions) including prototype demonstrations at the Invent Arena 2024, a competitive trade fair for technological novelties and innovations in Třinec.

The ethical side of TUL

TUL has valid [The Ethics Code for the TUL Employees and Students](#), which sets general moral rules that it considers self-evident for academic and research positions and insists on their observance. Violations of these rules are dealt with by the Ethics Committee. In the field of R&D, the TUL Code of Ethics addresses, among other things, plagiarism, duplication of research, fragmentation of results, protection of intellectual property, fair recognition of colleagues' contributions, conflict of interest situations, compliance with publication ethics rules, handling of published errors, etc.

[The TUL Ethics Committee](#) considers cases of violations of the rules of ethical conduct and behaviour on the basis of individual complaints. In its resolution, it states whether there has been a violation of generally applicable moral principles or "The Ethics Code for the TUL Employees and Students", including an explicit statement of what has been violated and an assessment of the seriousness of the violation.

In addition to the TUL Ethics Committee, TUL also has a [Research Ethics Committee](#) (Rector's Directive No. 3/2022 [Statutes of the Research Ethics Committee](#)), which deals with ethical aspects of research conducted at TUL involving mainly human subjects (including work with biological

material of human origin), but also other activities requiring ethical consideration. As part of this activity, the Commission issues opinions and recommendations on research project proposals or research projects already awarded.

Last but not least, there is an [ombudsman](#) at TUL and at some units of TUL. The Ombudsman at TUL is the guardian of the rights of employees and students, and is available as an independent observer to all employees and students of TUL in case of concerns about the observance of rights and procedures, in particular in the following areas: equal access, discrimination, sexual harassment, bullying and burnout. It can also mediate potential disputes and communication disagreements. The whistleblowing system at TUL allows for anonymous reporting of ethical violations, which are then investigated and dealt with in accordance with applicable regulations.

Since 2020, CXI TUL has been a holder of the HR Award, where part of the HR Award evaluation includes monitoring the ethical aspect of research, compliance with ethical principles and good scientific practice.

Examples:

- 1. The Research Ethics Committee has considered a total of 7 applications for approval of research projects/plans since its establishment until the end of the reporting period. All the applications reviewed were processed favourably.*
- 2. In 2023, the Ombudsman received 8 relevant complaints. Of these 8 relevant complaints, 5 were closed by the complainants. The other 3 were resolved. These concerned inappropriate teaching practices and in one case a conflict of interest related to the election of a dean. In 2024, the Ombudsman received 2 relevant complaints. The first complaint was resolved at the level of consultation and consideration of the seriousness of the conduct of the person concerned, with further action being waived at the discretion of the whistleblower. The second complaint is still pending.*

4.4 Sustainability and resilience of R&D&I

The HEI will describe the arrangements for sustainability and increasing the resilience of R&D&I, if such a system exists, and provide examples of its implementation. These include:

- The sustainable development concept (strategy, objectives, plan and implementation).
- Social responsibility strategy.
- A knowledge transfer system, if it is established at central level.³
- The third role, the transfer of R&D&I results to society and interaction with local actors.
- The concept of research data management (data collection, access and sharing of data, use of the information obtained for R&D&I management, responsibility for data files, archiving and backup of data).
- Ethics and personal data protection.
- Intellectual property protection.
- Ensuring institutional resilience (resistance to foreign influence, cyber security, risk prevention, prevention of misuse of R&D&I and knowledge transfer results, a system to prevent or mitigate the negative impacts of R&D&I and knowledge transfer in society).
- Digitisation and the use of smart technologies.
- The institutional strategy for Open Science 2.0/Open Access (if one exists), including information on the operation of the institutional repository or similar tools.
- A system for training undergraduate and postgraduate students as well as staff in the field of intellectual property protection and technology transfer.

The HEI will demonstrate the effectiveness of its procedures by examples (e.g., the number of people trained in intellectual property protection and technology transfer, data on the usage of Open Access repositories, handling of risk incidents, etc.).

Maximum 300 words per point.

Sustainability and increasing the resilience of R&D&I

TUL has set up a comprehensive system of measures to increase the resilience of R&D&I and the sustainability of R&D&I. This system includes resilience in terms of R&D funding and the elimination of possible shortfalls from other sources (e.g., contractual research), staffing strategy, R&D strategy, creation and protection of R&D results, intellectual property, digitisation of processes, OpenScience strategy, ethical aspects and last but not least effective transfer of knowledge to society.

The key strategic institutional tools for ensuring sustainability and increasing the resilience of R&D&I at TUL are:

- [Strategic Plan for Educational and Creative Activities and Strategy for the Internationalisation of the Technical university of Liberec for the period 2021-2025, with a view to 2030,](#)
- [Programme to support the strategic management of the Technical University of Liberec for the years 2022-2025,](#)
- [Implementation plan of the Strategic plan of the Technical university of Liberec for 2025,](#)
- [The TUL Strategic Development Plan for 2020 with a forward view to 2030,](#)
- [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030,](#)
- [Mission | Vision | Strategy in Science and Research of TUL between 2020 and 2030,](#)
- [Personnel Development and Evaluation of Employees of the Technical University of Liberec,](#)
- [Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec,](#)

³ If the knowledge transfer system is decentralised to the unit level, the HEI shall describe how the system works.

- [Career Development Regulations of the Technical University of Liberec,](#)
- [Work regulations,](#)
- [The protection of intellectual property at the TUL and the commercialization of R&D results,](#)
- [Rector's Directive No. 2/2023 - Open Science,](#)
- [Sustainable Development Strategy TUL by 2030,](#)
- [Protection and processing of personal data at the Technical University of Liberec,](#)
- Employee Satisfaction Survey 2023,
- TUL budget,
- Internal grant competitions,
- Internal database systems,
- Establishment of a subsidiary company TUC TUL.

Sustainable Development Concept (strategy, objectives, plan and implementation)

TUL has developed a comprehensive [Sustainable Development Strategy](#), defining its vision, mission, priority areas, goals, actions, and indicators. The university actively promotes sustainability across three main pillars - environmental, social, and economic - and fosters a responsible and value-based institutional culture.

TUL implements the university-wide project "Sustainable Development of TUL" (NPO MEYS-2141/2024-4), which links education with environmental protection and aims to minimise negative impacts of institutional processes.

While TUL does not hold ISO 14001 certification, it ensures strong environmental management. Internal regulations govern equipment inspections, chemical and biological agent handling, and waste tracking. TUL is active in CSR-related areas, including energy and water use, waste and recycling, transport, sustainable products, packaging, and purchasing. The university contributes to most of the 17 UN Sustainable Development Goals (SDGs).

TUL maintains long-term financial stability, despite annual budget variations.

Sustainability principles are also embedded in the TUL "Science, Research and Innovation Strategy to 2025 with outlook to 2030", covering themes such as sustainable business, social responsibility, and resilience - reflected in research and contract projects.

The CXI institute released CSR reports in 2023 and 2024 that assess its social, environmental, and economic performance. It established the CXI4LIFE group to address internal CSR activities, facilitate regular staff-management meetings, and monitor employee satisfaction. As part of HR Award certification, internal documents were created to promote awareness of staff responsibility and operational impact. The reports show ongoing improvement in environmental outcomes.

At the FAA, the Sustainable Development Concept is based on the Reuse-Reduce-Recycle principle. It is published on the faculty website and aligned with the UN 2030 Agenda. Research in sustainable construction, architecture, and urban planning is a key priority for the faculty.

Social Responsibility Strategy

The Social Responsibility Strategy is not defined in a separate document, but is interwoven throughout the TUL legislation. Social responsibility is an integral part of the University's activities and is also included in the Strategic Plan for Educational and Creative Activities and the TUL Internationalisation Strategy for the period 2021-2025, with a view to 2030, and the Strategic Plans of TUL's components, the Annual Plans for Implementation of the Strategic Plan.

Social responsibility is not only a matter for the management of TUL, but for all employees, because only then can things be changed for the better. All three areas of sustainable development, i.e., social, environmental and economic, should be taken into account when implementing social responsibility. For this reason, TUL provides and organises questionnaire surveys and employee satisfaction surveys (see Chapter 4.7) on various themes (working environment, remuneration, quality of meals, etc.), which are voluntary. On the basis of the results of the surveys, an action plan for 2025-2026 has been established by TUL management.

Knowledge transfer system, if established at central level

The system of knowledge transfer (KT) is generally a very complicated matter at universities, because the university system has to effectively solve the dilemma of rapid dissemination of scientific results among the general professional and lay public on the one hand and simultaneously protect the resulting know-how with subsequent possible commercialisation on the other hand. As each case of knowledge transfer and commercialisation of IP is usually quite unique, it is impossible to establish a uniform procedure for knowledge transfer.

The knowledge transfer system at TUL is currently governed by the Rector's Directive [The protection of intellectual property at the TUL and the commercialization of R&D results](#), which sets out the basic rules for the flow of information on intellectual property and the basic duties of key persons in the knowledge transfer process. The experience of key personnel in the management of TUL and its units plays an essential role in the process. An important role in the knowledge transfer process is provided by the "Commercialisation Council", which is an advisory body to the Rector. TUL also receives important information from the "Transfera" platform, of which TUL is a full member.

Knowledge transfer can currently take place at TUL in several possible ways, which may be intertwined:

- At the rectorate level (Vice-Rector for Science and Research), who discusses transfer possibilities in cooperation with the originators of the result, is present at negotiations with potential users of the result, coordinates activities, provides legal services and interpretation of internal standards,
- Using the subsidiary [TUC TUL](#),
- A joint procedure of the rectorate departments and the TUC TUL,
- On the basis of Contracts for the Use of Results of Science and Research,
- On the basis of Work Contracts,
- On the basis of Cooperation Agreements.

Statistics/examples:

1. Number of licence agreements concluded in the period under review:

	2020	2021	2022	2023	2024
Number of licence agreements	6	8	7	9	12
of which new	0	2	1	2	3

2. Number of units for transfer of results to society: 1 (TUC TUL).

3. Number of knowledge transfer projects: 2 (Prosyko projects - proactive commercialisation system, e.g., TG01010117)

4. Number of spin-off companies with TUL ownership: 1 ([Glassiteca](#))

Third role, transfer of R&D&I results to civil society and interaction with local actors

TUL is aware of its key mission in the field of the third role based on the synergy and interconnection of technical disciplines with social sciences, humanities and arts. The management of TUL and its organisational units are in daily contact with representatives of industrial partners, primary and secondary school principals, regional and municipal officials, representatives of national organisations, governmental institutions and municipalities, and are thereby provided with a continuous overview of the needs of society and the market, and of the needs of local actors.

TUL regularly organises events for the public (Researchers' Day, Open Day, Company Days, Open Days, popularisation lectures, events for MIT regarding European projects, workshops, expert lectures 3600 seconds, Days of Architecture, ...), University of the Third Age, Children's University, TUL Ball, concerts on important events and anniversaries, etc.

TUL organises dozens of events, excursions and demonstrations for primary and secondary school students every year, participates in the IQlandia exposition, organises suburban camps, and summer schools, etc.

TUL has concluded cooperation agreements with industrial enterprises, the city, region, hospital, health authorities, and ambulance services. TUL is actively involved in cooperation within the Science, Research and Innovation Council of the Liberec Region, the Smarter Region of the 21st Century platform, cooperates with the Regional Development Agency (ARR) of the Liberec Region, with Lipo.Ink in terms of knowledge transfer, cooperation on the EDIH project, Ideathon competition, on the H2020 project "The Initiation of Sustainable Energy Community for the City of Liberec", etc.

TUL also offers services of its departments to the public (Centre for Asset Valuation - EF, Analytical Laboratory CXI - water analysis, determination of algae in plaster, Centre of the Czech Society for Quality, etc.), and industrial partners (lifelong learning and training, seminars).

Concept of research data management (data collection, access and sharing, use of information for R&D&I management, responsibility for data files, archiving and backup of data)

The concept and strategy of research data management at TUL is formalised by internal legislation (see e.g. Open Access) and internal data systems (see e.g. Publikace TUL). In real terms, the available resources are used for this purpose, in particular the data repositories of TUL and the CESNET association, which enable the collection, backup, sharing, recording and use of data.

Data protection, personal data and data ethics are defined in the relevant Rector's directives. IT support for research data management is handled university-wide. The systems are subjected to annual stress tests. The person responsible for data management at TUL is the Vice-Rector for Informatics.

Ethics and data protection

Ethical aspects are incorporated at TUL in [The Ethics Code for the TUL Employees and Students](#). In 2021, the management of TUL established the position of [ombudsman](#) to strengthen the relationship with employees and students and to improve the university culture. A public [ombudsman](#) website has been established to facilitate communication. Following [The Ethics Code for the TUL Employees and Students](#), an Ethics Committee has been established. In 2023, a Research Ethics Commission was established at TUL. For the area of gender equality, the [TUL Gender Equality Plan](#) was developed in 2022, which defines clear objectives for the development of a high quality personnel policy within the fields of education, science and research as well as care for employees within the established priority areas, and also [Code for Gender-Sensitive Communication at the](#)

[Technical University of Liberec](#). TUL is actively involved in activities implemented by other universities in the area of equal conditions, in particular the sharing of good practice.

TUL adheres to ethical principles in its activities and protects personal data according to the principles of GDPR. The internal legislation dealing with this issue, which is implemented at TUL, is as follows:

- Social security at TUL - intranet section,
- [The Ethics Code for the TUL Employees and Students](#),
- [Ethics Committee](#),
- [Ombudsman](#),
- [Research Ethics Committee](#) and [Statutes of the Research Ethics Committee](#),
- [Disciplinary Commission of TUL](#),
- [Protection and processing of personal data at the Technical University of Liberec](#) and [Information on the principles of processing and protection of personal data at TUL](#),
- [Cyber security](#),
- [Declaration of accessibility of the TUL website and mobile applications](#),
- [Using artificial intelligence in teaching and creative work](#),
- [Conflicts of interest in habilitation proceedings and proceedings for appointment as professor](#).

Intellectual property protection

The system of intellectual property protection at TUL is currently regulated by the Rector's Directive [The protection of intellectual property at the TUL and the commercialization of R&D results](#). At the same time, the internal system of Results Management and Intellectual Property Management is used, where the originators enter information about their original know-how, or the Notification of Intellectual Property Origination.

TUL has long experience in the field of intellectual property protection. TUL, as well as a large number of industrial partners and companies, requires the signing of various types of contracts (Work Agreements, Project Agreements, Cooperation Agreements, NDA agreements, etc.) before the start of research activities and work, in which the creation, disposal, and property rights in the event of intellectual property creation are treated and clearly defined.

In the event of a violation of the rules and internal legislation, cases are dealt with by the TUL Ethics Committee (see Chapter 4.3)

Ensuring institutional resilience (resistance to foreign influence, cyber security, risk treatment, prevention of misuse of R&D&I and knowledge transfer results, system for preventing or mitigating negative impacts of R&D&I and knowledge transfer on society)

TUL has been intensively addressing the issue of institutional resilience, recognising it as essential for protecting academic and societal freedoms. As a university based on openness and internationalisation, TUL is particularly vulnerable to illegitimate influence.

Several strategic documents are already in place, with others in development, such as a Strategy for Prevention and Response to Illegitimate Influence and an Anti-Influence Manual with practical examples. Existing measures include:

- [Protection and processing of personal data at the Technical University of Liberec](#)
- [Cyber security](#)
- [The protection of intellectual property at the TUL and the commercialization of R&D results](#)
- TUL's stance on countries/workplaces listed under EU sanctions

- [Using artificial intelligence in teaching and creative work](#)

TUL actively cooperates with state security agencies (e.g. BIS, Ministry of Interior, Ministry of Education) to mitigate risks in the academic environment. Plans include systematic monitoring of security incidents and regular updates to prevention and response strategies.

Before signing contracts or entering partnerships, TUL conducts security risk assessments, taking into account geopolitical factors. Internal control procedures are in place, involving responsible staff and managers at all levels.

Cybersecurity - including cloud, network, and endpoint protection - is managed by the Cybersecurity Officer and Methodologist, under the Vice-Rector for Informatics. The Vice-Rector for Science and Research coordinates strategies related to illegitimate influence. At the faculty level, the Vice-Dean for Science and Research oversees implementation.

Statistics/examples:

1. *In the evaluation period (year 2023), 1 training session was held by BIS with the participation of about 15 senior staff of TUL and the Science and Research Department.*
2. *In 2023, we dealt with one serious incident of misuse of our patent by a US company.*

Digitisation and the use of smart technologies

In addition to internal databases and systems, TUL uses systems for personnel (VEMA), document management (filing service), educational activities (STAG), repository (DSpace), smart technologies for recording and controlling water and energy consumption in individual buildings, building security, ordering food in the canteen, etc. At the same time, TUL has a valid guideline regarding [Using artificial intelligence in teaching and creative work](#).

At the same time, TUL is digitising its agendas and activities to the maximum extent possible and on its own to reduce the administrative burden and facilitate internal processes. The following institutional systems have been developed and deployed in recent years:

- System for internal grant competition,
- System for Student Grant Competition (SGS TUL),
- Grants and Projects system (GaP),
- System of recording the results of science and research (Publikace TUL),
- System for recording and tracking mobility (Mobility TUL),
- System for reporting the creation and management of intellectual property,
- Instrument registration system (Instruments TUL),
- Open Science Support System (DDR),
- TUL employee evaluation portal (Cassandra),
- Systems for training and administrative agendas (fleet, training, education, etc.).

Digitisation and smart technologies are also a significant system integration activity. An example is the European Digital Innovation Hubs (EDIH) project, which we are working on together with regional organisations such as the Liberec Region, ARR, VÚTS or CIRI. Its essence is to help small and medium-sized enterprises with digitisation and AI tools.

Institutional strategy for Open Science 2.0/Open Access (if any), including information on the operation of the institutional repository or similar

TUL has a legislated institutional strategy for Open Access, outlined in [Rector's Directive No. 2/2023 - Open Science](#), which defines internal procedures and responsibilities. TUL applies Open Science principles to the publication of research outputs and data funded from public sources and promotes long-term access to research data in line with ethical standards. TUL follows the FAIR principles and the guideline "as open as possible, as closed as necessary" when making data available. Recommended repositories are listed in the annex to the directive.

Open Science activities at TUL are coordinated by Open Science Coordinators and Data Stewards at individual units. The University Library participates in international initiatives like Open Access Week and supports repository use.

Since 2014, TUL has operated a Dspace repository, providing open access to undergraduate theses and serving as a secure archive for research outputs of staff and students.

TUL publishes the ACC Journal, an open access scientific journal, and is a member of the SCOAP3 consortium - an international network of over 1,000 institutions from 24+ countries promoting open access in cooperation with key publishers.

A Data-Driven Research (DDR) tool for research data storage and sharing is being developed in collaboration with CESNET. The CXI institute actively advances research data management and is part of the MATECH working group, contributing to the design of a national open data repository within EOSC CZ.

CXI is also part of the OpenScience I (OS I) project team led by CASR, focusing on automating data collection and instrument data storage in the National Repository Platform (NRP). DDR is expected to become an open-source solution for the wider research community. TUL is also participating in the preparation of a proposal for the Open Science II call.

System of education of undergraduate and postgraduate students and staff in the field of intellectual property protection and technology transfer

TUL has a comprehensive system for educating students and staff in intellectual property (IP) protection and technology transfer (TT) - key areas due to the university's strong application-oriented research. Education is coordinated centrally through the Continuing Education Centre and the University Library. In 2024, a Staff Training section was launched on the TUL intranet to consolidate training opportunities. TUL also maintains an internal system (Publikace TUL) for registering publications and IP-related outputs.

Between 2017–2021, TUL implemented the OP RDE project "Effective Technology Transfer Process at TUL" (CZ.02.2.69/0.0/0.0/16_014/0000631). The project built the personnel and information foundation for TT and academic training. It resulted in a complete internal TT system, updated regulations, and new support tools. As part of this initiative, Technology Scouts were appointed across TUL units. These experts offer methodological support for result creators in areas such as IP protection, commercialisation, and legal pathways for TT. Additional trained staff within departments also support this process. In 2022, TUL established [TUC TUL](#), a subsidiary company responsible for managing technology transfer and commercialisation.

Education in IP and TT is also a core part of the University Doctoral School, which offers targeted training and seminars, case studies, and guidance on spin-offs, internal systems, and transfer

opportunities. TUL also promotes student entrepreneurship through the Student Business Club (SBC), founded by the Faculty of Economics. Since 2015, the SBC has supported student innovation and business projects, hosting activities such as competitions and an annual summer school of entrepreneurship (Business Workout).

Statistics/examples:

Between 2022 and 2024, the number of participants in the University Doctoral School was 113.

PERSONNEL POLICY

4.5 Structure of human resources

The HEI shall describe the current state, age structure, degree of internationalization and development trends of the staff involved in R&D&I, along with their distribution by a job title and gender for the period of 2020–2024 as detailed in annex tables (Tables 4.5.1 to 4.5.3) (including the provision of technical and economic facilities).

Maximum 1000 words.

Self-assessment:

TUL is stable in terms of staff numbers, in terms of overcounted staff numbers, and in terms of age structure, which is very good. There is a continuous generational turnover of staff.

Current status

As of 31 December 2020, the Technical University of Liberec employed 1263 physical employees (of which 778 were academic and scientific staff), with a converted number of 1091 FTE employees. As of 31 December 2024, it employed 1281 employees in the physical state (of which 778 were academic and scientific staff), in the converted number of 1071 FTE employees. Over the period under review, the number of staff increased by about 1.5%, but there was a decrease of 1.9% in FTE employees. The number of academic and scientific staff remains the same, with an increase of 3.7% in administrative, technical and service positions.

Worker development trend

Changes in the structure of academic and scientific staff have been made between 2020 and 2024, with a 10% reduction in the number of professors, a 22% reduction in the number of researchers and a 20% reduction in the number of technical and economic staff. On the other hand, the recalculated numbers were increased by 15.6% for associate professors, 4.3% for assistant professors and 5.5% for other scientific, research and development staff.

As of 31 December 2020, TUL employed 294 women in academic and scientific staff positions and as of 31 December 2024 it employed 304 women in these positions. There is therefore a slight increase of women in academic and scientific positions of about 3%. The proportion of women in senior positions and in the management bodies of TUL has increased by 1.5% compared to 2020, i.e., to 25.5% as of 31 December 2024.

Age structure

The average age of academic and scientific staff is slowly increasing, reaching 46 years in 2020 and almost 48 years in 2024. The most ageing staff are assistant professors, whose average age has increased by 2 years to 47 years, and researchers, whose average age has also increased by 2 years to 41 years compared to 2020. For other positions, the age is the same or differs by a maximum of 1 year. The average age as of 31 December 2024 is 64 years for professors, 55 years for associate professors, 36 years for assistant professors and 49 years for lecturers.

Degree of internationalisation

As of 31 December 2020, TUL employed 89 employees with foreign nationality, and as of 31 December 2024, it employed 62 employees with foreign nationality. In terms of the number of FTEs of employees with foreign nationality in employment contracts and work agreements, the number of foreign nationals in 2020 is 67 and in 2024 it is 58, i.e., a decrease of 9%. In 2020, TUL employed the largest number of employees with foreign nationality from the Slovak Republic, Poland, Ukraine, the Republic of India and the Socialist Republic of Vietnam. In 2024, the highest number of employees with foreign nationality from the Slovak Republic, Ukraine, the Republic of Poland, the Islamic Republic of Pakistan and the Socialist Republic of Vietnam were employed at TUL.

4.5.1 Staff involved in R&D&I of the university (FTE) in the period under review

Academic/professional position	Total 2020	Of which women [%]	Of which foreign [%] ⁴	Total 2024	Of which women [%]	Of which foreign [%]
Professor	40.02	5.00%	3.04%	35.86	6.57%	0.00%
Associate Professor	89.72	29.99%	2.45%	103.52	30.52%	3.81%
Assistant Professor	270.81	45.36%	3.04%	282.48	46.87%	4.10%
Assistant	43.70	33.82%	9.14%	40.80	32.93%	2.86%
R&D Personnel ⁵	100.28	39.68%	2.57%	88.49	39.89%	3.22%
Researchers in other categories ⁶	199.96	44.18%	16.47%	163.68	45.36%	16.01%
Technical and economic staff ⁷	315.67	83.07%	0.97%	299.37	81.75%	0.77%
Early career researcher ⁸	116.15	40.02%	9.25%	102.66	41.54%	8.41%
Scientific, research and development staff involved in teaching activities	519.48	40.53%	4.03%	526.69	41.33%	4.09%
Total number of foreign nationals	56.68	44.56%	100.00%	50.09	43.12%	100.00%

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, research and development staff, scientific staff not falling into other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Note: The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

⁴ Researchers with Slovak citizenship are not considered foreign.

⁵ The category "Other scientific, research and development personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁶ The category "Researchers not falling under other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁷ Who participates in the management and support of R&D&I in the institution.

⁸ See Definition of Terms in Methodology HEI2025+.

4.5.2 Percentage of HEI's staff involved in R&D&I, categorized by age structure, job title, and gender in the year 2020 (number of physical employees and staff)

Academic/professional position	Under 29 years [%]		30-39 years [%]		40-49 years [%]		50-59 years [%]		60-69 years [%]		70 years and over [%]	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0.00 %	0.00 %	0.00 %	0.00 %	1.83 %	0.00 %	4.33 %	0.00 %	13.19 %	1.52 %	36.36 %	10.00 %
Associate Professor	0.00 %	0.00 %	1.64 %	1.54 %	9.42 %	3.96 %	10.39 %	7.69 %	16.67 %	7.58 %	34.09 %	30.00 %
Assistant Professor	0.00 %	0.00 %	31.48 %	22.31 %	35.60 %	30.69 %	22.08 %	21.68 %	18.75 %	22.73 %	6.82 %	20.00 %
Assistant	16.00 %	18.75 %	9.51 %	6.15 %	3.14 %	0.50 %	1.30 %	0.70 %	0.69 %	1.52 %	0.00 %	0.00 %
Early career researcher ⁹	0.00 %	0.00 %	28.20 %	20.00 %	7.33 %	5.94 %	6.49 %	6.29 %	2.08 %	3.03 %	0.00 %	0.00 %
R&D Personnel ¹⁰	33.33 %	28.13 %	32.46 %	27.69 %	14.14 %	14.36 %	20.35 %	15.38 %	15.28 %	16.67 %	9.09 %	0.00 %
Researchers in other categories ¹¹	32.00 %	25.00 %	6.56 %	5.38 %	8.38 %	3.96 %	4.33 %	4.20 %	9.03 %	9.09 %	2.27 %	10.00 %
Technical and economic staff ¹²	18.67 %	28.13 %	18.36 %	36.92 %	27.49 %	46.53 %	37.23 %	50.35 %	26.39 %	40.91 %	11.36 %	30.00 %
Scientific, research and development staff involved in teaching activities	22.67 %	25.00 %	49.18 %	36.15 %	57.33 %	44.55 %	50.65 %	41.26 %	59.72 %	50.00 %	84.09 %	60.00 %

Note: The total number of employees/workers as of 31.12. of the calendar year in question is to be given, irrespective of the proportion of full-time equivalents, but only in an employment relationship, i.e. not including persons working parttime agreements. Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

4.5.3 Percentage of HEI's staff involved in R&D&I, categorized by age structure, job title, and gender in the year 2024 (number of physical employees and staff)

Academic/professional position	Under 29 years [%]		30-39 years [%]		40-49 years [%]		50-59 years [%]		60-69 years [%]		70 years and over [%]	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0.00 %	0.00 %	0.00 %	0.00 %	1.14 %	0.00 %	4.68 %	0.00 %	13.67 %	1.54 %	28.57 %	18.18 %
Associate Professor	0.00 %	0.00 %	2.04 %	1.82 %	8.88 %	3.45 %	13.31 %	7.98 %	17.99 %	15.38 %	21.43 %	0.00 %

⁹ See Definition of Terms in Methodology HEI2025+.

¹⁰ The category "Other scientific, research and development personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹¹ The category "Researchers not falling under other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹² Who participates in the management and support of R&D&I in the institution.

Assistant Professor	1.67 %	5.00 %	29.39 %	24.55 %	38.04 %	31.03 %	27.70 %	25.15 %	17.27 %	21.54 %	11.90 %	27.27 %
Assistant	18.33 %	5.00 %	10.61 %	8.18 %	1.82 %	1.72 %	1.08 %	0.00 %	0.72 %	1.54 %	0.00 %	0.00 %
Early career researcher ¹³	1.67 %	5.00 %	30.61 %	21.82 %	8.43 %	6.47 %	5.40 %	4.29 %	1.44 %	0.00 %	0.00 %	0.00 %
R&D personnel ¹⁴	33.33 %	25.00 %	29.80 %	20.00 %	16.63 %	15.52 %	13.31 %	12.27 %	16.55 %	16.92 %	9.52 %	9.09 %
Researchers in other categories ¹⁵	31.67 %	35.00 %	7.76 %	8.18 %	6.38 %	3.02 %	7.91 %	6.75 %	5.76 %	6.15 %	7.14 %	9.09 %
Technical and economic staff ¹⁶	15.00 %	30.00 %	20.41 %	37.27 %	27.11 %	45.26 %	32.01 %	47.85 %	28.06 %	36.92 %	21.43 %	36.36 %
Scientific, research and development staff involved in teaching activities	30.00 %	15.00 %	49.39 %	39.09 %	56.49 %	44.40 %	56.12 %	43.56 %	61.87 %	56.92 %	66.67 %	54.55 %

Note: The total number of employees/workers as of 31.12. of the calendar year in question is to be given, irrespective of the proportion of full-time equivalents, but only in an employment relationship, i.e. not including persons working parttime agreements. Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹³ See definitions in Methodology HEI2025+.

¹⁴ The category "Other scientific, research and development personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁵ The category "Researchers not falling under other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁶ Who participates in the management and support of R&D&I in the institution.

4.6 Academic and Research Careers

The HEI will briefly describe the central system for HR recruitment, placing particular emphasis on recruitment from outside the HEI, especially from abroad, as well as system of career development of academic and research staff, if such system exists. Information will be provided on:

- Career development rules and legislation related to the recruitment and career development of domestic and foreign employees (e.g. Career Code, HR Award, OTMR policy, etc.).
- International tenders.
- The process of new employee adaptation and mentoring.
- Transparent distribution of institutional time, attitudes towards chaining of contracts and senior academic positions.
- Rules for filling senior positions in the context of R&D&I.
- The rules and support system of sabbaticals.
- Measures for the return of workers after a stay in an external workplace, including a foreign workplace.
- Arrangements for workers to return after maternity/parental leave or other career breaks (e.g. caring for family members).
- Other relevant information at HEI discretion.

The HEI shall provide a reference to an existing career code or similar document (if one exists). The HEI shall describe the effectiveness of the systems used with examples (e.g. a model example of the adaptation process, a specific anonymised example of an academic's career path, statistics on the return after maternity/parental leave or career breaks before and after the implementation of the measures, etc.).

Maximum 300 words per point.

Self-assessment:

TUL has focused significantly on human resource management over the last five years. As a result, processes have been set up, especially in the areas of career development and staff appraisal, recruitment or wellbeing support for employees and incorporated into TUL's internal legislation. The Institute for Nanomaterials, Advanced Technologies and Innovation has been a recipient of the HR Award since 2020 and has officially adopted the principles and policies of the Charter and Code of Conduct for Researchers. The Technical University of Liberec has submitted a project OP JAK Research Environment Call No. 02_23_026 towards the end of 2024 in which it would like to achieve the HR Award throughout TUL.

Career development rules and legislation governing recruitment and career development of domestic and foreign employees (e.g., Career Code, HR Award, OTMR policy, etc.)

TUL's human resources management is guided by several strategic documents, including [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#), [Work regulations](#) and the directive on [Career Development Regulations of the Technical University of Liberec](#). These align with the requirements of the National Academy of Sciences, the Ministry of Education, and TUL's strategic goals and Gender Equality Plan (GEP). Additional HR documents include the "Regulations for Selection Procedures for Academic and Other Employees" and the "Internal Wage Regulations of TUL."

[Career Development Regulations of the Technical University of Liberec](#), effective since 1 January 2023, applies to all staff and sets rules for career management, defining profiles and expectations for academic and research roles. It supports various career paths - progression, development, or internal job rotation - aimed at boosting motivation, retaining talent, and utilizing institutional

experience. [Career Development Regulations of the Technical University of Liberec](#) also addresses work-life balance and outlines support for career development in this context.

Gender equality is reflected in transparent evaluation and remuneration processes, regulated by the directive on Personnel Development and Evaluation and the Internal Wage Regulations. Details on gender equality measures are found in Chapter 4.7.

A fully revised version of the “Regulations for Selection Procedures” came into effect on 1 January 2024, outlining updated procedures for recruitment and attestation of academic and other employees at TUL. These HR tools collectively ensure that TUL fosters a high-quality, inclusive, and strategically aligned environment for teaching, research, and professional growth.

Selection procedures, international selection procedures, rules for filling positions

Academic staff positions are always filled on the basis of transparent selection procedures. Suitable candidates are selected on the basis of fulfilled qualifications and performance, and are evaluated by an expert selection committee. Researchers are selected on the basis of qualifications and performance, either by the Head of Department or by a selection procedure including evaluation by a selection panel.

Positions of managers in departments and research units are filled on the basis of selection procedures, where the decisive criterion is not only appropriate qualifications but also managerial skills and personal prerequisites for the performance of such a position. The requirements for the managerial position include a vision, a proposal for the development and a concept for the department in the medium term. Some units of TUL have additional rules for the appointment of members of selection committees. Transparency and non-discrimination permeate the whole process. The selection committee is obliged to take into account the career break of the candidate. Recruitment procedures for positions of scientific or academic staff from abroad are advertised on [the TUL career pages](#), as well as on the portals of the Ministry of Labour and Social Affairs, job portals [Jobs.cz](#), [ResearchJobs](#), [Euraxess](#), and others as needed. Interviews with applicants from abroad are conducted online in English. The staff of the TUL Welcome Centre will contact the successful foreign candidate and, as part of the successful adaptation, will already be involved in the processing of the entry formalities, in particular the visa requirements of the employee, and possibly his/her family, accommodation, medical examination, joint processing of documents at Department of Asylum and Migration Policy, etc. TUL has accommodation facilities that are mainly used by foreign employees. [A guide](#) for adaptation of foreigners in the Liberec Region is available on the intranet.

Transparent distribution of institutional time, chaining of contracts and academic leadership positions

Until the end of 2023, TUL used fixed-term employment agreements for academic and scientific staff, often renewed based on the nature of the position. Since 2024, this practice has ended, and permanent (indefinite) contracts are now the standard. Only positions tied to specific projects or contractual research may still use renewable fixed-term contracts. Senior academic and scientific positions are typically appointed for a fixed term of four years.

The job description for academic staff is based on the Higher Education Act, which defines their responsibilities in both teaching and creative (research) activities. These duties are further specified in TUL's internal regulations, including the Career Regulations and Internal Wage Regulations. An employee's total time commitment is determined upon hiring - or during the contract period - to reflect the actual workload. The share of time across teaching, research, and other duties is agreed individually and tracked internally, especially for project registration and contract research, to ensure no time overlaps or overcommitments. The TUL Career Regulations outline recommended

workload distributions. For example, for an assistant professor, the expected allocation is: 50% teaching, 30% creative/research activities, 20% other activities. Some TUL units define these proportions in more detail based on individual performance or project involvement. Staff time is planned and monitored to align with institutional needs, project funding, and personal development goals. This system ensures workload clarity, supports transparency in time allocation, and aligns employee responsibilities with TUL's educational and research mission.

Rules and support systems for Sabbaticals

The entitlement to creative leave is based on the University Act and is further regulated by the Internal Wage Regulations of TUL. Before taking creative leave, we conclude a Creative Leave Agreement with employees. By concluding the agreement, the employee undertakes to fulfil the agreed deliverables. The components supplement the central legislation with their internal regulations.

New employee adaptation process, mentoring

The new adaptation process at TUL will be fully implemented by 2025 as part of the Human Resource Management Strategy 2024–2025. Currently, employees have access to the “Adaptation Guide for Employees”, which provides information on TUL's organisational structure, internal systems, benefits, employee rights and obligations, health and safety, working hours, and teaching duties.

For international staff, the Welcome Centre of TUL assists with entry formalities, including visas (for employees and families), accommodation, health checks, and official documentation. A guide for foreign employees in the Liberec Region is available via the intranet. TUL provides accommodation facilities, primarily for international staff.

New employees are supported by designated colleagues at their unit or workplace. Assistance includes setting up access (cards, keys, phones), IT systems (IS Vema, IS STAG), and completion of mandatory training. In some departments, a mentor is assigned alongside the supervisor. Managers can access the “Effective adaptation process - a guide for managers” e-learning course. In 2024, the Employee Education section was added to the TUL intranet, listing all [training](#) opportunities. A unified Education Portal was also launched in 2024, centralising all educational events.

From 2023, 10% of employees can access SEDUO offline training focused on personal development and management skills. E-learning materials cover areas such as OSH, remote work, driving, and social safety (including discrimination and inappropriate behaviour). A cybersecurity course is being finalised.

Employees on career breaks can continue participating in training. Since 2022, monthly “Coffees” are held for parents on parental leave, offering development sessions and updates on legislation and TUL news. Sessions take place in the Children's Corner, with child care provided.

Measures for the return of workers after a stay in an external workplace

Measures for the return of employees after a stay at an external workplace, i.e., for employees who, following the acquisition of work experience, work in international project teams or follow-up long-term contacts within international mobility and who do not work at the TUL workplace for a minimum of one month, proceed as follows (everything depends mainly on the length and nature of the stay. Therefore, there is no termination of the employment relationship due to being employed by another organisation and a return to the original TUL workplace is expected after the end of the stay):

- If the employee's employment relationship is already concluded and the subject of the professional activity in another organisation is relevant for the employee's continued stay

at TUL, an agreement on paid study leave in excess of the obligations under the Labour Code is negotiated and the employee receives wage compensation from TUL for the duration of the activity in the other organisation.

- If the stay is indirectly or not at all related to the employment relationship, unpaid leave, or a combination of unpaid leave and holiday, is agreed with the employee for the duration of the stay.
- Another option is to arrange part-time work for the duration of the stay and to use teleworking, or to use the so-called compressed week, where the employee, for example, works half a month at TUL and half a month at another organisation.

Measures for workers to return after maternity/parental leave or other career breaks (e.g., caring for family members)

In June 2021, TUL conducted a survey on maternity and parental leave. Responses were received from 61% of employees who had taken leave in the past three years and 62% of managers. The survey showed that most employees were aware they could contact HR and Payroll for guidance before going on leave. During leave, those wishing to work part-time were usually allowed to do so, and managers generally supported this arrangement. Employees' main concerns were work-life balance and childcare options upon returning. Both managers and staff agreed that returning from maternity or parental leave did not negatively affect career development.

From 2021 to 2024, 36 academic and research staff returned from career breaks - about 9 per year. Currently, 19 staff members are on career break, and 16 took paternity leave in 2023-2024. During leave, 9 female employees worked part-time. Upon returning, 11 women opted for part-time work, while 2 returned full-time. On average, returning employees work 50% of full-time hours. TUL offers gradual return options, such as part-time work or short agreements. Flexible working hours and telework are available, especially for academic and research staff.

[A guide for parents and carers](#) was created to address common questions on maternity, paternity, childcare, and care responsibilities.

Employees on leave have unrestricted access to training, benefits, and university events. Childcare support includes the TUL Children's Corner and ŠkaTULka Kindergarten. Scientific staff receive 6 weeks of leave, and administrative staff 5 weeks - both 2 weeks above the legal minimum.

TUL documents:

- [Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec,](#)
- [Internal wage regulations of The Technical university of Liberec,](#)
- [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030,](#)
- [Guide for new employees,](#)
- [A guide for adaptation of foreigners](#)
- [A guide for parents and carers.](#)

At CXI, some areas are expanded in relation to the HR Award through internal regulations, strategic documents or supplementary documents to the HRS4R. These documents include in particular:

- [CXI Human Resource Development Strategy,](#)
- [OTM-R Policy CXI,](#)
- [Director's Directive No. 1/2012 Guidelines for selection procedures for the positions of R&D staff, managers and other employees of CXI TUL,](#)
- [CXI Staff Selection Manual,](#)

- [A guide to the selection and development of CXI postdoctoral fellows,](#)
- Director's Directive No. 1/2024 Evaluation and Career Development of CXI Employees,
- [Handbook for new CXI employees.](#)

4.7 Gender equality measures

The HEI will briefly describe the measures relating to the application of gender equality in the areas required for assessment criteria 4.5, 4.6, with an emphasis on:

- Gender equality in recruitment and career development.
- Legislation and documents regulating gender equality (e.g. Gender Equality Plan, Action Plans, strategic documents for equality, including links to overarching strategies, etc.).
- The filling of leadership positions (including gender balance in leadership positions, see Table 4.7.1).
- Nominations to professional bodies.
- Evaluation and remuneration.
- Measures to reconcile the work and family life of researchers (flexible working hours, flexible forms of work, maternity/parental leave management, facilitating child/dependent care, age management in relation to gender).
- Measures to eliminate negative workplace behaviour such as mobbing and sexual harassment.

The HEI shall provide evidence of the examples from practice (e.g. use of flexible working hours, dealing with cases of mobbing or sexual harassment, compliance with the principles of gender equality in HEI professional bodies, etc.).

Maximum 300 words per point.

Self-assessment:

The management of TUL perceives gender equality as a natural and necessary part of human resources management. This attitude is reflected in the set processes of human resources management, whereby the conditions of equal opportunities are applied in all areas of TUL's activities without distinction of gender.

Gender equality in recruitment and career development

The TUL [Career Development Regulations of the Technical University of Liberec](#) applies to all employees of TUL and is effective from 1 January 2023. It contains rules for career management of all employees with gender equality. The TUL [Career Development Regulations of the Technical University of Liberec](#) includes a summary of the system for supporting career development related to the reconciliation of work and personal life. Gender equality also includes fair evaluation and remuneration of employees. These processes at TUL are regulated by the [Personnel Development and Evaluation of Employees of the Technical University of Liberec](#) and the [Internal wage regulations of The Technical university of Liberec](#). Academic staff positions are always filled on the basis of transparent selection procedures. Academic staff are selected on the basis of their qualifications and performance, either by the Head of Department or through a selection procedure including an evaluation by a selection committee. Senior positions in departments and research units are filled on the basis of selection procedures, where the decisive criterion, in addition to appropriate qualifications, is management skills and personal qualities for the performance of such a position, not gender. Transparency and non-discrimination permeate the whole process.

Legislation and documents regulating gender equality (e.g., Gender Equality Plan, Action Plans, Strategic Documents for Equality including links to overarching strategies, etc.)

Legislation in the area of gender issues has been elaborated in the [TUL Gender Equality Plan](#). It is based on the analysis of the needs identified in the survey and also on the possibilities for adequate implementation of interrelated measures that will lead to the defined objectives. The field of gender equality often encounters stereotypes and prejudices, which often operate on an unconscious basis and which are often accepted as generally valid values or norms. Actions related to understanding the barriers inherent in set systems and seemingly neutral measures are then a prerequisite for their successful removal. Gender sensitivity and awareness raising is present in all phases of [TUL Gender Equality Plan](#). TUL developed a [Code for Gender-Sensitive Communication at the Technical University of Liberec](#) in 2022. The Code provides guidance on how to set up and use gender-sensitive language so that cultural stereotypes or unintended discrimination against a particular group of people are eliminated in TUL communication, and communication is instead inclusive for all persons, not only with regard to gender, but also other possible characteristics.

Filling of leadership positions (including gender balance in leadership positions, see Table 4.7.1)

Academic positions at TUL are always filled through transparent selection procedures. Candidates are evaluated based on their qualifications and performance by expert selection committees. Research staff are selected either directly by department heads or through similar evaluation processes. Gender is not a criterion, and all TUL units follow a unified institutional gender framework.

Managerial positions in departments and research units are also filled through selection procedures that assess qualifications, managerial skills, and personal aptitude. All evaluations are conducted fairly and transparently. As of 1 January 2024, TUL follows the updated [Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec](#), which clearly define rules for recruitment and attestation processes.

As of 31 December 2024, 663 women work at TUL, representing 52% of all employees. Among them, 39% are in academic and research roles. Women hold 25.5% of leadership positions, calculated across roles such as deans, vice-deans, department and research heads, and members of boards and the academic senate. On average, 43% of senior roles are held by women, though this varies by unit. Some faculties show above-average female leadership: FE: 61.5%, FAA: 60%, FT: 58%, FHS: 50%. In contrast, more technical faculties have significantly lower female leadership representation.

TUL actively works to increase the visibility of women and girls in science, promoting events like the International Day of Women and Girls in Science, "Girls Belong at TUL", and highlighting that technical fields are ideal for female students.

Nominations to professional bodies

The nomination of employees or external nominees to TUL bodies or parts of TUL (e.g., scientific, artistic or administrative boards) is based mainly on the expertise and personality of the selected candidate, or his/her contribution to the given body.

Evaluation and remuneration

Gender equality at TUL includes a strong focus on fair employee evaluation and remuneration, linked to individual career paths defined in the [Career Development Regulations of the Technical University of Liberec](#). The guideline [Personnel Development and Evaluation of Employees of the Technical University of Liberec](#) sets out a system for the regular assessment of all staff, evaluating their work approach and performance, regardless of gender.

In 2023, this evaluation system was implemented across all TUL units, including the Rector's Office. Alongside performance reviews, individual personal development plans were established in alignment with each unit's strategic goals in teaching and research. Evaluation outcomes are also connected to employee remuneration, as per the above regulations and the [Internal wage regulations of The Technical university of Liberec](#).

In 2024, TUL launched internal discussions on equal pay as part of the Wage Cohesion Project and [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#). The first step was to standardise pay rates within each pay grade across the university. The new Internal Pay Code, with unified pay scales, will take effect on 1 January 2025. A model for equal pay analysis was also developed for each unit and job category, aligned with the European Equal Pay Directive, to be adopted in the Czech Republic by 2026. This model includes calculation of the Pay Gap for each unit.

By the end of 2024, data was analysed by unit secretaries and heads of Rectorate departments. In 2025, the results will be assessed centrally, and further measures will be taken to strengthen a fair remuneration system, with particular focus on performance-based pay components.

Measures to reconcile the family and working life of researchers (flexible working hours, flexible forms of work, maternity/parental leave management, facilitating child/dependent care, age management in relation to gender)

TUL actively supports employees who may be at risk of gender inequality by offering flexible and inclusive working conditions. Common options include adjusted working hours (shorter or flexible hours, remote work), extra paid leave (6 weeks for researchers and non-academic staff, creative leave for academic staff), gradual return from parental leave, childcare services (Children's Corner, ŠkaTULka Kindergarten), holiday programmes for school-aged children, and remote IT access and equipment. These benefits are governed by the Internal Regulations on Benefits, the TUL Work Rules, and the Career Rules. From 2025, TUL will offer new benefits, including: paid leave to attend childbirth, two days of paid volunteering leave, support for caregiving via the TUL Volunteer Centre. These benefits exceed standard Labour Code entitlements.

In 2023 and 2024, the Academic Counselling and Support Centre hosted lectures on mental wellbeing and mental health, delivered by a psychologist and psychotherapist. TUL's approach to wellbeing is supported by legislation and internal regulations. In 2024, the intranet was redesigned to better serve employees seeking work-life balance resources and practical workplace information.

TUL conducted its first university-wide satisfaction survey, with 47% participation. Results showed:

- 78% of employees are satisfied
- Top positives: friendly work atmosphere, team collaboration (26%), meaningful and flexible work (16%)
- Areas for improvement: remuneration (52%), bureaucracy and unclear processes (36%), and information sharing (29%)

Based on these findings, TUL management has set an action plan for 2025 - 2026 to address key concerns and enhance employee satisfaction.

Measures to eliminate negative workplace behaviour such as mobbing and sexual harassment

TUL addresses sexual and gender-based harassment and inappropriate behaviour through its [Work Regulations](#), which are based on Czech labour law. These regulations define the rights and obligations of both employer and employees and allow individuals to contact the Rector in cases of discrimination or abuse of rights. Ethical conduct is also outlined in [The Ethics Code for the TUL Employees and Students](#), which applies to all employees and students. Cases involving harassment,

particularly between a student and a staff member, are handled by the TUL [Ethics Committee](#) or the relevant Unit Disciplinary Committee.

Since June 2021, TUL has had an [ombudsman](#), who also serves as Vice-Chair of the Committee for Institutional Assurance of Equal Opportunities under the Czech Government Council. The ombudsman is available to all students and staff who experience discrimination, unequal treatment, or harassment. They can contact the ombudsman in person, by email, online, or anonymously via a secure mailbox. If a serious violation is suspected, the ombudsman may, with Rector's approval, convene an independent expert panel (e.g. lawyer, psychologist). The ombudsman also mediates disputes between staff and management and runs awareness seminars, launched in 2022.

Complaint statistics:

- In 2023, 22 complaints were submitted; 8 fell within the ombudsman's scope. 5 were closed by complainants; 3 were resolved, including improper teaching and a conflict of interest in a dean election.
- In 2024, 12 complaints were received; only 2 were within scope.

Since 2024, a Social Safety course for academic and non-academic staff has been available in TUL's e-learning system. It covers discrimination, harassment, response procedures, and includes four educational videos. TUL clearly states that discrimination and harassment are not tolerated.

TUL documents/links:

- [The Ethics Code for the TUL Employees and Students,](#)
- [Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec,](#)
- [Disciplinary Code for students of the Technical University of Liberec,](#)
- [University management,](#)
- [Equal opportunities and diversity,](#)
- [TUL Gender Equality Plan.](#)

4.7.1 Gender balance in management positions

Senior staff	2020		2024	
	Men	Women	Men	Women
Rector	1		1	
Vice-Chancellor	4		3	2
Dean ¹⁷	7		7	
Academic Senate	74	29	73	26
Scientific/Artistic/Academic Council	190	37	171	38
Quaestor	1			1
Board of Directors	11	1	10	1

Note: If one person holds more than one of these positions within the HEI, he/she will be counted in each.

¹⁷ or other head of a relevant work unit of a higher education institution under Section 22(1) of the Higher Education Act performing R&D&I activities, regardless of the designation.

4.8 Mobility of academic and research staff (including sectoral and inter-sectoral mobility)

The HEI shall describe in a concise and structured manner its strategies and objectives for the mobility of academic and research staff (including PhD students), with particular emphasis on mobility related to the development of excellent science and interdisciplinary (intersectoral) mobility. The HEI shall identify potential barriers to mobility, including gender-based barriers. The HEI shall provide information on long-term stays abroad by its own academic staff or, conversely, by foreign staff at the HEI being evaluated.¹⁸

The achievement of the set objectives will be demonstrated by the HEI by describing specific examples of mobility or by brief statistics on mobility during the period of 2020–2024.

Maximum 500 words plus 200 words for each example given (max. five examples with a specific description of the relevance of mobility to the stated objectives).

Self-assessment:

TUL actively supports the mobility of academic and research staff and doctoral students through various instruments: EU and national projects (e.g. OP RDE Calls No. 02_16_027 and 02_18_053, International Research Laboratories, MOTUL, MSCA), programmes such as ERASMUS+, CEEPUS, the Visegrad Fund, bilateral and intergovernmental agreements, Indicator D for international cooperation, mandatory internships in doctoral programmes, and the mobility funds of individual TUL units. These opportunities have a significant impact on the quality of science and research at TUL. Mobility is integrated into ongoing research projects, including research stays, conference participation, and use of partner institutions' labs. It is managed centrally by the International Office and Erasmus Office, and locally by faculty Erasmus coordinators.

TUL's mobility framework is aligned with the European standard, covering short-term and long-term, inbound and outbound mobility. Mobility is a component of the TUL Strategic Plan, Career Regulations, and the International Cooperation Strategy. Doctoral student mobility is governed by faculty-level rules. Each mobility is typically linked to a specific research topic and goal.

Mobility is tracked through internal systems:

- Publikace TUL (R&D outputs)
- Mobility TUL (mobility records)

Mobility strategy priorities include:

- Involvement in international projects and teams
- Sharing research infrastructure and producing joint publications
- Targeting priority countries and disciplines
- Linking traditional and emerging research areas
- Supporting interdisciplinary and intersectoral collaboration
- Customised research with international companies
- Financial support (grants, scholarships, funds)
- Adjusting working conditions to encourage long-term mobility
- Administrative support and visa cooperation with Czech ministries and embassies
- Promoting TUL globally

Mobility objectives:

- Attract renowned researchers and postdocs
- Establish joint labs with foreign institutions

¹⁸ Long-term mobility means an uninterrupted period of more than three months.

- Increase long-term mobilities
- Improve research quality and project leadership
- Support staff career growth via international engagement
- Reduce academic inbreeding by hiring internationally
- Increase infrastructure use
- Boost TUL's international prestige and competitiveness

Barriers to Mobility include:

- Heavy teaching and project workloads
- Limited number of international projects
- Language barriers or lack of language confidence
- Reluctance to travel
- Family responsibilities
- Financial and logistical constraints
- Gender-specific barriers: women often face greater family care responsibilities, limiting their mobility abroad.

Information about long-term stays of own academic staff abroad or, conversely, of foreign staff at the evaluated university

1. Within the Erasmus+ programme, doctoral student Tereza Michalová completed a research stay at University of Milan (UNIMI), significantly enhancing her academic and research competencies. The mobility focused on developing expertise in human resource and knowledge management, especially in knowledge hiding. In collaboration with her mentor, she also explored the role of human resources in creative and cultural industries, a growing field in Italy, particularly relevant to Industry 5.0. During her stay, Tereza co-designed research materials on knowledge sharing and hiding and participated in teaching the course "Project and Innovation Management," where she delivered lectures on knowledge management and organisational learning. This experience promoted international collaboration and the exchange of best practices. She also took part in the "Craft and Creative Cultures" workshop, which inspired a new research direction focused on knowledge transfer in craft-based industries. The mobility led to valuable international contacts and laid the foundation for future cooperation. Key skills gained include communication, adaptability to different educational environments, and a broader research perspective, all of which contributed to her dissertation development and professional growth.
2. At the turn of 2019/2020, architect Mark Johnson, based at the renowned *Urban Solutions* studio in San Francisco, served as guest studio leader. During his semester at FAA, he was dedicated to teaching and collaborating with students in the field of urban design and sustainable planning. A major benefit of his residency was teaching a specialised course, "Urban Regeneration Strategies", which focused on the transformation of blighted urban sites. Under his guidance, students worked on real projects of revitalisation of industrial zones in the Liberec region. Johnson's approach combined theoretical knowledge with practical experience from projects in the USA, which provided students with a unique perspective. In addition to teaching, he gave a public lecture, "Commons Park Denver Colorado", presenting the latest trends in urban planning and design, and organised a workshop on participatory planning.
3. In 2023-2025, Olha Mazur is on a long-term research stay at the FM as a postdoc under the supervision of Pavel Márton. The stay is conducted within the prestigious project "Control Methods of Ferroelectric Self-Assembly" funded by the European Union under the Marie Skłodowska-Curie Actions programme.

4. Dr. Serhii Petrushenko joined the CXI team within the MSCA4Ukraine programme with a project focused on microstructural evolution and atmospheric oxidation of nanocrystalline films as a way to create functional structures. This project represents a comprehensive approach to the study and application of nanocrystalline materials, developing this field not only at CXI.
5. Mobility of Tereza Nalezená, doctoral student at *Brooklyn Grange, USA*, who is working on green spaces from the perspective of sustainable development. The main objective of the research placement at a leading company in the field of rooftop agriculture in the USA, which operates the largest soil farms in the world located in New York City, was to be able to use the results of the R&D. Brooklyn Grange promotes sustainable urban living by building green spaces, hosting educational programs and events, and expanding access to locally grown produce in New York City communities.

RESEARCH INFRASTRUCTURE

4.9 Research infrastructure

The HEI will describe the system for acquiring/optimizing expensive instruments and equipment, as well as refurbishing outdated expensive instruments. The HEI will also briefly present the internal organisation of the research infrastructure (including technology, expensive instruments, and instrumentation)¹⁹. The HEI will describe the system of sharing (including external research entities) of instruments and instrumentation, including expensive instruments and instrumentation units, referred to as 'core facilities' (if such a system exists). The HEI will demonstrate the effectiveness of the systems with examples (e.g., specific instruments acquired/optimised and their relevance to the achievement of research objectives, examples of sharing of expensive instruments and instrumentation, statistics on sharing of expensive instruments and instrumentation, etc.). The HEI will briefly comment on the data in Table 4.9.1.

The HEI shall also indicate whether it hosts large research infrastructure projects. The name and a brief description will be provided.

Maximum 500 words plus 200 words for each example given (max. five examples).

Self-assessment:

Acquisition, modernisation, optimisation and renewal of costly instruments and equipment is performed continuously according to the requirements and needs of individual departments. The acquisition, innovation and development of equipment is planned annually during the preparation of the funding plan and takes into account the strategic requirements for meeting R&D objectives. The research teams in the various organisational units and units of TUL provide initiatives for the acquisition or renewal of instrumentation through the departments. These initiatives are strategically divided into three categories:

- Costly and large-scale investments,
- Small-scale investments,
- Priority investments.

For the acquisition or renewal of expensive equipment and investments, financial resources are used from structural funds, European projects, research projects, or by pooling the resources of departments and units from the Fixed Asset Development Fund (FRIM). For the acquisition or renewal of smaller-scale investments, financial resources are used from research projects, DKRVO

¹⁹ The definition of research infrastructure is set out in the Framework for State Aid for Research, Development and Innovation (2014/C 198/01) and Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in accordance with Articles 107 and 108 of the Treaty.

or FRIM. For priority instruments, the majority of the funds used are from the Capital Asset Development Fund (FRIM). The acquisition of instruments is mainly carried out through public tenders.

Internal organisation of the research infrastructure

The research infrastructure is centrally owned by TUL and managed by individual units, where it belongs strategically in terms of expertise and where research activities are carried out in terms of personnel. Spatially, the instruments are located in the laboratories of the individual research units and their management is entrusted to the appointed and responsible staff of the unit. Information about the equipment and instruments is provided on the websites of the organisational units of TUL, as well as in the information brochures of the individual laboratories. The list of research infrastructure is also available on the internal system pristroje.tul.

Sharing system

The TUL consistently follows the rule of sharing, where all research infrastructure is available for R&D activities of staff and students of both the faculty and the entire TUL, or other research organisations. The organisation of sharing of the equipment is the responsibility of the department that ensures its operation. If the nature of the equipment allows it, we strive to include it in infrastructures beyond TUL. External entities are informed about the possibilities of sharing TUL equipment on the websites of TUL units and departments, at seminars, conferences, open days, researchers' nights, within research activities, etc.

Examples of shared costly instruments and instrument clusters

1. The flow cytometer (FCS) allows for rapid detection and quantification of different cell types, which it is able to distinguish not only by their size (necessary to distinguish bacterial cells from human cells, both suspension immune cells and adherent skin, bone or neuronal cells), but also by their fluorescent labelling (this allows to distinguish between dead and live cells, cells showing different metabolism or different surface markers in the sample). The flow cytometer within the core-faculties is shared at most of the TUL units (FHS, FT, CXI, FSHE, FME) and outside TUL (1st Medicine Faculty Charles University). The FHS provides operation and professional guarantee.
2. The electron microscope (CXI) can image the object under examination at nanometer resolution and at the same time allows you to look below the surface of the sample. This can be very useful, for example, for a comprehensive analysis of material quality and surface finishes or alloys, or for the inspection of welds or the examination of material defects. In the Czech Republic, only two workplaces have such a microscope in a similar configuration. The electron microscope within the core-faculties is shared by most parts of TUL (CXI, FT, FSHE, FME, FHS, FM) and outside TUL (industrial practice). CXI provides the operation and professional guarantee.

Table 4.9.1 shows the expenditure/costs on research infrastructure and equipment for the evaluation period (2020 to 2024 inclusive) as provided by the Bursar of TUL. The values and the amount of expenditure are in principle determined by the size of TUL, which is where the amount of expenditure would be taken. When calculated per employee, the expenditure is comparable with universities not only in the Czech Republic.

Large research infrastructure projects

TUL is involved in large research infrastructure projects as a **partner institution**. Specifically, TUL is involved in the following infrastructures:

1. Research infrastructure for experiments at CERN (CERN-CZ): the TUL cooperates with other Czech institutions to participate in the CERN International Laboratory, which focuses on particle physics research, the search for the properties of dark matter and dark energy.
2. NanoEnvicz: TUL participates in an infrastructure that offers scientists access to unique instruments and facilities for environmental and materials research in the field of complex interdisciplinary research on a wide range of nanomaterials and nanotechnologies.

4.9.1 Summary of expenditure/costs on research infrastructure and equipment for the period under review (including related non-investment and personnel costs).

Costs/expenses in thous. CZK/EUR/year	2020	2021	2022	2023	2024	Total value of assets ²⁰
Costs/expenses related to the acquisition of small fixed assets for R&D&I	9,156/361	9,200/363	7,672/303	5,674/224	6,196/244	37,898/1,495
Cost of repairs and maintenance of equipment	1,710/67	2,880/114	2,448/97	3,398/134	2,903/115	13,339/526
Acquisition of tangible (DH) and intangible (DN) assets for R&D&I (investments)						
Of which software	2,329/92	707/28	3,981/157	739/29	375/15	8,131/321
Of which other intangible fixed assets						
Of which land, buildings and structures	14,502/572	8,200/323	109,798/4,331	34,434/1,358	12,124/478	179,058/7,063
Other intangible fixed assets (machinery, apparatus, equipment, etc.	31,217/1,231	54,442/2,148	47,253/1,864	23,293/919	77,495/3,057	233,701/9,219
Total infrastructure spending in years ²¹	58,914 /2,324	75,429 /2,976	171,152 /6,752	67,538 /2,664	99,093 /3,909	472,126 /18,624

²⁰ Enter the sum of the row.

²¹ Enter the sum of the column.

FINANCES

4.10 Budget and structure of financial resources

The HEI shall provide and comment on an overview of the total R&D&I budget in the period of 2020–2024, broken down by organisational units of the evaluated HEI and by source of funds (Table 4.10.1). The HEI shall also comment on the shares of total costs/outputs covered by public and non-public sources by type of R&D&I for the period under evaluation as shown in Table 4.10.2.

As complementary data, the university will provide an overview of prestigious research projects obtained during the period of 2020–2024 (ERC²², MSCA²³, HHMI²⁴, HFSP²⁵, NSF²⁶, Horizon Europe²⁷, NIH²⁸, Wellcome Trust²⁹, EDF³⁰, OP JAK³¹, OP TAK³², NPO³³, GA ČR³⁴, TA ČR³⁵ etc.). Include information on the amount of funding received and whether the HEI were principal investigator or co-investigator in Tables 4.10.3, 4.10.4 and 4.10.5.³⁶

In addition, the HEI will describe in more detail up to five of the most important projects from the list of prestigious individual projects abroad (ERC, MSCA, HHMI, HFSP, NSF, etc.), providing basic information at the HEI's discretion and regardless of the funder: title, field of expertise, agency, amount of funding, other project participants, and other relevant information as appropriate.

A maximum of 500 words plus 200 for each example of a prestigious international individual project given.

Commentary on the R&D&I budget in the period under review, broken down by organisational unit and by source of funds

The total budget of TUL is composed of about 65% of public funds from the Czech Republic, about 5% of public foreign funds and about 30% of funds from other sources. CXI has the highest percentage of public funds from abroad. Those units that have, for example, a high volume of cooperation with industrial practice (FME, FT, FM, CXI) also have a high proportion of funds from other sources. Other components have a predominance of public funds within their budget.

²² The European Research Council (ERC) is part of the 'Excellent Science' pillar of Horizon Europe. The ERC funds cutting-edge research by supporting individual Principal Investigators and their research teams.

²³ Marie Skłodowska-Curie Action (MSCA) is part of the "Excellent Science" pillar of Horizon Europe and is also aimed at supporting young researchers, including PhD students.

²⁴ Howard Hughes Medical Institute - a non-profit organization in the USA significantly supporting international biomedical research.

²⁵ Human Frontier Science Program - an international programme to support research, particularly in the natural sciences and computer science.

²⁶ National Science Foundation (USA).

²⁷ Horizon Europe - the EU's 9th Framework Programme for research and innovation, running from 2021-2027.

²⁸ National Institutes of Health (NIH) - an agency under the United States Department of Health and Human Services. NHI is a major player in project support for biomedical research.

²⁹ major UK private foundation supporting mainly biomedical research.

³⁰ European Defence Fund.

³¹ Operational Programme Jan Ámos Komenský - Priority 1 - Research and Development - multiannual programme under the Ministry of Education, Youth and Sports. Within the framework of the OP JAK it is possible to draw financial resources from the European Structural and Investment Funds (ESIF) in the period 2021-2027.

³² Operational Programme Technologies and Applications for Competitiveness. The European Regional Development Fund (ERDF) is available in the period 2021-2027 to co-finance business projects in the areas of research, development and innovation, digitalisation and digital infrastructure, business development, smart and sustainable energy and the circular economy.

³³ National Recovery Plan - under Pillar 5 - Research, Development and Innovation of the National Recovery Plan, the Recovery and Resilience Facility (RRF) is available for the period 2022-2026.

³⁴ Grant Agency of the Czech Republic.

³⁵ Technology Agency of the Czech Republic.

³⁶ The military and the police HEIs, as parts of the organisational unit of the state, are treated specifically in terms of the possibility to participate in the projects.

Commentary on the share of total costs/outputs paid from public and non-public sources by type of R&D&I for the period under evaluation

The scientific and research activities of TUL have historically been closely linked to cooperation with industry. TUL has long had an advantage in the field of applied research. A large proportion of research and development themes and innovations addressed by TUL are initiated by the requirements of industrial partners. This is reflected in the structure of expenditure on basic research (about 30 to 40%), applied research (45 to 55%) and experimental development and innovation (15 to 20%), as shown in Table 4.10.2. The share of expenditure then corresponds to the number and quality of publications and results of applied research. The number of publications corresponds to the average values of other HEIs in the Czech Republic, and the quality is gradually improving. The number of patents and patent citations at TUL has long been the highest in the Czech Republic, which can be seen as evidence that in the field of applied research we are able to identify and solve problems that have a significant social and economic impact.

Commentary to Tables 4.10.3, 4.10.4, and 4.10.5

In the evaluation period, TUL dealt with about 30 international projects, most of which were supported by the Horizon programme of the European Commission and in more than 40% of these projects TUL was the beneficiary. The budget of international projects was about a quarter of all projects. TUL is striving to increase the share of international projects, having submitted more than a hundred international project proposals in the reporting period.

The above-mentioned historical orientation of TUL towards applied research is also reflected in the composition of the national providers of grants awarded to TUL - TACR has a significant representation, but TUL has also received several large multidisciplinary grants from operational programmes of the MEYS. Support for basic research grants is provided by the GACR. The providers of co-recipient grants are mainly the MIT and again the TACR (the fact that TUL acts as a partner of the project comes directly from the tender documentation). Support for basic research in the role of another participant is again represented by the GACR.

The close links between TUL and industry are also reflected in the structure of non-public resources, with a significant proportion of contractual research and complementary activities (see Table 4.10.5).

The five most important projects from the inventory of prestigious individual projects abroad (ERC, MSCA, HHMI, HFSP, NSF, etc.) with basic information (at the discretion of the university and regardless of the funder: title, field of expertise, agency, amount of funding, other project participants, other relevant information as appropriate).

1. Project LIFE+ No. 01114509 LIFE22-ENV-CZ-LIFE4ZOO; Water Resources Management in Visitor Attractions - FIT4USE Water Recirculation Technology, 2023-2027, solver Technical University of Liberec. The main objective of the project is to move from the traditional linear model of water consumption to the innovative FIT4USE concept for water recirculation. This method will allow the reuse of less polluted water instead of its disposable use. This "water circulation" will allow Zoo Liberec and Zoo Barcelona to reuse water. This will result in operational savings, a lower load on sewage systems and multiple synergies leading to better water and energy use. The project involves TUL, ZOO Liberec, Photon Water Technology s.r.o., ZOO Barcelona, Universitat de Girona (Spain), FUNDACIO SOLIDARITAT UB. At TUL it is solved at CxI.
2. H2020-EURATOM project No. 847593 call NFRP-2018, COFUND-EJP; European Joint Programme on Radioactive Waste Management (EURAD). TUL is involved in a European project focused on the preparation of a deep repository for radioactive waste as a linked third party through SÚRAO. In the framework of WP DONUT, it participated in the

development of numerical methods for modelling coupled processes in rock environments. The result was a coupled model of mechanics and flow in fractured granite using parallel computations, optimisation of calculations with uncertainties using multi-level Monte Carlo and machine learning, and a methodology to extract model inputs from a 3D hydrogeological model. Researchers from FM TUL have published five papers in impacted journals and their work with stochastic data calculations and surrogate models has received recognition among project partners. This led to a prestigious presentation at the EURAD Final conference and a co-lead role in a follow-up project. The proposed methods represent a significant advance in the field of numerical computations, which must balance accuracy and computational complexity - a key factor for the safety of a deepwater repository. TUL has therefore made a significant contribution to the development of technologies and methodologies for radioactive waste management at international level.

3. H2020 project No. 101036519 - NETZEROCITIES, The Initiation of Sustainable Energy Community for the City of Liberec, 2023-2025. The project supports the European mission 100 Climate Neutral and Smart Cities by 2030. It aims to overcome barriers to decarbonising cities and provide tools, expertise and support to cities on their path to climate neutrality. Among the 34 partner organisations from 13 countries, TUL is contributing its expertise in sustainable development and innovative technologies. The city of Liberec is also the only Czech representative among the 100 selected cities, and the project is one of its key activities to achieve climate neutrality. As part of the project, Liberec is focusing on the systematic preparation of the Liberec Energy Community, which will connect citizens, businesses and public administration in the field of sustainable energy and transport electrification. The pilot activities will focus on the development of e-mobility infrastructure, the use of renewable energy sources and building a communication platform for public engagement. The collaboration between the city and TUL will enable practical applications of academic innovations and the emergence of a new model of sustainable development management. NetZeroCities therefore helps to create smart and climate-neutral cities of the future.
4. Project H2020-WIDESPREAD-2018-03 No. 857061; Networking for Research and Development of Human Interactive and Sensitive Robotics Taking Advantage of Additive Manufacturing (R2P2), 2020-2023. TUL coordinates the European project R2P2, focused on advancing research in interactive and sensitive autonomous robotic systems using additive manufacturing and nanopolymer-based smart materials. Running from 2020 to 2023, the project strengthens TUL's role in high-tech robotics through collaboration with top research institutions in France (Institut National Polytechnique de Toulouse, Université Paul Sabatier Toulouse III), Spain (Mondragon Goi Eskola Politeknikoa), and Denmark (Aalborg Universitet). Key project activities include staff and student exchanges, expert visits, and conference participation, all aimed at boosting TUL's research quality and competitiveness. These mobilities provide access to cutting-edge expertise in interactive robotics and facilitate the preparation of international research projects. The project also supports knowledge transfer through seminars, workshops, PhD forums, and international conferences, directly connecting TUL with leading European research centres. R2P2 contributes significantly to enhancing scientific capacity at TUL and partner institutions, while supporting the professional development of academic and research staff. By coordinating this strategic project, TUL reinforces its position in the development of advanced robotics technologies at the international level and improves its access to European Commission funding.
5. EIT HEI Initiative project No. 101080705, call EIT-HEI-2022-SUPSTRAND1, Skills2Scale - Deep Tech Empowerment for Higher Education Institutes - a project funded by the European Institute of Innovation and Technology (EIT) under the EIT Urban Mobility Programme, 2023-

2024. TUL is actively involved in the Skills2Scale project, which supports the development of higher education institutions in the field of Beyond 5G technologies. The aim is to enhance universities' capabilities in innovation, entrepreneurship and collaboration with industry. TUL focuses on HEI capacity building, partnership development and entrepreneurship support. The university is mapping existing collaborations, organising international workshops and training sessions, and developing educational programmes for students and startups. In April 2024, TUL hosted the third meeting of the project partners to present its experience in innovation and entrepreneurship support. Participants visited TUL's science laboratories and the Lipo.ink innovation centre. Skills2Scale thereby contributes to the development of universities as key players in technological innovation, with TUL playing an important role in achieving these objectives at a European level.

4.10.1 Total budget of the HEI

Name of the HEI unit	Total budget in thous. CZK/EUR	Percentage of public funding in the Czech Republic	Share of public funding from abroad in %	Percentage of funding from other sources
FME	891,166/35,154	66.97%	0.46%	32.58%
FE	454,307/17,921	92.13%	1.17%	6.70%
FT	632,337/24,944	86.86%	0.04%	13.09%
FSHE	1,198,946/47,296	90.52%	0.76%	8.72%
FAA	215,027/8,482	92.64%	0.00%	7.36%
FM	746,851/29,462	70.00%	1.31%	28.69%
CxI	1,286,967/50,768	48.85%	8.92%	42.22%
FHS	207,287/8,177	96.68%	0.00%	3.32%
REK	1,320,735/52,100	41.16%	5.08%	53.76%
TOTAL	6,953,622/274,305	68.23%	3.03%	28.74%

4.10.2 Share [%] of total costs/outputs by type of R&D&I paid from public and non-public sources

	2020	2021	2022	2023	2024	Total
Basic research	40.22%	39.52%	31.74%	29.88%	30.77%	34.65%
Applied Research	46.19%	45.85%	48.24%	51.92%	49.55%	48.22%
Experimental development and innovation	13.59%	14.62%	20.02%	18.20%	19.68%	17.13%
Total	100	100	100	100	100	100

Note: For definitions see Definition of Terms in Methodology HEI2025+.

4.10.3 Projects supported by a foreign provider

In the role of beneficiary							
Provider / Investor	Programme/Grant Scheme	Project name	Support (in thousands CZK/EUR)				
			2020	2021	2022	2023	2024
European Commission	LIFE	Innovative technology based on constructed wetlands for treatment of pesticide contaminated waters	43805 /1728				
European Commission	Horizon 2020	Networking for Research and Development of Human Interactive and Sensitive Robotics Taking Advantage of Additive Manufacturing	19900 /785				
European Commission	Horizon Europe	Sustainable Remediation of Radionuclide Impacts on Land and Critical Materials Recovery				32828 /1295	
European Commission	LIFE	Water Resources Management in Visitor Attractions - FIT4USE Water Recirculation Technology				42208 /1665	
European Commission	MSCA4Ukraine	Microstructural evolution and atmospheric oxidation of nanocrystalline films, as a way to create functional structures				1382 /55	1363 /54
European Commission	Interreg Europe	Cross-border support for SME involvement in future materials research					61905 /2442
European Commission	Interreg Europe	Interdisciplinary Bridge – InterBridge					24133 /952
European Commission	MSCA4Ukraine	Control Methods of Ferroelectric Self-Assembly				1010 /40	2082 /82
Office of Naval Research Global	NICOP	Advanced Methods for Blind Extraction of Independent Sources from Multi – Sensor Observations	351 /14	668 /26		881 /35	900 /36
Visegrad fund	Scholarship	Visegrad Fund - Liudmyla Melnyk					75 /3
Norwegian Funds	Norwegian Funds	Norway-Czech jewellery in Norway					283 /11
Bank of Saxony	Interreg Czech – Saxon	TOPOMOMO – Experimental territory of modernity		1115 /44	1876 /74		
Total			64056 /2527	1783 /70	1876 /74	78309 /3090	90741 /3580
In the role of another participant							
Provider / Investor	Programme/Grant Scheme	Project name	Support (in thousands CZK/EUR)				
			2020	2021	2022	2023	2024
European Commission	Interreg Central Europe	Alliance for Advanced Manufacturing in Central Europe (AMiCE) (2017-2020, Public support: 4512 CZK / 178 EUR)					
European Commission	Horizon 2020	European Joint Programme on Radioactive Waste Management (Third party)		4893 /193			
European Commission	Horizon 2020	Enhanced In Situ Bioremediation for Contaminated Land Remediation		5070 /200			
European Commission	Horizon 2020	Distributed Artificial Intelligent Systems		3727 /147			
State Environment. Fund	Norwegian Funds	Reduction of pollution of surface water with pharmaceutical substances in the biologically treated waste water			1558 /61	1496 /59	1032 /41
European Commission	Interreg Central Europe	Management of urban water resources in Central Europe facing climate change				5324 /210	
European Commission	Digital Europe	EDIH Northern and Eastern Bohemia				6363 /251	
European Commission	Horizon Europe	Green, digital, and sustainable transition for technology and process optimisation in energy intensive industries					217 /9

European Commission	Horizon Europe	European Partnership on Radioactive Waste Management – 2					3752 /148
European Commission	Horizon Europe	Deep Tech Empowerment for Higher Education Institutes, Skills2Scale				1783 /70	1449 /57
European Commission	Horizon 2020 MSCA	TOMOCON - Smart tomographic sensors for advanced industrial process control	1 441 /57	885 /35	36 /1		
European Commission	Horizon 2020	European Joint Programme on Radioactive Waste Management EURAD		58 /2	731 /29	1405 /55	
European Commission	Horizon Europe	EECONE - European Ecosystem for Green Electronics				355 /14	267 /11
European Commission	Horizon Europe	Borders shaping perceptions of European societies				357 /14	
European Commission	Horizon 2020 MSCA	Molecular design of polymers for biomedical applications	35 /1		257 /10	1625 /64	
European Commission	Horizon 2020	NetZeroCities / The Initiation of Sustainable Energy Community for the City of Liberec				1653 /65	1745 /69
European Commission	ERASMUS+ Blueprint Alliances	Addressing Skills Gaps in the European Textile, Clothing, Leather and Footwear Industries, Emphasising Equality, Innovation, and Resilience					1511 /60
Total			1476 /58	14633 /577	2582 /101	20361 /802	9973 /395

Note: For co-sponsorship projects, please only indicate the amount of funding for the evaluated HEI.

4.10.4 Projects supported by the Czech provider

In the role of beneficiary							
Provider / Investor	Programme/Grant Scheme	Project name	Support (in thousands CZK/EUR)				
			2020	2021	2022	2023	2024
CESNET		Data Drive Research			264 /10	195 /8	165 /7
Grant Agency of the Czech Republic		Standard projects, Junior projects	5416 /215	5792 /229	9562 /378	8918 /352	13,408 /529
Regional Authority of the Liberec Region		Assistance vouchers, technology vouchers	950 /38	490 /19		404 /16	
Ministry of Education, Youth and Sports		Inter-Excellence, Large R&D&I infrastructure projects	12870 /508	11036 /436	9616 /379	8173 /323	5675 /224
Ministry of the Environment	Life Programme		8561 /338			14059 /555	
Technology Agency of the Czech Republic		TREND, Clean Energy, National Competence Centre, DELTA, SIGMA, Environment for life, KAPPA, Theta, EPSILON, EuroNanoMed, GAMA, Zeta, M-Era net, ÉTA	55090 /2182	60452 /2384	52603 /2077	61514 /2232	72813 /2873
Ministry of Education, Youth and Sports	OP RDE	International Research Laboratories	3619 /143	3511 /139	1823 /72		
Ministry of Education, Youth and Sports	OP RDE	CxI TUL Management Mechanisms with a focus on increasing the quality of the results of R&D&I activities (2017-2022, Public support: 19,525 CZK / 770 EUR)	2845 /112	3669 /145	1 /0		

Ministry of Education, Youth and Sports	OP RDE	Hybrid Materials for Hierarchical Structure (2018-2022, Public support: 73,175 CZK / 2886 EUR)	21000 /828	14000 /552	822 /32		
Ministry of Education, Youth and Sports	OP RDE	Modular platform for autonomous chassis of specialised electric vehicles for freight and equipment (2018-2022; Public support: 73,058 CZK / 2882 EUR)	24659 /973	843 /33	889 /35		
Ministry of Education, Youth and Sports	OP RDE	3D STAR / 3D Print in civil engineering and architecture	11272 /445	12144 /479	5922 /234	1306 /52	
Ministry of the interior	Security Research		5232 /206	286 /11			
Ministry of Health	Programme to support applied medical research		1316 /52	2188 /86	2194 /87	1897 /75	
Total			152,830 /6040	114,411 /4513	83,696 /3304	96,466 /3613	92,061 /3633
In the role of another participant							
Provider / Investor	Programme/Grant Scheme	Project name	Support (in thousands CZK/EUR)				
			2020	2021	2022	2023	2024
Grant Agency of the Czech Republic		Standard projects, Junior projects	2759 /109	2008 /79	1951 /77	1107 /44	1821 /72
Ministry of Regional Development	INTERREG top-up funding					659 /26	
Ministry of Industry and Trade		TRIO	24390 /962	17791 /702	14234 /561	6653 /262	2147 /85
Ministry of Education, Youth and Sports		Inter-Excellence, Large R&D&I infrastructure projects	6612 /262	6563 /259	6376 /251	4729 /187	7064 /278
Ministry of the interior	Security Research		2311 /91	3127 /123	6694 /264	3764 /148	2003 /79
Ministry of Agriculture	EARTH			918 /36	936 /37	972 /38	1 089 /43
Ministry of Health	Programme to support applied medical research					982 /39	1488 /59
State Environment. Fund	Norwegian Funds				1558 /61	1496 /59	1032 /41
Technology Agency of the Czech Republic		TREND, Clean Energy, National Competence Centre, DELTA, SIGMA, Environment for life, KAPPA, Theta, EPSILON, EuroNanoMed, GAMA, Zeta, M-Era net	81237 /3207	97559 /3838	76700 /3026	78550 /3099	79479 /3136
Ministry of Industry and Trade	OP EIC	Industrial research and experimental development of small city electromobile and tools for production	3028 /119				
Ministry of Industry and Trade	OP EIC	Research and development of innovated surfaces of cutting tools using carbon nanoparticles		6263 /247			

Ministry of Industry and Trade	OP EIC	Development of Electromechanical Brake for Tram Transport		225 /9	503 /20	847 /33	
Ministry of Industry and Trade	OP EIC	STIMUL20 - Selection pressure and nanomaterials as effective tools for stimulation of biotechnology systems		790 /31	1098 /43	1345 /53	
Ministry of Industry and Trade	OP EIC	Development of a hybrid sprinkled bioreactor				1428/56	
Ministry of Industry and Trade	OP EIC	The development of advanced treatment technology for highly mineralised water based on membrane distillation		1028/41	532/21	803/32	
Ministry of Industry and Trade	OP EIC	Hybrid optical fibre sensor for sensing the level and quality of vehicle operating fluids			591/23		
Ministry of Industry and Trade	OP EIC	New possibilities of increase in efficiency of membrane systems operation: retentate recycling from reverse osmosis units and innovative methods of membrane backwash			301/12	578/23	
Ministry of Industry and Trade	OP EIC	Research and development of a new universal non-drip quick coupling	410 /16	747 /26	920 /36	2 /1	
Ministry of Industry and Trade	OP EIC	Development of textile products from non-combustible and recyclable materials	1765 /70				
Ministry of Industry and Trade	OP EIC	Integration of microcomputers into lighting systems	797 /31				
Ministry of Industry and Trade	OP EIC	Research and development of textile products with a focus on the technology of knitting and the use of aqueous chemicals		4164 /164	3172 /125		
Ministry of Industry and Trade	OP EIC	Development of an automatic device for inspection quality testing of rotational aircraft engine parts using ultrasonic immersion method		134 /5	974 /38	649 /26	
Ministry of Industry and Trade	OP EIC	Reduction of noise from linear transport constructions using active and passive elements			3767 /149	10,00 ³ /395	
Ministry of Industry and Trade	OP EIC	Application of geopolymers in fire safety of buildings			3767 /149	4071 /161	
Ministry of Industry and Trade	OP EIC	Development of a filter for capturing heavy metals in combustion processes				1003 /40	
Ministry of Industry and Trade	OP EIC	Test station for pre-certification tests of internal combustion engines	282 /11				
Ministry of Industry and Trade	OP EIC	Development of a prototype of a new type of blow moulding machine			835 /33	109 /4	
Ministry of Industry and Trade	OP EIC	Development of a new generation of robotic deburring machine without the need for brushing			572 /23	109 /4	
Ministry of Industry and Trade	OP EIC	Pretreatment, coating and protection of the substrate			978 /39	689 /27	

Ministry of Industry and Trade	OP EIC	Reducing noise pollution from linear traffic structures using active and passive elements				148 /6	
Ministry of Industry and Trade	OP EIC	Application of geopolymers in fire safety of buildings				129 /5	
Ministry of Industry and Trade	OP TAC	Electrodialysers for effective recycling of valuable components from industrial wastewaters (2026: 8087 CZK / 319 EUR)					
Ministry of Industry and Trade	OP TAC	Innovation of flotation through implementation of nanobubbles and optimisation of flotation process for water management applications (2026: 6309 CZK / 249 EUR)					
Ministry of Industry and Trade	OP TAC	Innovative 3D structure of biomass carrier with nanofibrous and biological component for biotechnological applications in the field of water purification (2026: 2582 CZK / 102 EUR)					
Ministry of Industry and Trade	OP TAC	Innovative ways of energy-performance optimisation of membrane bioreactors (2026: 6537 CZK / 258 EUR)					
Ministry of Industry and Trade	OP TAC	Integrated samplers for water treatment plants and wastewater treatment plants (2026: 3319 CZK / 131 EUR)					
Ministry of Industry and Trade	OP TAC	Integrated samplers for water treatment plants and wastewater treatment plants (2026: 3319 CZK / 131 EUR)					
Ministry of Industry and Trade	OP TAC	A modular platform for complete wastewater treatment				222 /9	1909 /75
Ministry of Industry and Trade	OP TAC	Development of biodegradable fibre carriers for dermocosmetic applications				225 /9	3033 /120
Ministry of Industry and Trade	OP TAC	Research and development of multi-purpose automated filling equipment with production software and disposable capsules made of fully biodegradable material based on the principle of circular economy					4861 /192
Ministry of Industry and Trade	OP TAC	Flexible technology for robotic grinding and polishing of large-scale glass objects with complex shapes					2719 /107
Ministry of Industry and Trade	OP TAC	Application of natural structure analogies on the surface of blow-moulded plastic parts					1466 /58
Ministry of Education, Youth and Sports	OP RDE	Modernisation and upgrade of large research infrastructure "Nanomaterials and nanotechnologies for protection of the environment and sustainable future"		1463 /559			
Ministry of Education, Youth and Sports	OP JAK	BREAKTHROUGH laser technologies for smart manufacturing, space and bio-TECH applications					3800 /150
Ministry of Education, Youth and Sports	OP JAK	Upgrade and modernisation of large research infrastructure "Nanomaterials and nanotechnologies for protection of the environment and sustainable future"					5700 /225
Ministry of Education,	OP JAK	Excellent research in regenerative medicine					3400 /134

Youth and Sports							
Total			123,591/4875	142,780/5636	126,459/4989	121,272/478	123,011/4853

Note: Please summary list GA CR, TA CR and other departmental projects. For co-sponsor projects, please indicate the financial volumes for the HEI. Projects financed from EU structural funds and focused exclusively on R&D&I (e.g. OP JAK, OP TAC, NPO) and projects financed from regional sources focused exclusively on R&D&I list individually. For co-sponsoring projects, please indicate the financial volumes for the evaluated HEI only.

4.10.5 Projects supported from non-public sources

In the role of beneficiary						
Provider / Investor	Project name	Support (in thousands CZK/EUR)				
		2020	2021	2022	2023	2024
Škoda Auto a.s., Combata, s. r. o., Břetislav Flídr, Liberec, TES VSETIN a.s., Narran s.r.o., ; Nadace Presiosa; ELITRONICS s.r.o.; Alligard s.r.o.; SANS SOUCI, s.r.o.	Donations	5660/223	2067/82	2590/103	715/29	1182/47
Alexandr Filippov, JaP - Jacina, s.r.o., Barvy a laky Teluria s.r.o., Entry Engineering s.r.o., fy NANOLOGIX SE/Nanologix protect s.r.o., DAKO-CZ, a.s., COMDES CZ s.r.o., SINDAT spol. s r.o.	Licensing agreements, Agreements on the use of results	412/17	1210/48	531/29	850/34	544/21
NANOPROGRESS, z.s., Škoda Auto a.s	Received rent	1192/47	1133/45	1199/47	1198/47	922/37
Clean - air s.r.o., Narran s.r.o., STEINEL Technik s.r.o., ŠKODA AUTO a.s., VALEO AUTOKLIMATIZACE k.s., ITLC s.r.o., KNOMI, s.r.o., Krajská nemocnice Liberec,a.s., PK MAT s.r.o., A.P. spol. s r.o., Nano Medical s.r.o., A. RAYMOND JABLONEC s.r.o., A.P. spol. s r.o., ALPHA Vehicle Security Solution, BRANO a.s., DŘEVOPLAST LUDVÍK s.r.o., DEKONTA, a.s., Modelárna LIAZ spol. s r.o., PRECIOSA a.s., SSI Technologies s.r.o., VARE elektro, s.r.o., CARDAM s.r.o., EPS biotechnology, s.r.o., MALINA - Safety, s.r.o., MEBSTER s.r.o., Photon Water Technology s. r., REMARK FILTRATION GROUP SPÓŁKA, TEMPERATOR s.r.o., ČEZ, Unipetrol, Innogy Gas Storage, et al.	Complementary activities	23681/935	21865/864	27438/1080	26499/1042	30627/1207
SÚRAO, Škoda Auto a.s, ÚJV Řež, a. s. RIETER CZ, s.r.o., RECUTECH s.r.o., Texas	Contractual research	18746/740	12200/481	16866/666	23718/937	23544/929

Institute of Science, SHM, s.r.o., COMDES CZ s.r.o., DORN System s.r.o., KOH-I-NOOR holding a.s., Siemens, s.r.o., ABB s.r.o., ENELEX spol. s r.o., MECAS s.r.o., Tata Steel International, s.r.o., Chemische Werke Kluthe GmbH, Magna Exteriors (Bohemia) s.r.o., Henkel KG a A , Czech Olympic Committee, SaYu, a.s. ČR, KVV Olbersdorf, ZF Automotive Czech s.r.o., Liberec Region, Statutory City of Liberec, et al.						
Nanoprogress, z.s.	Laboratory equipment for the preparation of pure nanofibrous yarns, consisting only of nanofibres, without a core support yarn			5625 /222	8319 /328	
Škoda Auto a.s.; TENEZ a.s.; TRW Automotive Czech, s.r.o.; Festo, s.r.o.; KASI, spol. s r. o.; sinit kunststoffwerk louny s.r.o.; KNORR-BREMSE Systémy pro užitkovou vozidla ČR, s.r.o.; Continental Automotive Czech Republic s.r.o.; VALEO AUTOKLIMATIZACE k.s.; HYDRA a.s.; EuroProfis, s.r.o.; Laird s.r.o.; EMERGE, a.s.; ANDRITZ HYDRO s.r.o.; ZF Slovakia; Libeos, s.r.o.; RETIA, a.s.; KOSTAL Kontakt Systeme GmbH & Co. KG; 100% REWORK s.r.o.; Klüber Metrology s. r. o.; AJKA - SOLUTION s.r.o.; Sellier & Bellot a.s.	Training for industrial partners	231 /9	479 /19	655 /26	418 /17	554 /22
Total		49922 /1 969	38954 /1 537	54904 /2 166	61717 /2 435	57373 /2 263
In the role of another participant						
Provider / Investor	Project name	Support (in thousands CZK/EUR)				
		2020	2021	2022	2023	2024
Liberec Region, Ministry of Industry and Trade, European Commission	Innovative vouchers	5931 /234	11,36 7 /448	10,85 3 /428	8990 /1071	3543 /140
Total		5931 /234	11,36 7 /448	10,85 3 /428	8990 /1071	3543 /140

Note: Indicate, for example, sponsorship donations, resources generated from other own economic activities, foreign subsidy programmes of private entities.

4.11 Rules for the use of institutional support for the LCDRO

The HEI will describe the strategy and rules for the use of institutional support for the LCDRO in the management of institutionally supported research activities (e.g., prioritisation of research topics by the HEI according to individual needs, internal grant agencies, incentive tools, support for excellent science) and the method for distribution of institutional support to individual departments/research teams for the period of 2020–2024. The impact on the management of institutionally supported research activities will be described by the HEI using specific examples (e.g. distribution of institutional support in the period of 2020–2024 depending on the evaluation results, examples of supported excellent science projects, etc.).

Maximum 500 words plus 200 words for each example given (max. five examples).

Self-assessment:

TUL's strategy for distributing institutional support for LCDRO (DKRVO) aims to promote high-quality research outputs, identify near-term research priorities, support internal grants, and foster excellent science with internationally recognized results.

The support is allocated through a transparent internal methodology that combines performance and incentive parameters, with a strong emphasis on research excellence. Both bibliometric and applied results are considered, allowing fair evaluation of creative activity across units, departments, and research teams. The system is flexible, enabling quick adaptation to current research needs.

During the evaluation period, the role of the stabilisation component in distribution was reduced in favour of the incentive component. Allocation to individual TUL units follows internal rules based on the quality and international relevance of R&D outputs, performance of research teams, and alignment with Modules 1-3 of Methodology 17+. It also considers internal programmes (e.g. PURE, ENAGO) as approved by the TUL Senate and faculty senates.

Each unit manages its DKRVO funds based on specific local criteria, typically aligned with the institutional methodology. This autonomy ensures the strategy supports the unit-level R&D&I strategies, enabling effective research management and excellence development.

Standard supported activities include:

- Funding internal grant programmes
- Supporting highly rated but unfunded grants
- Developing excellent research teams
- Launching new R&D themes for future national/international projects
- Upgrading infrastructure and equipment
- Supporting stable teams during funding gaps
- Financing R&D with public institutional funds

This structured yet adaptable approach strengthens the research environment and competitiveness of TUL and its units.

Statistics/cases:

1. *Financial support for the basic research project "New chiral composite magnetic membranes combined with rotational and magnetic levitation forces for racemic mixture separation". The project was successful in the competition of GACR, but due to the volume of the call allocation it was not supported. As a result of the support, the project could be solved and subsequently supported by the awarded project.*

2. Support for a foreign doctoral student Masoud Khaleghiabbasabadi, who is developing the theme of new graphene-based materials at CXI. As a result of the support, Mr. Khaleghiabbasabadi has published his results in eleven articles in scientific journals in 2023 alone, and project applications have been submitted on this theme.

3. Number of projects supported in the internal grant competition:

In the period 2019-2023, the following numbers of projects have been supported under the PURE programme

- 2019: 1 project
- 2020: 6 projects
- 2021: 7 projects
- 2022: 6 projects (of which 1 project received support from the GACR, thereby ending its implementation under the PURE programme)
- 2023: 4 projects (2 of which have received support from external entities - GACR, AZV)

In the period 2019-2023, 5 projects were implemented under the RISING-STARS programme. In 2019-2022, ENAGO provided the following contributions for language proofreading.

- 2019: 4 contributions
- 2020: 5 contributions
- 2021: 3 contributions
- 2022: 5 contributions

The following numbers of projects were implemented at TUL within the SGS.

- 2020: 60 projects
- 2021: 67 projects
- 2022: 68 projects
- 2023: 68 projects
- 2024: 60 projects

4. Distribution of institutional support depending on the results of the evaluation of individual units of TUL in 2024: FAA 1%, FE 5%, FM 13%, FSHE 15%, FME 22%, FT 16%, FHS 1%, CXI 27%. The percentage distribution clearly shows the influence not only of the size of individual units of TUL, but also of the number of research teams at individual units, the influence of the results of creative activity and the quality of R&D results. Technical faculties and institutes have a significantly higher share of support. Humanities, arts and socially oriented faculties and at the same time smaller faculties have a significantly lower share of institutional support.

NATIONAL AND INTERNATIONAL COOPERATION

4.12 Important collaborations in R&D&I

The HEI will describe specific cases of R&D&I collaboration at the national level (maximum five examples) and the international level (maximum five examples), including examples of concrete results and impacts in the field of R&D&I beneficial for the HEI during the period of 2020–2024.

Maximum 300 words per example.

Self-assessment:

TUL cooperates at the **national level** in the field of basic research with a number of universities and institutes of the Academy of Sciences of the Czech Republic (CAS). In the field of applied research, TUL is involved in cooperation with industrial enterprises or major clusters.

1. Cooperation with the Academy of Sciences of the Czech Republic

In the field of basic research, the most important cooperation is with the Institute of Plasma Physics, especially with its Regional Centre of Special Optics and Optoelectronic Systems (TOPTEC), with which several projects of the GACR and TACR have been implemented. TUL has a long-standing and significant cooperation with the Institute of Thermomechanics and the Institute of Physics, with which several projects of GACR, TACR and MEYS were solved. Other projects were solved with the Institute of Physiology, Institute of Geonics, Masaryk Institute and Archives, Institute of Instrumentation, Institute of Inorganic Chemistry, J. Heyrovsky Institute of Physical Chemistry, Institute of Atmospheric Physics, Institute of Physics of Materials, Institute of Organic Chemistry and Biochemistry, Institute of Information Theory and Automation. Cooperation with institutes of the CAS results in joint publications and outputs in addition to joint grants and projects.

2. Cooperation with clusters

Nanoprogress: TUL is a member of a cluster that ranks among the excellent European groups. Nanoprogress was awarded the Golden Cluster 2016 title for the most dynamic cluster of 2016. Furthermore, the cluster was awarded the Gold Medal of Cluster Management Excellence. Winning this award places Nanoprogress among Europe's cluster elite. Since its foundation, Nanoprogress has been dedicated to cutting-edge technological research and development. The aim is to promote the development of innovation, competitiveness and internationalisation of the business sector and to foster cooperation at European Union level. FME, together with FSHE (FT) and CXI, is dedicated to the research and development of experimental devices for the production of nanofibres using AC electrospinning. Research results are presented at international trade fairs. In recent years, there has been a growing interest in commercialisation activities, mainly from abroad (USA, France), but also from the Czech Republic (Elmarco). The volume of contractual research and projects resulting from the cooperation of the Institute and the staff of individual faculties is about 70 million CZK for the evaluation period. Other outputs of cooperation are the results of applied research.

The Association of Textile, Clothing and Leather Industry (ATOK), Czech Technological Platform for Textiles (ČTPT) z.s., Technical Textiles Cluster (Clutex) z.s.: TUL has long been cooperating with members of these groups focused on the textile industry. This involves cooperation on the concepts of development of the textile and clothing industry. The benefit is the creation of conditions for successful cooperation with many universities and institutions focused on textile and material engineering.

3. Cooperation within the National Centre of Competence

The National Centre of Competence for Industrial 3D Printing (2023–2028, TACR, TN02000033) is a strategic project aimed at advancing additive manufacturing in the Czech Republic. Coordinated by TUL (CXI), the project includes around 30 partners from academia, research, and industry. It focuses on developing advanced 3D printing technologies, promoting their industrial application, and fostering interdisciplinary cooperation. The centre supports innovation transfer, increases technological competence, and strengthens the international competitiveness of Czech industry. TUL leads research on new materials, technology optimisation, and sustainable practices, including raw material recycling and the integration of waste materials. The project is highly multidisciplinary, involving chemistry, physics, materials science, and engineering, with active participation from FM and FME faculties. Outputs include joint projects, grants, publications, and applied results.

The Božek Vehicle Engineering National Centre of Competence is implemented in two phases:

- 2019–2022 (TACR, TN01000026)
- 2023–2028 (TACR, TN02000054)

This initiative focuses on sustainable mobility for road and rail vehicles and their integration into modern transport systems. It addresses strategic technological development in sectors vital to the Czech economy and industry. The consortium leverages synergies between academic, research, and industrial institutions to solve critical transport challenges. Key industrial partners include ŠKODA AUTO a.s., TATRA, a.s., and TÜV SÜD Czech s.r.o. TUL contributes through FME and CXI, with collaboration also extending to its roles in the Hydrogen Platform and the Electromobility Association, where TUL is a founding member. These projects lead to joint research activities, applied results, and international collaboration.

4. Collaboration within the speech transcription platform

Several projects (e.g. TACR TH03010018 DeepSpot - Multilingual technology for detection and early warning, TACR TO01000027 NordTrans) implemented in cooperation with Newton Technologies, a.s. have led to the development of a platform at FM TUL that uses deep neural networks to automatically detect keywords in spoken speech and transcribe fluent speech in thirteen major Slavic languages (Czech, Slovak, Polish, Russian, Ukrainian, Belarusian, Slovenian, Serbian, Croatian, Bosnian, Montenegrin, Macedonian and Bulgarian are supported). In the following years (2021–2024), support for Norwegian, Swedish and Danish was added to the TACR international project TO01000027 NordTrans, still in cooperation with the Norwegian university NTNU. The platform is also used to detect entities (e.g. commercial logos or persons by face) in image data and works in both online (detection in the live data stream) and offline mode (very fast detection in the data archive). On the basis of this platform, Newton Technologies operates a number of add-on services, which it offers itself or through its partners in the Czech Republic and abroad. These include in particular the Beey web platform, which enables automatic transcription and subsequent correction of various audio recordings or the creation of subtitles. This keyword detection module is then used, for example, in the TVR Alerts service, which alerts clients in the shortest possible time to the appearance of specified keywords in various TV and radio stations or programmes available on the Internet. Based on the results (published at the prestigious international conference InterSpeech), it can be argued that this technology achieves transcription accuracy fully comparable to or even better than cloud-based speech transcription services from Google or Microsoft. The results are commercially exploited.

5. Collaboration within large infrastructures

NanoEnvi.cz Project – Research Infrastructure for Nanomaterials and Environmental Protection (2016–2026; supported by MEYS, Large Infrastructures Programme) aims to build a national research infrastructure for interdisciplinary research on nanomaterials and nanotechnologies focused on environmental protection and sustainable development. This multidisciplinary platform supports comprehensive nanomaterial characterisation, covering chemical, physical, health, and environmental aspects. The platform emphasizes not only technological innovation but also health and environmental risk assessment of nanomaterials. NanoEnvi.cz focuses on:

- Development of innovative nanostructured materials
- Design of new technologies for environmental protection and remediation
- Services in heterogeneous (photo)catalysis, sustainable energy technologies, pollutant detection and degradation, and environmental monitoring

The project integrates the capacities of major Czech research institutions, including the J. Heyrovsky Institute of Physical Chemistry of the CAS (coordinator), TUL (CXI), Jan Evangelista Purkyně University, Palacký University, the Institute of Inorganic Chemistry of the CAS, and the Institute of Experimental Medicine of the CAS. The infrastructure provides open access research services for both internal and external users, enabling efficient collaboration among partners and with broader scientific and industrial communities. Follow-up projects are aimed at upgrading research infrastructure, extending application capabilities, and optimising research

methods for broad environmental use. The collaboration has led to joint publications, applied results, and new grant projects.

International cooperation of TUL with foreign partners in science and research is conducted in standard forms and similarly to national cooperation. TUL cooperates with a number of universities and industrial enterprises. In the following, the projects listed in Chapter 4.10 will be purposely not mentioned.

1. Cooperation within the CERN research infrastructure

TUL has maintained long-term cooperation with CERN, the European Organization for Nuclear Research in Geneva, through the [CERN-CZ](#) research infrastructure, which coordinates Czech participation in CERN activities.

The collaboration focuses on two key areas:

- **Basic Research on Dark Matter and Energy**
TUL played a key role in designing and preparing experiments using optical methods to explore dark matter and energy. These experiments established critical detection limits, now serving as reference points. The current focus is on a new experiment measuring induced birefringence in vacuum, led by INFN Ferrara, Italy.
- **Structured Optical Beams and Applications**
TUL researchers contributed to the discovery of non-classical polarisation in optical beams, including beams with longitudinal polarisation components, offering new insights into light behaviour. This research enabled the creation of narrow beams with 500× less divergence than predicted by classical theory, suitable for high-precision metrology.

Theoretical and experimental research is conducted at TUL, while CERN applications, developed with ETH Zurich and TUL doctoral students, focus on precise positioning of accelerator components. In April 2025, a TUL doctoral student will apply these results at the KEK accelerator in Japan. From 2020–2025, three TUL doctoral students have undertaken long-term CERN stays (1–3 years), with others involved via theses or internships. CERN plans to integrate structured optical beam research into a new department, with continued TUL involvement. The collaboration has led to numerous publications, internships, and applied research opportunities, supporting lab modernisation and the career development of TUL graduates in international science environments.

2. Cooperation in the research and development of polymer nanofibre materials

TUL (FSHE) has a long-standing collaboration with Aston University (UK) on research into polymer nanofibre materials for special medical applications. The linking of the teams has led not only to the development of collaborations focused on polymeric materials and their characterisation, preparation technologies and testing of nanofibrous materials, but also to joint publication and project activities (The Royal Society, UK (IES/R3/183098) *Non-woven membranes for the recovery of human therapeutic cells Applicant*, 2019-2021; EC H2020 MSCA *Molecular Design of Polymers for Biomedical Applications “MEDIPOL”*, 2020-2024). A follow-up project to MEDIPOL, HyPerMed (*Advanced Hybrid Polymers for Sustainable Global Biomedical Healthcare*; EC HE MSCA), is currently under preparation.

Within this long-term cooperation, there are frequent exchanges of doctoral students for the implementation of their doctoral research work and visits of academics related to ongoing or upcoming projects and research. The research is related to the development of biodegradable polymers and their application in the form of nanofibres for the development and testing of materials especially for skin regeneration, for the development of contact lenses or for the development of nanofibre cell-permeable membranes for new blood salvage devices especially

for cancer patients for the successful removal of circulating tumour cells (principle of extremely selective immunoaffinity membrane chromatography).

3. Collaboration in blade research

Within the framework of three follow-up projects between the Institute of Thermomechanics of the CAS, the FM TUL and Duke University, N.C. (USA), the construction of equipment and experimental research of flutter of large turbomachinery blades was carried out on the Czech side, and on the US side numerical modelling of these processes. Duke University is one of the most prestigious universities in the USA, which was ranked sixth in the USNews - Best Colleges ranking at the same time as Caltech. The Duke Aeroelasticity team is also one of the founding members of the GUIde consortium, bringing together research institutions and companies involved in turbomachinery development (Duke University, NASA, Doosan, GE, Honeywell, Pratt & Whitney, Rolls-Royce, etc.).

During the project, a world unique device was developed to measure the aerodynamic load on an oscillating blade grating at transonic modes and high reduced frequencies. Using this device, a set of nearly 500 measurements were made at different flow regimes and blade oscillation positions or frequencies using a range of experimental methods (static pressure measurements, dynamic pressure measurements using Kulite probes, split-film probe measurements in the blade flange), and an extensive database of experimental results was compiled. In addition to the planned objectives of the project, a new methodology of dual-wavelength laser digital interferometry was developed and used to optically measure the Mach number distribution around the blade. The measurement results were analyzed and compared with numerical simulations using the Harmonic Balance Technique developed at Duke University. The main role of FM TUL was structural calculations of the blade drive mechanism, preparation of the sensors and measurement chain including data acquisition and processing, development of new optical methods for measuring the current field, and together with the Institute of the CAS, evaluation of the measurements and publication of the results.

4. Collaboration within ecology

TUL (FSHE) has a world-class facility studying taxonomy and phylogeny of bryozoans in collaboration with Isfahan University Iran (studying Tertiary sediments of the Qom Formation in central Iran), with the Polish Academy of Sciences (studying Tertiary ecosystems in Europe and central Asia), Woosuk University, Republic of Korea (research mainly on modern bryozoans of the orders Cyclostomata and Ctenostomata and the first fossil record of bryozoans in Korea), Oceanology Institute of Chinese Academy of Science (research on modern bryozoans of Qingdao Bay in eastern China). Research in this area contributes to the understanding of the process of climate change in the early/mid Cenozoic and its impact on the fauna, and is therefore relevant to current estimates of the impact of the current climate changes we are facing. Long-standing collaboration with Woosuk University has led to the publication of several joint papers, and a joint project. Long-term collaboration with the Polish Academy of Sciences has led to two joint publications in 2020-2024. Collaboration with the University of Oslo has also led to two joint papers. The most valuable result was published in the journal *Science advances* (R. Orr, E. Di Martino, K. Zágorský, et al., *Paleozoic origins of cheilostome bryozoans and their parental care inferred by a new genome-skipped phylogeny*, *SCIENCE ADVANCES*, WASHINGTON, Amer Assoc Advancing Science, 11 pages, ISSN: 2375-2548, n. 13, [\[Online\]](#), 2022).

TUL also cooperates with the Technical University of Dresden and the Senckenberg Museum in Goerlitz to study grassland ecosystems in the border area of the Czech Republic and Saxony. In 2024, TUL was awarded the EU Interreg-funded project "Causes of the decline of grassland diversity in protected areas of the Czech-Saxon border region" (DiGraSo) with German partners and the Czech Agricultural University in Prague.

5. Collaboration within the virtual centre

The Sustainable Remediation of Radionuclide Impacts on Land and Critical Materials Recovery (SURRI, Horizon Europe Twinning, 101079345, 2023–2025) project aims to establish an international virtual research centre with a shared agenda to tackle challenges related to post-mining sites, particularly those impacted by uranium extraction. In addition to soil remediation and water treatment, the project focuses on the recovery of critical raw materials such as rare earth elements (REEs) and heavy metals, supporting the circular use of soil, water, and strategic resources. Post-uranium mining sites in Central Europe, especially the Czech Republic, pose major societal and environmental challenges. The project also includes economic feasibility assessments of the proposed technologies, contributing to the goals of the EU Green Deal and raw material independence. SURRI integrates electrochemical and microbiological methods, applicable in-situ and ex-situ, offering innovative tools for remediation and resource recovery. As a multidisciplinary project, combining chemistry, biology, and environmental sciences, targeting sustainable remediation of contaminated land and recovery of critical materials, aims to: Advance research excellence at CXI TUL, Develop a shared research vision and innovation agenda, Strengthen the international research profile of staff, Build a global network of contributors, Deliver technologies transferable across the EU. Coordinated by CXI TUL, partners: University of Granada (Spain), Università La Sapienza Roma (Italy), University of Southampton (UK).

STUDIES

4.13 Doctoral studies

The HEI will briefly describe the organisation of the doctoral studies (if there are any doctoral study programmes³⁷). HEI will comment on:

- Structure and organization of studies.
- A system of cooperation between PhD students and their supervisors.
- Basic statistics (including drop-out rate, student workload, etc.).
- Information on promotion and recruitment schemes.
- Cooperation within doctoral studies (e.g., Czech Academy of Sciences, application sphere, building open study programmes for foreign nationals and creating international networks of study programmes, "joint degree", "cotutelle", etc.).
- Student care system (e.g. counselling, wellbeing care, career guidance).
- A system for tracking the future careers of graduates³⁸.
- Other relevant data, such as the existence of a doctoral school, basic soft skills courses, etc. at the discretion of the HEI.

The HEI shall support this with appropriate examples (e.g. a model example of doctoral student cooperation with their supervisor, statistics on collaboration within doctoral studies, specific examples within doctoral studies, statistics on the use of student care systems, etc.).

Maximum 300 words per point.

Self-assessment:

TUL offers study programmes in Czech (full-time and combined form of study) and in English (full-time and combined form of study), see. Table 4.13.1. The FHS is currently preparing a doctoral study

³⁷ If the HEI does not organise any doctoral programme, it will explicitly state this information in the self-evaluation report.

³⁸ The HEI will list the top five highest ranked graduates in academia, the private sector, and public administration over the past five years.

programme which will be submitted to The National Accreditation Bureau for Higher Education in the near future. CXI does not have degree programmes.

Table 4.13.1: Number of doctoral study programmes at TUL as of 31 December 2024

Faculty	New accreditations		SP for graduation	
	CZ	ENG	CZ	ENG
FME	3	3	3	3
FT	2	2	1	1
FSHE	2	1	2	0
FE	2	2	3	2
FAA	2	0	1	0
FM	3	3	2	0
FHS	0	0	0	0
Total TUL	14	11	13	6

The numbers of DSP students in Czech and English at TUL and the numbers of newly admitted students to DSP at TUL in Czech and English are presented in Tables 4.13.2 and 4.13.3.

Table 4.13.2: Number of DSP students in 2020-2024 at TUL

Faculty	2020		2021		2022		2023		2024	
	ENG	CZ	ENG	CZ	ENG	CZ	ENG	CZ	ENG	CZ
FME	18	77	11	57	9	54	8	47	6	43
FT	35	36	13	46	15	40	15	28	11	14
FSHE	0	6	0	6	0	6	0	13	2	27
FE	2	31	6	23	5	31	2	27	1	19
FAA	0	45	0	40	0	43	0	41	0	29
FM	6	104	3	73	5	71	6	59	8	53
REK	0	23	0	21	0	20	0	12	0	1
Total TUL	61	322	33	266	34	265	31	227	28	186

Table 4.13.3: Number of newly admitted DSP students in 2020-2024 at TUL

Faculty	2020		2021		2022		2023		2024	
	ENG	CZ	ENG	CZ	ENG	CZ	ENG	CZ	ENG	CZ
FME	4	13	2	14	1	14	1	7	0	10
FT	3	7	2	10	4	5	0	4	2	5
FSHE	0	1	0	0	0	0	0	7	2	11
FE	0	10	4	11	1	11	0	2	0	1
FAA	0	17	0	7	0	13	0	4	0	3
FM	3	15	4	10	3	14	0	9	1	7
REK	0	0	0	0	0	0	0	0	0	0
Total TUL	10	63	12	52	9	57	1	33	5	37

Structure and organisation of studies

Doctoral studies at TUL are conducted within accredited doctoral study programmes (DSP) at individual faculties. They follow the Higher Education Act No. 111/1998 Coll., TUL's [Study and Examination Regulations](#), specific DSP accreditations, and faculty directives. The standard length is 4 years, with full-time or combined study options, in Czech or English. Each DSP is overseen by a

Doctoral Board (DB), which evaluates individual (ISP) and annual study plans (ASP), monitors progress, and proposes examination and defence committees. It also recommends termination of studies if obligations are unmet. The Vice-Dean for doctoral studies coordinates the faculty's DSPs and manages exams, defences, and promotion. The DSP guarantor leads programme development, accreditation, and quality assurance. Doctoral study is guided by an ISP, updated annually, and supervised by an appointed advisor. The supervisor assists in academic planning, monitors progress, and submits evaluations to the DB. The ISP includes at least three exams - two in science/applied and discipline/applied foundations. Exams must be completed within two years. Language competence is proven by an English exam or certificate. In the first or second year, students prepare a research study or thesis for the State Doctoral Examination (SDZ), which includes a professional oral exam and thesis discussion. Pedagogical duties such as tutoring, supervising, and teaching may apply. Students also engage in research, projects, and must publish results before dissertation defence. A 3-month study internship abroad is mandatory, with exceptions approved by the DB. Participation in soft skills training may also be required. The dissertation must demonstrate original research and scientific independence. Once all requirements are met, the student applies for defence, supported by the supervisor and reviewed by a committee of experts.

The system of cooperation between doctoral students and supervisors

The collaboration between a doctoral student and their supervisor is essential for the successful completion of the study. The supervisor plays a central role, providing not only academic guidance and consultation but also engaging the student in joint publications, project work, and discussions on research direction and doctoral progress. Supervisor quality is assessed across several areas: cooperation with students, research activity, publication output, international connections, and teaching skills. In 2024, TUL introduced a "Supervisor Metric" to systematically evaluate supervisors across all units. Student performance is assessed by the DSP Board and the supervisor. Studies follow an Individual Study Plan (ISP), developed and regularly updated through Annual Study Plans (RSP) under the supervisor's guidance. The Departmental Board reviews any changes and evaluates the student's progress at least once a year.

Examples of Successful Student–Supervisor Collaboration:

1. *Ing. Markéta Klíčová (FT) won the 2022 Werner von Siemens Prize together with Senta Müller for the best thesis, marking the first female tandem to receive this award - highlighting the strength of supervisor-student cooperation.*
2. *Ing. Michal Dostál, PhD was invited by EF TUL to join a TACR junior project while finishing his master's degree. He enrolled in the DSP under Assoc. Skrbek, partnered with Škoda Auto, taught courses, and completed a semester internship at Hochschule Zittau/Görlitz, resulting in a joint publication. He completed his doctorate in four years and now works full-time at KIN.*
3. *Doctoral students at EF TUL can also join the Škoda Auto doctoral programme, involving dual supervision with a practical research focus. Graduates include Ing. Michal Dostál, PhD (2022) and Ing. Márcio Vitor Tonhá Rodrigues, PhD (2024).*

Basic statistics (incl. drop-out rate, student workload, etc.)

The success rate of studies in the DSP at TUL after the first year is on average 85% over the last four academic years. The success rate in the DSP at TUL was around 25%, but now it is over 40% (see Table 4.13.4). The success rate is generally lower in the combined form of study.

Table 4.13.4: Study success rate in DSP

Faculty	2020		2021		2022		2023		2024	
	ENG	CZ	ENG	CZ	ENG	CZ	ENG	CZ	ENG	CZ
FME	33%	32%	25%	32%	20%	35%	60%	38%	100%	78%
FT	18%	12%	25%	27%	25%	23%	25%	20%	36%	63%
FSHE	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
FE	0%	25%	0%	50%	0%	0%	50%	50%	0%	50%
FAA	0%	0%	0%	0%	0%	0%	0%	14%	0%	43%
FM	0%	27%	0%	14%	0%	35%	0%	54%	0%	67%
REK	0%	0%	0%	0%	0%	0%	0%	60%	0%	100%
Total TUL	20%	24%	25%	20%	23%	23%	37%	40%	43%	66%
	23%		21%		23%		40%		60%	

The main reason for early graduation is a change in career priorities, a job offer from an industrial practice, difficulties in reconciling personal and professional life, a change in family situation, a change in life priorities and, last but not least, the difficulty of studying.

The teaching load of students is minimal and is usually in the range of 2 hours per week. Doctoral students participate in teaching in Bachelor's and Master's degree programmes if they have this as part of their ISP. Students are usually involved in teaching activities, e.g. by conducting tutorials in professional subjects, which contributes to their teaching skills. If students are involved in teaching, they must have an employment relationship with TUL.

Information on promotion and recruitment schemes

Promotion and recruitment of DSP students is targeted annually, e.g. by:

- Webpages of the individual units of TUL, where the themes and annotations of dissertation themes with the name of the supervisor are listed in Czech and English,
- Online campaigns,
- Social networks of individual TUL units,
- Targeted outreach to talented Master's degree students,
- Educational portals,
- International trade fairs,
- Cooperation with foreign universities,
- Cooperation on projects,
- Cooperation with partners from industry,
- Cooperation with the Foreign Department of TUL.

Cooperation in the framework of doctoral studies (e.g. CAS, application sphere, building open study programmes for foreign nationals and creating international networks of study programmes, "joint degree", "cotutelle", etc.)

In 2017, an agreement on cooperation in the implementation of doctoral study programmes was signed between the CAS and TUL. Currently, the most intensive cooperation is with the Institute of Plasma Physics of the CAS, v.v.i., the Institute of Physics of the CAS, v.v.i., the Institute of Information Theory and Automation of the CAS, v.v.i., the Institute of Thermomechanics of the CAS, v.v.i., Institute of Physiology of the CAS, v.v.i., Institute of Macromolecular Chemistry of the CAS, v.v.i., Institute of Microbiology of the CAS, v.v.i., J. Heyrovsky Institute of Physical Chemistry of the CAS, v.v.i., Institute of Experimental Medicine of the CAS, v.v.i. and others. Based on our excellent relationships with partners from industry, we annually announce themes that are linked to the application sphere and aim to solve complex research tasks with application potential. Last but not

least, we offer dissertation themes on the websites of individual units and also send them to partner universities abroad, as most of the doctoral study programmes are accredited in English.

DSP Environmental Engineering is accredited jointly with Uniwersytet Opolski in Poland on the basis of an academic cooperation agreement (joint degree). The DSP Mechatronics (double degree) is accredited jointly with the Faculty of Electrical Engineering and Computer Sciences, University of Applied Sciences Zittau/Görlitz and the DSP International Management (double degree) is accredited in cooperation with the Technical University Dresden. The cotutelle system is part of the TUL legislation and the FME is the most advanced in this area.

Student care system (e.g. counselling, wellbeing care, career guidance)

TUL offers a comprehensive support system for doctoral students, available at both university and faculty levels. This includes access to study and personnel departments, supervisors, vice-deans, international offices, mentoring, handbooks for students and staff, career regulations, benefit systems, digitised services, and Career Days.

Doctoral students benefit from:

- Training sessions and workshops to build academic and soft skills.
- Career and psychological counselling.
- Financial support for internships and mobility (Erasmus+, Ceepus, internal mobility funds).
- Internal grants and SGS project opportunities.
- University accommodation and dormitories.
- University Doctoral School and courses in Academic Writing and Technical English.
- Centre for Continuing Education.
- Employee benefits, sports facilities, and child care options (ŠkaTULka Kindergarten, Children's Corner).

TUL students can use the **Academic Counselling Centre** for support in academic, personal, social, and career matters. Services include psychological, spiritual, and crisis counselling. The **Support Centre** offers help to students with special needs. The **TUL Ombudsman** is also available for confidential support. For general study-related questions, students can contact their vice-dean for doctoral studies, supervisor, or study department. New students can consult the online [Guide for New Doctoral Students](#). Employees who are also DSP students can refer to the **Adaptation Guide for Employees**. In 2024, a **Staff Training** section was added to the intranet, listing training opportunities. A course on cyber security is also in development. To support work-life balance, TUL provides child care services and access to a wide range of sports at the **Academic Sports Centre**. DSP students who are also employees can take advantage of [TUL's employee benefits](#).

Graduate career tracking system

At the faculties of TUL where doctoral study programmes are accredited, not only as a result of GDPR, the further careers and employment of doctoral graduates are not systematically monitored, unless the DSP graduates themselves communicate their further career activities to the components or their employment in practice or at prestigious workplaces is supported by personal contacts of supervisors. On the other hand, the possibility of monitoring and feedback of graduates at TUL is intensively discussed. In the period evaluated, it can be calculated that approximately 30% of doctoral graduates continue their employment at TUL and approximately 70% continue their professional life outside TUL.

Examples of graduate employment:

1. *Dr.-Ing, Michael Oeljeklaus, Ph.D., Member of the Board of Management of Škoda Auto for Production and Logistics.*

2. Ing. Radka Jírová, Ph.D., post-doc position at Hochschule Zittau/Görlitz - University of Applied Science, Germany.
3. Ing. Martin Borůvka, Ph.D., two years in a multinational company; then joining Johannes Kepler University Linz - Institute of Polymer Processing and Digital Transformation, Austria, from 2024 joining TUL as an academic staff member.
4. Ing. Tomáš Kořínek, Ph.D., academic employee of CTU in Prague, Faculty of Engineering.
5. Ing. Petr Kulhavý, Ph.D., Technical Director, DEPRAG CZ a.s.
6. Ing. Shereen Abouelazayem, Ph.D., Tokamak Energy, UK.
7. Ing. Nikifor Asatiani, Ph.D., Porsche Engineering.
8. Ing. arch. Dana Přihodová, Ph.D., Faculty of Ladislav Sutnar, ZČU in Pilsen.
9. Ing. arch. Jan Tyrpekl, Ph.D., private architectural office.
10. March. Ing. arch. Ing. Jiří Vítek, Ph.D., architectural office jiri vitek architects
11. Ing. Petra Kašparová, Ph.D., Head of System Logistics Magna Exteriors (Bohemia) s.r.o.

Other relevant data such as the existence of a doctoral school, basic soft skills courses, etc. at the discretion of the university

TUL has established a [University Doctoral School](#) at the institutional level and also centrally offers Academic Writing and Technical English Courses and seminars for doctoral students within the TUL University Library and the TUL Continuing Education Centre. The University Doctoral School and the Courses of Academic Writing and Technical English centrally at the TUL level provide education for doctoral students twice a year through targeted courses and seminars, examples of good practice in terms of ethics of scientific work, text production, citations, academic writing, publication processes, types and kinds of results, transfer possibilities, internal systems, etc. Seminars are continuously renewed depending on feedback from applicants and graduates of the Doctoral School. The aim is to increase the knowledge and skills of doctoral students, to improve the quality of final doctoral theses and the success rate of the studies.

DSP students at TUL units have access to internal systems, databases and digitisation of agendas related to their activities and aimed at facilitating activities, internal processes and searches within TUL. These include:

- Study agenda (STAG.TUL),
- Personnel agenda (VEMA.TUL),
- Database of final theses (DSpace.TUL),
- Database of publication outputs (publikace.TUL),
- Database of grants and projects (GAP.TUL),
- Mobility database (mobility.TUL),
- Instrument database (pristroje.TUL),
- SGS project database (SGS.TUL), et al.

Statistics/examples:

Number of participants in the University Doctoral School:

- 2022: 52 students
- 2023: 24 students
- 2024: 37 students

IMPLEMENTATION OF RECOMMENDATIONS

4.14 Implementation of the recommendations in Module 4

The HEI will briefly describe how it has implemented the recommendations for Module 4 from the previous evaluation period, if applicable.

Maximum 1000 words

Self-assessment:

Different standards for publishing results

The basic standards for the types of results and the standards for publication of results are consistent with and based on the materials Evaluation of Research Organisations and Evaluation of Programmes of Special Purpose Support for Research, Development and Innovation according to the M17+ Methodology, the definition of individual types of results and outputs of R&D&I, and the methodologies of the Research, Development and Innovation Council. An electronic database for entering and recording results and outputs at TUL (the *publikace.tul.cz* system), which defines standards for recording and publishing results was prepared based on the recommendations of the previous evaluation. Furthermore, a methodology for the evaluation of R&D results and the subsequent allocation of funds at TUL has been prepared. Finally, internal documents have been developed that take into account the recommendations in terms of predatory journals and countries at risk for collaborative R&D.

Gender imbalanced composition of professors

The overall gender composition of professors at TUL is more or less balanced. In the evaluation period, more female professors were appointed than male professors, which contributes to the gradual increase in the number of women in professorial positions. However, the gender imbalance in the representation of professors persists in the technical faculties, where the proportion of women in the academic staff has been low for a long time. TUL is actively seeking to alleviate this imbalance, but despite all efforts, this trend persists at the university. However, this phenomenon is in line with the global situation, where, according to statistics from 2023, women make up only 28% of the technical workforce. In the United States, they account for 18%, in the European Union 17%, in Japan 16% and in India 14%.

Implementation of applied research projects with low research value

In recent years, applied research projects have been exclusively implemented through company-university cooperation. The company is the beneficiary of the project, and the university is the co-beneficiary. Only projects that have a high potential for research activities and application of the results will succeed in the calls. This fulfils the requirement to increase the research value of applied research projects.

More funding for basic research

Every year, TUL allocates funds for basic research projects, both at the level of TUL and at the faculties, in the form of support for the preparation of project applications. At the same time, it spends funds to support internal competitions, or to re-fund basic research projects that were well evaluated in calls but were not funded due to limited allocation. In parallel with the funding, the number of staff in the project departments and units of TUL and the number and volume of projects submitted to national and international calls where basic research is the primary objective are increasing.

Unclear web pages

The www.tul.cz website was completely redesigned in December 2020. Both the technical implementation (switching from our own content management system to WordPress) and the content were changed. A completely new content structure was prepared by a working group with an emphasis on clarity and usability for visitors. The content of the new website is based on the following basic principles:

- Easy navigation, a small number of basic sections.
- Consistency between the Czech and English language versions.
- Automated retrieval of information from other information systems (study programmes, projects, calendar of events, news).
- Responsive design with an emphasis on accessibility.

We are convinced that in terms of clarity and timeliness of the information provided, the university website has made a significant step forward. The chosen solution has proven itself, among other things, in the implementation of the new visual identity of TUL in 2023, which was smooth, fast and without significant problems.

Each part of TUL should define its main research directions

On the basis of this recommendation, all units have updated their R&D&I Strategies (see faculty reports M3), which define the main research directions and research areas with a view to the near future.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 4

Document name	No. criteria	Location (link in HTML)
Publikace TUL	4.1	https://publikace.tul.cz/?lang=en
Scholarship regulations of the Technical university of Liberec	4.2	https://doc.tul.cz/14449
International Council	4.3	https://www.tul.cz/en/research/international-board/
The Ethics Code for the TUL Employees and Students	4.3, 4.4, 4.7	https://doc.tul.cz/9840
The TUL Ethics Committee	4.3, 4.4, 4.7	https://www.tul.cz/en/university/university-management/ethics-board/
Research Ethics Committee	4.3, 4.4	https://www.tul.cz/en/university/university-management/research-ethics-committee/
Statutes of the Research Ethics Committee	4.3, 4.4	https://doc.tul.cz/14450
TUL's ombudsman	4.3, 4.4, 4.7	https://www.tul.cz/en/university/university-management/ombudsman/
Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec	4.4	https://doc.tul.cz/14424

for the period 2021 - 2025, with a view to 2030		
Programme to support the strategic management of the Technical University of Liberec for the years 2022-2025	4.4	https://doc.tul.cz/14420
Implementation Plan of the Strategic Plan of the Technical University of Liberec 2025	4.4	https://doc.tul.cz/14416
The TUL Strategic Development Plan for 2020 with a forward view to 2030	4.4	https://doc.tul.cz/7331
The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030	4.4, 4.6, 4.7	https://doc.tul.cz/14427
Mission Vision Strategy in Science and Research of TUL between 2020 and 2030	4.4	https://doc.tul.cz/8702
Personnel Development and Evaluation of Employees of the Technical University of Liberec	4.4, 4.7	https://doc.tul.cz/14419
Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec	4.4	https://doc.tul.cz/14422
Career Development Regulations of the Technical University of Liberec	4.4, 4.6, 4.7	https://doc.tul.cz/14414
Work Regulations	4.4, 4.6, 4.7	https://doc.tul.cz/14430
The protection of intellectual property at the TUL and the commercialization of R&D results	4.4	https://doc.tul.cz/7330
Rector's Directive No. 2/2023 - Open Science	4.4	https://doc.tul.cz/14418
Sustainable Development Strategy TUL by 2030	4.4	https://doc.tul.cz/14426
Protection and processing of personal data at the Technical University of Liberec	4.4	https://doc.tul.cz/14421
The University Company TUL	4.4	https://tuctul.cz/en/

Glassiteca	4.4	https://glassiteca.eu/en/
Gender Equality Plan (GEP) for the period 1. 1. 2022 – 31. 12. 2025	4.4, 4.7	https://doc.tul.cz/10596
Code for Gender-Sensitive communication at the Technical University of Liberec	4.4, 4.7	https://doc.tul.cz/14415
Disciplinary Commission of TUL	4.4	https://www.tul.cz/en/university/university-management/disciplinary-committee/
Rector's Order No. 3/2023 - Cyber security	4.4	https://doc.tul.cz/14448
Declaration of accessibility of the TUL website and mobile applications	4.4	https://www.tul.cz/en/accessibility-declaration/
Rector's Directive No. 4/2023 - Using artificial intelligence in teaching and creative work	4.4	https://doc.tul.cz/14429
Conflicts of interest in habilitation proceedings and proceedings for appointment as professor	4.4	https://doc.tul.cz/14452
TUL career pages	4.6	https://www.tul.cz/en/university/official-desk/careers-at-tul/
Jobs.cz	4.6	https://www.jobs.cz/en/
ResearchJobs	4.6	https://www.researchjobs.cz/en/
Euraxess	4.6	https://www.euraxess.cz/
A guide for adaptation of foreigners	4.6	https://doc.tul.cz/10432
TUL training	4.6	https://trainings.tul.cz/?lang=en
A guide for parents and carers	4.6	https://doc.tul.cz/13589
The Regulations of the Habilitation and Appointment to Professor Procedure of the Technical University of Liberec	4.6, 4.7	https://doc.tul.cz/14428
Internal Wage Regulations of The Technical University of Liberec	4.6, 4.7	https://doc.tul.cz/14417
Guide for new employees	4.6	https://doc.tul.cz/12014

CXI Human Resource Development Strategy	4.6	https://doc.tul.cz/en/10746
OTM-R Policy CXI	4.6	https://doc.tul.cz/en/10787
Director's Directive No. 1/2012 Guidelines for selection procedures for positions of R&D staff, managers and other staff of CXI TUL	4.6	https://doc.tul.cz/en/10261
CXI Staff Selection Manual	4.6	https://doc.tul.cz/en/10783
Handbook for the selection and development of CXI postdoctoral fellows	4.6	https://doc.tul.cz/en/10765
Director's Directive No. 1/2024 Evaluation and Career Development of CXI Employees	4.6	https://doc.tul.cz/en/10610
CXI New Employee Handbook	4.6	https://doc.tul.cz/en/12125
Disciplinary Code for students of the Technical University of Liberec	4.7	https://doc.tul.cz/9837
University management	4.7	https://www.tul.cz/en/university/university-management/
Equal opportunities and diversity	4.7	https://www.tul.cz/en/university/equal-opportunities-and-diversity/
Study and Examination Regulations	4.13	https://doc.tul.cz/9835
Guide for New Doctoral Students	4.13	https://www.tul.cz/en/students/
TUL's employee benefits	4.13	https://www.tul.cz/en/university/employees/
University Doctoral School	4.13	https://www.tul.cz/en/students/doctoral-school/

MODULE 5 - STRATEGY AND POLICIES

5.1 Mission and vision of the evaluated institution in R&D&I

The HEI will briefly describe its mission and vision with emphasis on R&D&I in general and its R&D&I capacities in the implemented R&D&I fields³⁹ (Tables 5.1.1 and 5.1.2). In particular, the HEI's vision covers the following five-year period and must relate to the strategic objectives of the Provider, the National Policy on Research, Development, and Innovation of the Czech Republic 2021+, the Gender Equality Strategy 2021-2030, and other higher national and supranational strategic documents in the field of R&D&I (Table 5.1.3). The HEI shall complement the description with active references to its Strategic plan for the teaching, scholarly, scientific, research, development, artistic, and other creative activities of the higher education institution (regarding the results and recommendations from the previous evaluation period, if the evaluated HEI participated in it). The HEI shall describe how the vision and mission were implemented during the period of 2020–2024.

Maximum 2000 words.

Self-assessment:

The mission and vision of the Technical University of Liberec (TUL) in R&D&I is based on the Strategic Document [Mission | Vision | Strategy in Science and Research of TUL between 2020 and 2030](#).

Mission of TUL:

The mission of TUL is to disseminate knowledge and push its boundaries, cultivate Czech society, and contribute to social balance, well-being, and sustainable development through all its activities.

Vision of TUL:

In the spirit of European university traditions, TUL set itself a vision for the period 2020-2030 to be an independent, internationally anchored educational and research centre of European importance and a partner in finding and solving societal challenges.

The mission and vision of TUL in R&D&I are not only related to the strategic documents of TUL ([Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a view to 2030](#); [The TUL Strategic Development Plan for 2020 with a forward view to 2030](#); [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#); [Sustainable Development Strategy TUL by 2030](#)), but also national strategic documents (National Research, Development and Innovation Policy of the Czech Republic 2021+; Strategy for Gender Equality for 2021-2030; National RIS3 Strategy 2021+; RIS3 Strategy for the territory of the Liberec Region for the period 2023-2027; etc.).

Basis for scientific, R&D&I, artistic and other creative activities for 2020-2030:

TUL is based on the principle of freedom of scientific research, sharing of information and ideas, openness to different scientific opinions and the ability to think critically. In doing so, it draws on the research tradition of European universities, i.e., it systematically links the mission of an educational institution with scientific, research, development, innovation and artistic activities, cooperates with renowned foreign partners and strives for a strong international dimension of its activities. In science, research and innovation, TUL has a strong tradition in materials, mechanical, textile, electrical, information and environmental engineering and nanotechnology. It also focuses on research in natural sciences, social sciences, humanities, economics and health sciences.

A distinct advantage of TUL is its interdisciplinarity, the ability to build research teams and find innovative, complex solutions across disciplines. By this, it achieves success in many scientific fields

³⁹ For so-called R&D&I capacities, see Definition of Terms in Methodology HEI2025+.

and is able to build on basic research by commercial application of the results of its R&D&I, design and artistic activities.

The mission of TUL in scientific, R&D&I, artistic and other creative activities for 2020-2030:

The mission of TUL is to contribute to the expansion of knowledge through its creative activities and to strive for the practical application of new knowledge and its use in the development of society.

The vision of TUL in scientific, R&D&I, artistic and other creative activities for 2020-2030:

In today's dynamically changing environment, TUL sets a vision for the period 2020-2030 to be an independent, internationally anchored research, development and innovation institution of European significance, which actively seeks out key societal challenges and research tasks and brings comprehensive solutions to them.

Capacities in implemented R&D&I fields:

TUL covers 5 out of 6 FORDs: Natural Sciences, Engineering and Technology, Medical and Health Sciences, Social Sciences, Humanities and the Arts.

According to FORD groups, TUL had in **2024** the highest representation in FORD 2 Engineering and Technology (almost 50%), followed by FORD 1 Natural Sciences with 25%, then FORD 5 Social Sciences with 14% and FORD 3 Medical and Health Sciences and FORD 6 Humanities and the Arts with 6%. FORD 4 Agricultural and Veterinary Sciences is not covered at TUL. The disciplinary focus and its percentage representation are determined by the creative activity of individual units of TUL and, of course, the volume of creative activity and human potential in individual disciplinary groups. TUL has the highest share in terms of volume of creative activity within dFORD in dFORD 2.5 Materials Engineering (20%), then dFORD 2.3 Mechanical Engineering (11%), and then three dFORDs with approximately 7% (2.10 Nanotechnology, 1.4 Chemical Sciences, 5.2 Economics and Business). Another significant share is in dFORDs according to the specific focus of TUL units: Faculty of Mechatronics, Informatics and Interdisciplinary Studies in dFORD 1.2 Computer and Information Sciences and 2.2 Electrical Engineering, Electronic Engineering, Information Engineering; Faculty of Health Studies in dFORD 3.3 Health Sciences; Faculty of Science, Humanities and Education in dFORD 1.1 Mathematics and 5.3 Education; Faculty of Arts and Architecture in dFORD 6.4 Arts; and Institute for Nanomaterials, Advanced Technologies and Innovations in dFORD 1.5 Earth and Related Environmental Sciences.

In the next five years, TUL will continue with these creative activities, as it is clearly visible to national and international collaborating research entities, and most TUL units do not foresee a significant change in personnel or the focus of their creative activities. Conversely, new research themes will influence the percentage representation of disciplinary groups. TUL assumes that over the next five years, it will have a reduced representation in FORD 2 Engineering and Technology and on the contrary an increase in FORD 1 Natural Sciences. Other FORDs should remain approximately the same. FORD 4 Agricultural and Veterinary Sciences, as in this period, will not be covered. In the next five years, TUL expects to increase the disciplinary focus in dFORD 1.1 Mathematics, 1.3 Physical Sciences, 1.4 Chemical Sciences, 2.10 Nanotechnology and 3.3 Health Sciences. On the contrary, a decrease is expected in dFORD 2.5 Materials Engineering.

Strategic plan of educational and creative activities, its objectives and their implementation (especially with regard to the results and recommendations from the previous evaluation period)

The priority objective is to link the educational and creative activities and to ensure the stability of research teams at TUL. The secondary objective is to strengthen the institutional component of research compared to the existing targeted support of research through TUL's grant programmes, to maintain stable research teams and to strengthen the success of teams in obtaining foreign research projects and grants.

Implementation of the measures of the TUL strategic plan for creative activities according to the sub-areas:

TUL implemented the recommendations resulting from the work of the international evaluation panel and subsequently revised internal processes and directives at the institutional level and at the level of individual units. The appropriate distribution of scientific activities, human resources and financial resources leads to the prioritisation of research themes with the greatest international impact and themes playing a key role in the development of regional and national values in the units. Priority R&D directions will be reviewed in regular one- to two-year intervals in order to capture new R&D themes with a high potential impact not only on the scientific community but also on society as a whole.

In order to promote excellence and the social relevance of research, TUL has introduced an internal university-wide system for evaluating the quality of the results of scientific and creative work, which is based on internationally recognised indicators and which takes into account the characteristics of individual scientific fields. It also provides support and funding for the implementation of language proofreading by renowned international companies, increases the number of basic research grant projects supported by national or international providers each year. TUL grant programmes have been established to maximise the potential for producing excellent results and to increase the success of research teams in obtaining grant support for basic research from national (GACR) and international (ERC) providers. In terms of interdisciplinary cooperation support, TUL creates conditions for interfaculty research teams to enter large-scale international cooperation projects (administrative support for the preparation of these projects is provided by the Rector's Office in cooperation with the project departments of the faculties). TUL strengthens its R&D staff capacities by aligning professional growth with private life and removing gender barriers. Last but not least, TUL has developed a strategy for the protection of industrial and intellectual property, transfer of knowledge, experience, know-how and technology (revision of the IP protection strategy, introduction of processes, establishment of the TUC TUL), thereby increasing the volume of financial revenues from licensing agreements, and has set out a methodology for establishing spin-off companies to streamline the technology transfer process.

In terms of international cooperation, TUL holds university-wide grant competitions to support young talented academic and scientific staff in strategic, promising and emerging areas of basic research. TUL supports the organisation of joint international conferences and workshops and uses international mobility to promote international cooperation in science and research. TUL is increasing the number of working groups actively involved in international cooperation in science and research not only through bilateral cooperation but also through participation in international consortia, and to increase the success rate of international grant applications, a university-wide grant support centre is operated to provide assistance throughout the grant life cycle. Conditions for the establishment of active international scientific cooperation are created and supported by the TUL management and their individual units in order to increase the number of graduates of doctoral study programmes in post-doctoral positions at prestigious international institutes ranked in the THE Ranking up to 800. The expansion of international cooperation in publishing scientific journals and holding conferences at TUL leads to an increase in the international reach of scientific journals published at TUL and of scientific conferences, workshops and roundtables (indexing of proceedings of scientific conferences organised by TUL and journals published by TUL in internationally recognised databases Web of Science and Scopus; increasing citation metrics (IF, AIS, SJR) of scientific journals published at TUL).

Fulfilment of the vision and mission in the evaluation period:

By fulfilling its mission, vision and goals in R&D&I, **TUL continues to be an internationally respected multidisciplinary and interdisciplinary centre of science and research.** TUL fulfils its mission to generate new knowledge, develop excellent science and implement sustainable technologies with a positive impact on society, industry and the environment. The result is cutting-edge science and research outputs that are translated into real life, to develop human potential, education and the prosperity of society.

TUL continuously strengthens and develops international cooperation. *The vision and mission were fulfilled by maintaining existing and establishing new strategic partnerships with leading international institutions, increasing international project participation, and creating an international marketing strategy.*

TUL has defined priority directions and areas of R&D&I, including their sustainability and retrospective evaluation. *The vision and mission were fulfilled by implementing research projects pursuant to the National Policy of Research, Development and Innovation of the Czech Republic 2021+, the European Green Agreement, profiling research themes and searching for new research directions.*

TUL is a leader in applied and pre-application research in the Czech Republic. It achieves top results in several research areas, is a driver of new ideas, e.g., in nanotechnology, and has one of the highest numbers of filed and cited patents in the Czech Republic. *The vision and mission were fulfilled through interdisciplinary and inter-faculty collaboration, joint projects with industrial partners, national and international grants and projects, funding and effective resource planning for infrastructure and creative activities, contractual research, establishment of TUCTUL and transfer of knowledge not only to industrial practice but also to public life.*

TUL guarantees and ensures quality educational activities at all levels of study. *The vision and mission were fulfilled by integrating the knowledge of science and research into educational activities, using modern research infrastructure during studies, disseminating knowledge for socio-economic development of society, and implementing doctoral study programmes.*

TUL is a modern, attractive and desirable employer with satisfied employees in a friendly environment while respecting the basic principles of equality and HR policy. *The vision and mission were fulfilled by implementing strategic documents in the area of HR policy, implementing the Gender Equality Strategy 2021-2030, increasing the representation of women in management and research positions, implementing a gender equality plan, obtaining an HR Award, conducting an employee satisfaction survey including corrective measures, and supporting academic and scientific staff, and benefits.*

TUL provides a third role. *The vision and mission were fulfilled through the popularisation of science and research through public events, conferences, fairs, exhibitions, synergy of activities with partners from the public and industrial sphere, lectures, open days, etc.*

5.1.1 R&D&I capacities of HEI in the year 2025

Field of Research	FORD	FORD share [%]	Predominant type of research	Total share of field of research [%]
1. Natural Sciences	1.1 Mathematics	3	Basic research	25
	1.2 Computer and information sciences	5	Balanced basic and applied research	
	1.3 Physical sciences	4	Balanced basic and applied research	
	1.4 Chemical sciences	7	Balanced basic and applied research	
	1.5 Earth and related environmental sciences	5	Balanced basic and applied research	
	1.6 Biological sciences	1	Balanced basic and applied research	
	1.7 Other natural sciences	0	-	
2. Engineering and Technology	2.1 Civil engineering	1	Applied research	49
	2.2 Electrical engineering, Electronic engineering, Information engineering	4	Balanced basic and applied research	
	2.3 Mechanical engineering	11	Applied research	
	2.4 Chemical engineering	0	-	
	2.5 Materials engineering	20	Balanced basic and applied research	
	2.6 Medical engineering	1	Basic research	
	2.7 Environmental engineering	2	Balanced basic and applied research	
	2.8 Environmental biotechnology	1	Balanced basic and applied research	
	2.9 Industrial biotechnology	0	-	
	2.10 Nanotechnology	7	Balanced basic and applied research	
	2.11 Other engineering and technologies	2	Applied research	
3. Medical and Health Sciences	3.1 Basic medicine	0	-	6
	3.2 Clinical medicine	2	Basic research	
	3.3 Health sciences	4	Basic research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0	-	0
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	
	4.4 Other agricultural sciences	0	-	
5. Social Sciences	5.1 Psychology and cognitive sciences	1	Basic research	14

	5.2 Economics and Business	6	Balanced basic and applied research	
	5.3 Education	4	Basic research	
	5.4 Sociology	2	Balanced basic and applied research	
	5.5 Law	0	-	
	5.6 Political science	0	-	
	5.7 Social and economic geography	1	Balanced basic and applied research	
	5.8 Media and communications	0	-	
	5.9 Other social sciences	0	-	
6. Humanities and the Arts	6.1 History and Archaeology	1	Basic research	6
	6.2 Languages and Literature	3	Basic research	
	6.3 Philosophy, Ethics and Religion	1	Basic research	
	6.4 Arts (arts, history of arts, performing arts, music)	1	Applied research	
	6.5 Other Humanities and the Arts	0	-	
Total		100 %	-	100%

5.1.2 Target R&D&I capacities of HEI for the next five-year period

Field of Research	FORD	FORD share [%]	Predominant type of research	Total share of field of research [%]
1. Natural Sciences	1.1 Mathematics	7	Basic research	33
	1.2 Computer and information sciences	5	Balanced basic and applied research	
	1.3 Physical sciences	7	Balanced basic and applied research	
	1.4 Chemical sciences	8	Balanced basic and applied research	
	1.5 Earth and related environmental sciences	5	Balanced basic and applied research	
	1.6 Biological sciences	1	Balanced basic and applied research	
	1.7 Other natural sciences	0	-	
2. Engineering and Technology	2.1 Civil engineering	0	-	42
	2.2 Electrical engineering, Electronic engineering, Information engineering	4	Balanced basic and applied research	
	2.3 Mechanical engineering	11	Balanced basic and applied research	
	2.4 Chemical engineering	0	-	
	2.5 Materials engineering	16	Balanced basic and applied research	

	2.6 Medical engineering	1	Balanced basic and applied research	
	2.7 Environmental engineering	2	Balanced basic and applied research	
	2.8 Environmental biotechnology	1	Balanced basic and applied research	
	2.9 Industrial biotechnology	0	-	
	2.10 Nanotechnology	6	Balanced basic and applied research	
	2.11 Other engineering and technologies	1	Balanced basic and applied research	
3. Medical and Health Sciences	3.1 Basic medicine	0	-	7
	3.2 Clinical medicine	2	Balanced basic and applied research	
	3.3 Health sciences	5	Balanced basic and applied research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0	-	0
	4.2 Animal and Dairy science	0	-	
	4.3 Veterinary science	0	-	
	4.4 Other agricultural sciences	0	-	
5. Social Sciences	5.1 Psychology and cognitive sciences	1	Basic research	12
	5.2 Economics and Business	6	Balanced basic and applied research	
	5.3 Education	4	Balanced basic and applied research	
	5.4 Sociology	0	-	
	5.5 Law	0	-	
	5.6 Political science	0	-	
	5.7 Social and economic geography	0	-	
	5.8 Media and communications	1	Balanced basic and applied research	
	5.9 Other social sciences	0	-	
6. Humanities and the Arts	6.1 History and Archaeology	1	Basic research	6
	6.2 Languages and Literature	2	Basic research	
	6.3 Philosophy, Ethics and Religion	1	Basic research	
	6.4 Arts (arts, history of arts, performing arts, music)	2	Balanced basic and applied research	
	6.5 Other Humanities and the Arts	0	-	
Total		100 %	-	100%

5.1.3 Relation to the strategic objectives of the provider and strategic documents in the field of R&D&I

Strategic document	Follow-up
The Ministry's strategic plan for the higher education sector for the period from 2021 with an expected interim evaluation and update in 2025	Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a view to 2030
National Research, Development and Innovation Policy of the Czech Republic 2021+	Mission Vision Strategy in Science and Research of TUL between 2020 and 2030
Gender Equality Strategy 2021-2030	The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030
Research and Innovation Strategy for Smart Specialisation - RIS3	The TUL Strategic Development Plan for 2020 with a forward view to 2030
The European Green Deal	Sustainable Development Strategy TUL by 2030 (area: research on sustainable materials and green technologies)

5.2 Research and development objectives

The HEI will describe its intentions and goals for the next five-year period. The objectives in the field of research development, innovation, and knowledge transfer as well as the objectives in the field of cooperation with public administration, entrepreneurs, and non-profit organisations will be described in relation to the mission, vision and disciplinary capacities of the HEI. Furthermore, the objectives for the development of the HEI as a research organisation will be described, in the areas of human potential development, institutional resilience, the implementation of open science and adherence to the principles of ethics, scientific integrity, and good practice, and their interrelationship with R&D&I objectives. The objectives described must be consistent with the Strategic plan for the teaching, scholarly, scientific, research, development, artistic and other creative activities of the higher education institution.

Maximum 2000 words.

Self-assessment:

The intentions for the next five-year period in R&D&I and knowledge transfer and in cooperation with public administration, entrepreneurs and non-profit organisations in relation to the mission, vision and disciplinary capacities of the university are defined in the [TUL Strategic Development Plan for 2020 with a forward view to 2030](#), **objectives** are documented in the [Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a view to 2030](#); [Sustainable Development Strategy TUL by 2030](#); [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#). The documents were created in accordance with the "Innovation Strategy of the Czech Republic 2019-2030", the National RIS3 Strategy 2021+ and the RIS3 Strategy for the territory of the Liberec Region for 2023-2027 and in accordance with the Horizon Europe research mission.

In 2021-2030, TUL will focus its scientific, research and other creative activities on addressing the following societal challenges, research themes and needs related to the sustainability of long-term development of human society for the 21st century:

- Smart interdisciplinary solutions.
- Modern technologies.
- Development of advanced materials and technologies.
- Fostering entrepreneurship.
- Addressing socio-economic challenges.
- Quality education.

Scientific, research and innovation activities at TUL focus on the fields of technical sciences and engineering, natural sciences, social sciences, humanities and arts, and health sciences. The research directions in scientific fields that will be developed at TUL in the next 5 to 10 years are listed in the above-mentioned documents.

International context of TUL activities in the field of science and research for 2020-2030

TUL is an internationally anchored and internationalised research organisation. In the scientific fields in which it achieves internationally excellent results, it already cooperates with leading international institutions in the form of student and academic staff exchanges, joint publications and joint research projects. The further development of international activities is therefore an integral part of the strategic objectives and instruments in the field of science and research. The future of TUL rests on further expansion of cooperation with prestigious international institutions. Further improvement of managerial processes in science and research at TUL is based on the adoption and further development of successful models of good practice in management and professional implementation of research projects based on cooperation with prestigious international organisations.

The cooperation of TUL departments with important foreign partners will be supported by funds for internationalisation, grant funds and funds for the long-term conceptual development of the research organisation. TUL provides administrative and methodological support to its students and staff in applying for mobility support projects, such as MSCA events, Fulbright scholarship programmes, etc. TUL management monitors international calls, cooperates with the project departments of individual units in the preparation of projects such as Horizon, Inter-Excellence and Inter-Cost, Czech-Saxon cross-border projects, supports the preparation of ERC projects, etc.

Objectives for creative activities for the next 5 years

TUL's objectives in the area of creative activity for 2026-2030 are based on the approved [Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a view to 2030](#); on [The TUL Strategic Development Plan for 2020 with a forward view to 2030](#); on [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#) and on [Mission | Vision | Strategy in Science and Research of TUL between 2020 and 2030](#) and are linked to the career standards of TUL staff.

The objectives for the near term are as follows:

- Development of applied, collaborative and contractual interdisciplinary and intersectoral research, development and innovation, including the capability to meet the requirements of industrial practice and the public sector.
- Strengthening basic research and interdisciplinary basic research.

- Seeking and developing new directions in science, R&D, e.g., energy, hydrogen technologies, nanotechnologies, semiconductors, smart materials, AI support, sustainable processes.
- Increasing the share of excellent results in the number of internationally comparable results and outputs.
- Motivation and accountability of departments and staff for quality results and outputs, project activities, international collaboration.
- Supporting post-docs as carriers of new scientific knowledge.
- Involvement of departments and research teams in international projects, networks and platforms.
- Increasing the volume of technology transfer by finding commercialisable outputs, helping to establish spinoff and startup companies, popularising creative activity and scientific work.

Objectives for cooperation with the public sphere (third role)

TUL is aware of its key mission in this area and the significant potential it has thanks to its unique combination of a strong technical background with social sciences, humanities and arts. TUL management and its organisational units are in daily contact with representatives of industrial partners, primary and secondary school principals, regional and municipal officials, representatives of national organisations, government institutions and municipalities, and thereby receive a continuous overview of the needs of society and the market.

TUL regularly organises events for the public (Scientists' Day, Company Days, Open Days, popularisation lectures, events for the Ministry of Industry and Trade regarding European projects, workshops, 3600 seconds, ...), University of the Third Age, Children's University, etc. TUL has cooperation agreements with industrial enterprises, cities, regions, hospitals, and is actively involved in cooperation within the Council for R&D&I of the Liberec Region and in the Smarter Region of the 21st Century platform.

TUL has set up a system of knowledge and technology transfer, established a subsidiary company [TUC TUL](#), held annual Student Business Clubs, and has an advisory body, the Commercialisation Council.

Third role mission for 2021-2030

TUL promotes democratic principles, cultural diversity and humanistic values and plays an important role in the social development of the Liberec region and far beyond.

Third role vision for 2021-2030

In its third role, TUL's vision for 2021-2030 is to be an independent, open space for public debate and a sought-after partner in identifying and addressing societal challenges.

The objectives for the near term are as follows:

- Create a system and improve the work with alumni with the current transformation of the existing alumni database into an Alumni Club with the aim of offering various professional, cultural, social or sporting activities to its alumni. The achievements of TUL alumni will be presented in an appropriate form.
- Be an important authority in the formulation of strategies and policies at regional and national level and to continue to cooperate with the city, the region and central government authorities in the elaboration, commenting or opposing of strategic development documents.

- Continue to participate in clusters, professional associations and committees, decision-making and international organisations.
- Develop interest in world knowledge and higher education among the youngest generation through the Children's University, a diverse range of specialised lectures and laboratory demonstrations.
- TUL is a leader in lifelong learning and intergenerational activities and therefore sees it as its social responsibility to provide lifelong learning to all generations of citizens, including seniors.
- Cultivate the social environment and society by actively strengthening democratic principles and civil society by disseminating moral and ethical values, to organise popularising scientific, cultural and social events and lectures, e.g., GIS day, Physics fair, Children's Literature Conference, Scientists' Day, Open Days, 3600 seconds, etc., concert activities and organising various exhibitions, conferences and fairs.
- Increase regional exposure by organising project days and other activities for primary and secondary school students, graduates and job offers.
- Popularise the results of science and research in science centres and other thematically related platforms.
- Continue to organise public discussion tables in collaboration with professional organisations, build a model of partnership with commercial and non-commercial entities and actively engage in building an innovation environment.
- Promote shared values among students, staff and the public by creating an open, creative, inspiring cultural and social activity for TUL and to promote environmentally friendly processes.
- Prepare the implementation of advisory and educational services for the professional and general public.

Development objectives in the field of human potential

TUL's objectives in human potential are based on the principles of the [European Charter for Researchers](#), Code of Conduct for the Recruitment of Researchers and a satisfaction survey conducted in 2023, following [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#), implemented across the employee population through the Arnold service. All employees as of the date of publication of the questionnaire survey were contacted. A total of 1275 employees were contacted, with a return rate of 43%. TUL anticipates that the implementation of the objectives will lead to career development for existing and new staff, promotion of excellence, loyalty to TUL, and enhanced collaboration with other higher education and research organisations as well as private and public sector organisations. TUL has several strategic documents and internal directives that anchor and support the HR policy and on which the objectives in the area of human potential development are based, see 5.3.

The objectives for the near term are as follows:

- Conceptually proceed in the field of human resources development in relation to existing strategic and other documents of TUL.
- Regularly conduct staff appraisals using set qualification and performance indicators for academic and scientific staff.
- Maintain and develop a good working atmosphere and a friendly research environment.
- Motivate staff towards creative activities, personal and career development, personal responsibility.
- Simplify administrative procedures, computerise procedures and agendas.
- Increase the proportion of staff from outside TUL and visiting professors, increase the proportion of foreign internships and residencies.

- Support the linking of research with education, innovation, artistic and other creative activities, cooperation with industry, involvement in international R&D structures.
- Create interdisciplinary research teams.
- Improve the qualification and age structure of staff, promote the growth of responsible staff and successors to senior positions.
- Strengthen direct managerial responsibility for defining and meeting objectives in creative activities, use of technical equipment and management of intellectual property.
- Support young staff through mentoring and reconciliation of work and family life.
- Increase attractiveness and efficiency of recruiting and attracting quality employees, improving their subsequent adaptation, reducing inbreeding.
- Improve the gender structure of management positions.

Development objectives in the area of institutional resilience

Strengthening institutional resilience is an essential and necessary step to protect not only academic but also societal freedoms and rights in relation to the European Strategy for Economic Security (2023), the Council's Proposal for a Recommendation on Strengthening Research Security (2024) and the Security Strategy of the Czech Republic (2023). The evolution of the international security situation, especially in terms of geopolitical rivalry and the increasing number of cases of illicit technology transfer, increases the need for a systematic approach to risk prevention and management. Higher education and research institutions are particularly vulnerable to illegitimate influence because they operate on the principle of openness and internationalisation.

The objectives for the near term are as follows:

- Creation and setting up of a system and strategic measures contained in a single TUL strategy document.
- Creation of an anti-fraud manual with model examples.
- Updating the [protection of intellectual property at TUL and the commercialisation of R&D results](#).
- Implementation of measures to protect against cyber threats, implementation of stress tests of electronic systems.
- Regular education and awareness of academic and research staff and students in terms of risks associated with international cooperation.

Development objectives for the implementation of open science

TUL is committed to provide open research data for publicly funded scientific activities is TUL committed (in accordance with [Directive \(EU\) 2019/1024 of the European Parliament and of the Council](#)) whenever appropriate, necessary, expedient and required (see 5.3 for internal legislation). TUL adheres to the FAIR and "as open as possible, as closed as necessary" principles when making research data available. The relevant agenda is coordinated by the Open Science Coordinators and Data Stewards at TUL units.

The objectives for the near term are as follows:

- Conceptually advance and support the application of Open Science practices in relation to existing strategic and other TUL documents.
- OA to stored data under the terms of the latest available version of the Creative Commons Attribution International (CC BY) public license with a set form of disclosure.
- OA to metadata stored in the repository in accordance with the General Recommendations for Metadata Description as per the National Technical Library's ASEP/NR document.
- Continue to develop a research data repository and sharing tool ("DDR") within the University and the CESNET association.

Development objectives in the area of ethics, scientific integrity and good practice

Ethical aspects are incorporated at TUL in the [Ethics Code for TUL Employees and Students](#) of 2018. In 2021, TUL management established the position of [ombudsman](#) to strengthen the relationship with employees and students and improve the university culture. Following the [Ethics Code for TUL Employees and Students](#), an ethics committee was established. TUL also has an Academic Counselling and Support Centre, providing psychological, social and career counselling to employees. In 2023, a [Research Ethics Committee](#) was established at TUL. For gender equality, a [Gender Equality Plan](#) for TUL was developed in 2022.

The objectives for the near term are as follows:

- Anchor clear procedures and competencies in the Ethics Committee and Ombudsman agendas in internal regulations.
- Focus on age-management, at all stages of career, work-life balance, diversity and well-being.
- Improve the working environment.

5.3 Institutional tools and measures for the implementation of the research and development strategy

The HEI will describe its institutional and strategic tools (e.g., strategic management tools, tools created to support the implementation of research objectives, legal and organisational norms in relation to R&D&I support, etc.) that are designed to fulfil the research and development objectives for the next five-year period (Table 5.3.1), with an emphasis on:

- Supporting quality R&D&I.
- Excellent science.
- Innovative environment and increasing the international or disciplinary competitiveness of the HEI's research activities.
- Development of human potential.
- Institutional resilience.
- Adherence to ethical principles, scientific integrity and good practice in R&D&I.

Maximum 2000 words.

Self-assessment:

TUL is a research organisation under Commission Regulation (EU) No 651/2014, whose main objective is to implement independently basic research, industrial research or experimental development and to disseminate the results of these activities to the public through teaching, publications or knowledge transfer. TUL is a large research organisation with an organisational structure that includes all the bodies prescribed by law. The organisational structure is characterised by the intermingling of vertical linear links at the level of TUL units and the Rector's Office with the horizontal dimension of research teams. The strategic management of the university must therefore respect these specificities.

Beyond this structure, a university subsidiary for knowledge and technology transfer [The University Company TUL \(TUC TUL\)](#) was established in 2022.

Parallel to the official structure of TUL, individual managers of TUL and its organisational units are involved in national and regional councils, commissions, and advisory bodies, etc., where they participate, for example, in the development of the Regional Research and Innovation Strategy of the Liberec Region (RIS3 LK), which fulfils and further develops the National RIS3 Strategy 2021+. Strategic management at TUL is based on a process approach and defines strategic management as a strategic cycle with internal control mechanisms. Strategic management leads to setting strategic

measures for the area of educational activities, the area of creative activities, the area of internal processes and the area of the so-called third role. The strategic management and measures of TUL are systemic in nature, i.e., they cover all parts of the university and represent fundamental measures in terms of the nature or quality of the activities concerned. To this end, TUL uses the following institutional strategies and tools:

- [Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a view to 2030](#)
- [Programme to support the strategic management of the Technical University of Liberec for the years 2022-2025](#)
- [Implementation Plan of the Strategic Plan of the Technical University of Liberec 2025](#)
- [The TUL Strategic Development Plan for 2020 with a forward view to 2030](#)
- [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#)
- [Strategy of the Technical University of Liberec for the years 2020 – 2030](#)
- [Personnel Development and Evaluation of Employees of the Technical University of Liberec](#)
- TUL budget
- Internal IT systems and databases (GaP, Publikace TUL, internal grant competition, student grant competition, etc.)

The above-mentioned strategic documents show that TUL as a research organisation has ambitious plans for its future development. TUL wants to focus on strengthening its position in basic and applied R&D&I, plans to expand its research capacities and infrastructure, increase the number of international collaborations and projects, and promote technology transfer and commercialisation of research results.

TUL's vision for strategic management 2021-2030

In 2030, TUL will be a modern managed institution, with clearly defined processes, responding flexibly to environmental stimuli, minimising the administrative burden on staff and with centrally provided IT support.

Institutional and strategic tools for promoting quality R&D&I, excellent science, innovative environment and increasing international or sectoral competitiveness of research activities

Key tools for achieving the strategic objectives are defined to strengthen and develop existing and, where appropriate, introduce new science and research management processes, including human resource management, according to successful principles and standards used at the best foreign institutions. These tools are introduced or updated at all levels of TUL's organisational structure. The aim of the institutional strategic tools is to stimulate research performance, the quality and excellence of the results produced and to increase the social and economic impact of the results.

Key strategic institutional tools include:

- [Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a view to 2030](#)
- [Programme to support the strategic management of the Technical University of Liberec for the years 2022-2025](#)
- [Implementation Plan of the Strategic Plan of the Technical University of Liberec 2025](#)
- [The TUL Strategic Development Plan for 2020 with a forward view to 2030](#)
- [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#)

- [Strategy of the Technical University of Liberec for the years 2020 – 2030](#)
- [Personnel Development and Evaluation of Employees of the Technical University of Liberec](#)
- [Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec](#)
- [Career Development Regulations of the Technical University of Liberec](#), its implementation and compliance
- [The protection of intellectual property at TUL and the commercialisation of R&D results](#)
- [Rector's Directive No. 2/2023 - Open Science](#), application of Open Access procedures
- Employee Satisfaction Survey 2023
- TUL budget
- University-wide grant competition to support excellence of academic and scientific staff working in the field of basic research in order to maximise the potential for producing excellent results and to increase the success of research teams in obtaining grant support for basic research from national (Grant Agency of the Czech Republic) and international (ERC) providers
- University-wide grant competition for students (Student Grant Competition) with strengthening the elements of competition and increasing the quality of projects
- Support for publishing in international journals through internal university grants
- Internal IT system for recording grants and projects (GaP)
- Internal IT system for recording science and research results with the aim of quantifying results according to quality and excellence (Publikace TUL)
- Internal IT system for registration and tracking of mobility (MoTUL), mobility funds, support for internships at top foreign workplaces
- Based on the current R&D strategies, identification of cutting-edge, interdisciplinary or multidisciplinary research directions at TUL units and their financial support.
- Allocation of funds for the long-term conceptual development of a research organisation based on TUL's internal methodology with the aim of promoting excellence of results and motivating the production of results with commercialisation potential
- Internally set up process for selecting excellent science and research results for Module 1 according to Methodology 17+
- Implementation of tools to increase the efficiency and effectiveness of the use, acquisition, modernisation and sharing of research infrastructure
- Internal IT system for reporting and management of intellectual property
- Establishment of the TUC TUL subsidiary
- Support from the Rector's Office and project departments in the search, creation and management of projects
- Financial motivation and support for project preparation, publication outputs
- Implementation of national and international projects, international cooperation development projects
- Implementation of contractual research
- Recruitment of foreign staff at TUL for the development of international research environment

Institutional and strategic tools for human potential development

At TUL, human resources-related agendas are mainly handled centrally at the rectorate level. TUL has several strategic instruments and internal documents that anchor and support the HR policy and from which the objectives in the area of human potential development are based (see 5.2):

- [Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a](#)

view to 2030

- [Programme to support the strategic management of the Technical University of Liberec for the years 2022-2025](#)
- [Implementation Plan of the Strategic Plan of the Technical University of Liberec 2025](#)
- [The TUL Strategic Development Plan for 2020 with a forward view to 2030](#)
- [The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030](#)
- [Strategy of the Technical University of Liberec for the years 2020 – 2030](#)
- [Personnel Development and Evaluation of Employees of the Technical University of Liberec](#)
- TUL budget
- [Internal Wage Regulations of The Technical University of Liberec](#)
- [Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec](#)
- [Career Development Regulations of the Technical University of Liberec](#)
- [Work Regulations](#)
- [Gender Equality Plan \(GEP\) for the period 1. 1. 2022 – 31. 12. 2025](#)
- [Code for Gender-Sensitive Communication at the Technical University of Liberec](#)
- [The Regulations of the Habilitation and Appointment to Professor Procedure of the Technical University of Liberec](#)
- [Protection and processing of personal data at the Technical University of Liberec](#)
- Employee Satisfaction Survey 2023
- University-wide grant competition to support excellence of academic and scientific staff
- University-wide Student Grant Competition
- Training, mentoring and seminars for TUL staff
- Benefits and flexible working conditions for TUL employees
- [The University Doctoral School](#)

Institutional and strategic tools for institutional resilience

TUL is one of the world's top universities in the field of natural and technical sciences, it has the highest number of patents per employee in the Czech Republic and is also the most cited university. With this in mind, TUL has already prepared and implemented some strategic documents ([Rector's Order No. 3/2023 - Cyber security](#), "TUL's position on countries and workplaces at risk under the EU sanctions list") and some are currently being prepared (the Strategy for Prevention and Response to Illegitimate Influence and the practical Anti-Influence Manual with a list of model examples). TUL has implemented data protection measures in recent years (e.g. [Protection and processing of personal data at the Technical University of Liberec](#)) and systems against cyber threats and has established plans to prevent misuse of R&D&I results (Rector's Directive [The protection of intellectual property at TUL and the commercialisation of R&D results](#)). At the same time, it has a valid directive on the use of AI in science and teaching ([Rector's Directive No. 4/2023 - Using artificial intelligence in teaching and creative work](#)).

Institutional and strategic tools for compliance with ethical principles, scientific integrity and good practice in R&D&I

Ethical aspects are incorporated at TUL in the [Ethics Code for TUL Employees and Students](#). In 2021, TUL management established the position of ombudsman to strengthen the relationship with employees and students and to improve the university culture. This position's agenda includes compliance with equal access, discrimination, sexual harassment, bullying and burnout rights and practices. A public [ombudsman website](#) has been established to facilitate communication. An ethics committee has been established in relation to the [Ethics Code for TUL Employees and Students](#). In addition, TUL has an Academic Counselling and Support Centre, which provides psychological, social

and career counselling for employees, as well as academic counselling for students and counselling for students with specific educational needs. In 2023, a [Research Ethics Committee](#) was established at TUL. For the area of gender equality, the TUL [Gender Equality Plan](#) was developed in 2022, which defines clear objectives for the development of quality personnel policies within the fields of education, science and research, as well as care for employees, and the [Code for Gender-Sensitive communication at the Technical University of Liberec](#), within the framework of the established priority areas. TUL is actively involved in activities implemented by other universities in the area of equal conditions, in particular the sharing of good practice.

5.3.1 Institutional tools and measures for the implementation of the research and development strategy

Name of instrument/measure	Description of the tool/measure	Implementation status	Year
Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a view to 2030	The Strategic Plan serves TUL as a central tool for decision-making and formulation of development plans that are decisive for the development of TUL. At the same time, this document serves as an official information overview for the needs of public authorities and Czech and foreign partner institutions.	Implemented	2021
Programme to support the strategic management of the Technical University of Liberec for the years 2022-2025	This document specifies the financial allocation of the state budget contribution to individual measures to achieve the priority and operational objectives as set out in the Strategic Plan.	Implemented	2021
Implementation Plan of the Strategic Plan of the Technical University of Liberec 2025	This document consists of a list of the priority objectives of the Ministry of Education and Science and activities to achieve the operational objectives of TUL, broken down into individual organisational units.	implemented	2023
The TUL Strategic Development Plan for 2020 with a forward view to 2030	This document presents the idea of the future direction of TUL, the objectives of its development and the strategy of their fulfilment.	implemented	2015
Strategy of the Technical University of Liberec for the years 2020 - 2030	This document is based on the Strategic Development Plan of TUL, updates and specifies it for the period 2020-2030 with an expected interim evaluation and update in 2025. It	Implemented	2020

	serves TUL as a central reference point for decision-making and formulation of future visions that are decisive for the development of TUL.		
The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030	This document defines objectives in the field of human resources management and sets out measures leading to their achievement in relation to the strategic objectives of TUL and the implementation of the Gender Equality Plan.	Partly implemented	2022
Personnel Development and Evaluation of Employees of the Technical University of Liberec	This Directive establishes the general methodology of personnel development and evaluation of TUL employees and sets the basic rules for the management of personnel development and evaluation of employees, including its process and planning.	Implemented	2022
Internal Wage Regulations of The Technical University of Liberec	These Wage Regulations set out the wage conditions of all TUL employees and certain functional benefits for the performance of academic functions.	Implemented	2024
Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec	This Regulation sets out the method of filling the positions of academic and scientific staff, senior staff, or other staff according to the type of position to be filled and define the selection and attestation process at TUL.	Implemented	2023
Career Development Regulations of the Technical University of Liberec	This document establishes staff development procedures in line with TUL's strategic objectives. Based on it, TUL plans job positions, recruits, develops staff and continuously supports the development of their skills and abilities.	implemented	2022
The Ethics Code for TUL Employees and Students	This document formulates the basic ethical principles of behaviour and conduct and is binding for all concerned employees and students of TUL, while preserving academic freedom, especially in the sense of	Implemented	2018

	free will and decision-making in teaching students, freedom in self-education, freedom of scientific research, including the choice of issues and research methodology.		
Work Regulations	Work Regulations states the rules and conditions of the employment relationship between the employee and the employer.	Implemented	2011
Gender Equality Plan (GEP) for the period 1. 1. 2022 – 31. 12. 2025	This Equal Opportunities Plan is a summary of the overall objectives in the field of gender issues and is intended to support the development of a quality personnel policy in the fields of education, science and research, as well as staff care.	Implemented	2021
Code for Gender-Sensitive communication at the Technical University of Liberec	This document defines a gender-sensitive communication approach, or the setting and implementation of communication that reflects all persons at TUL appropriately. The methodology provides guidance for respectful communication within TUL and beyond.	Implemented	2021
The Regulations of the Habilitation and Appointment to Professor Procedure of the Technical University of Liberec	This document provides for more detailed regulation of those procedures beyond the law.	Implemented	2021
Rector's Directive No. 4/2023 - Using artificial intelligence in teaching and creative work	This document regulates the use of artificial intelligence tools in teaching and creative work at TUL and formulates the basic principles and rules for the use of artificial intelligence tools.	Implemented	2023
Rector's Order No. 3/2023 - Cyber security	This document regulates the fulfilment of TUL's obligations to ensure cyber security, to ensure a unified information security management system and the related supervision of its compliance, when implementing and fulfilling the requirements of relevant legislation or in direct connection with them.	Implemented	2023

Protection and processing of personal data at the Technical University of Liberec	This document sets out the principles and rules for the processing of personal data at TUL, establishes the responsibility of persons ensuring the protection of personal data, regulates the basic procedures for processing personal data, defines the rights and obligations of employees, students and other natural and legal persons involved in activities related to the processing of personal data.	Implemented	2018
The protection of intellectual property at TUL and the commercialisation of R&D results	The subject of the Directive is to determine the rights and obligations of employees related to the creation, notification, application, protection and commercialisation of research, development and innovation results and copyright works at TUL.	Implemented	2015
Rector's Directive No. 2/2023 - Open Science	This document commits TUL to provide open research data whenever appropriate, necessary, useful and necessary, to promote the long-term preservation and accessibility of research data resulting from publicly funded creative (research) activities, and to adhere to the FAIR principles when making research data available.	Implemented	2023
Report on the internal evaluation of the quality of educational, creative and related activities of the Technical University of Liberec	This document determines the target state of the quality of TUL's activities for the following five-year period and enables continuous evaluation of the direction of TUL's activities towards the set objectives, based on the evaluation of the development of indicators for the previous five-year period.	Implemented	2023
Addendum to the Report on the internal evaluation of the quality of educational, creative and related activities of the Technical University of Liberec	This document monitors the progress towards the set target status, formulates recommendations, monitors control activities and measures adopted by the Internal Evaluation Board in more detail.	Implemented	2022

5.4 Implementation of the recommendations in Module 5

The HEI will briefly describe how it has implemented the recommendations for Module 5 from the previous evaluation period, if applicable.

Maximum 1000 words

Self-assessment:

Different standards for publishing results

The basic standards for the types of results and the standards for publication of results are consistent with and based on the materials Evaluation of Research Organisations and Evaluation of Programmes of Special Purpose Support for Research, Development and Innovation according to the M17+ Methodology, the definition of individual types of results and outputs of R&D&I, and the methodologies of the Research, Development and Innovation Council. An electronic database for entering and recording results and outputs at TUL (the *publikace.tul.cz* system), which defines standards for recording and publishing results was prepared based on the recommendations of the previous evaluation. Furthermore, a methodology for the evaluation of R&D results and the subsequent allocation of funds at TUL has been prepared. Finally, internal documents have been developed that take into account the recommendations in terms of predatory journals and countries at risk for collaborative R&D.

Gender imbalanced composition of professors

The overall gender composition of professors at TUL is more or less balanced. In the evaluation period, more female professors were appointed than male professors, which contributes to the gradual increase in the number of women in professorial positions. However, the gender imbalance in the representation of professors persists in the technical faculties, where the proportion of women in the academic staff has been low for a long time. TUL is actively seeking to alleviate this imbalance, but despite all efforts, this trend persists at the university. However, this phenomenon is in line with the global situation, where, according to statistics from 2023, women make up only 28% of the technical workforce. In the United States, they account for 18%, in the European Union 17%, in Japan 16% and in India 14%.

Implementation of applied research projects with low research value

In recent years, applied research projects have been exclusively implemented through company-university cooperation. The company is the beneficiary of the project, and the university is the co-beneficiary. Only projects that have a high potential for research activities and application of the results will succeed in the calls. This fulfils the requirement to increase the research value of applied research projects.

More funding for basic research

Every year, TUL allocates funds for basic research projects, both at the level of TUL and at the faculties, in the form of support for the preparation of project applications. At the same time, it spends funds to support internal competitions, or to re-fund basic research projects that were well evaluated in calls but were not funded due to limited allocation. In parallel with the funding, the number of staff in the project departments and units of TUL and the number and volume of projects submitted to national and international calls where basic research is the primary objective are increasing.

Unclear web pages

The *www.tul.cz* website was completely redesigned in December 2020. Both the technical implementation (switching from our own content management system to WordPress) and the content were changed. A completely new content structure was prepared by a working group with

an emphasis on clarity and usability for visitors. The content of the new website is based on the following basic principles:

- Easy navigation, a small number of basic sections.
- Consistency between the Czech and English language versions.
- Automated retrieval of information from other information systems (study programmes, projects, calendar of events, news).
- Responsive design with an emphasis on accessibility.

We are convinced that in terms of clarity and timeliness of the information provided, the university website has made a significant step forward. The chosen solution has proven itself, among other things, in the implementation of the new visual identity of TUL in 2023, which was smooth, fast and without significant problems.

Each part of TUL should define its main research directions

On the basis of this recommendation, all units have updated their R&D&I Strategies (see faculty reports M3), which define the main research directions and research areas with a view to the near future.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 5

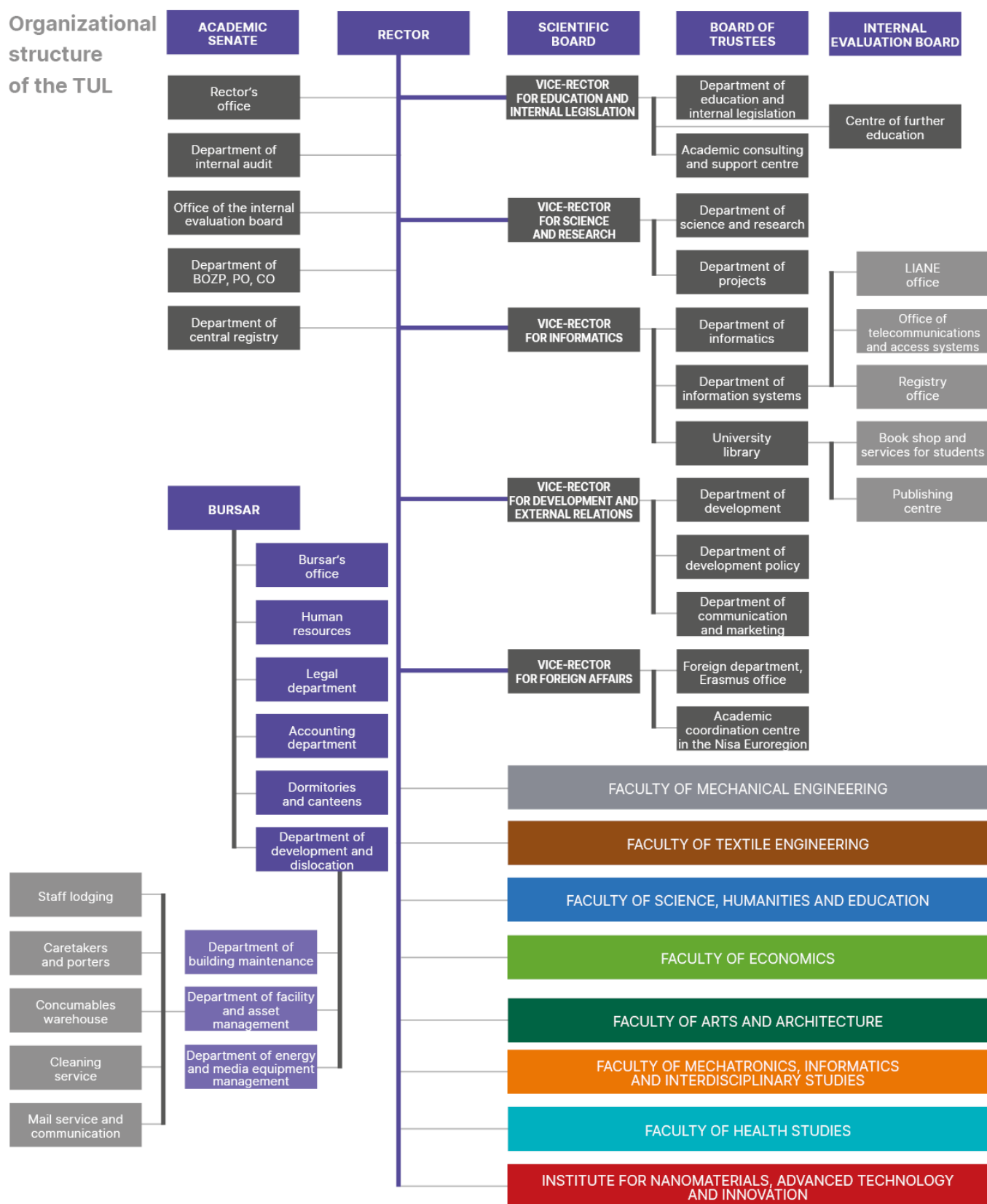
Document name	No. criteria	Location (link in HTML)
Mission Vision Strategy in Science and Research of TUL between 2020 and 2030	5.1	https://doc.tul.cz/8702
Strategic plan for educational and creative activities and Strategy for the Internationalisation of the Technical University of Liberec for the period 2021 - 2025, with a view to 2030	5.1	https://doc.tul.cz/14424
The Human Resources Strategy of the Technical University of Liberec for the period 2022 to 2025, with a view to 2030	5.1	https://doc.tul.cz/14427
Sustainable Development Strategy TUL by 2030	5.1	https://doc.tul.cz/14426

The TUL Strategic Development Plan for 2020 with a forward view to 2030	5.1	https://doc.tul.cz/7331
The University Company TUL	5.2, 5.3	https://tuctul.cz/en/
The protection of intellectual property at TUL and the commercialisation of R&D results	5.2, 5.3	https://doc.tul.cz/7330
European Charter for Researchers	5.2	https://euraxess.ec.europa.eu/hrexcellenceaward/european-charter-researchers
Directive (EU) 2019/1024 of the European Parliament and of the Council	5.2	https://eur-lex.europa.eu/eli/dir/2019/1024/oj/eng
TUL's ombudsman	5.2	https://www.tul.cz/en/university/university-management/ombudsman/
Research Ethics Committee	5.3	https://www.tul.cz/en/university/university-management/research-ethics-committee/
Programme to support the strategic management of the Technical University of Liberec for the years 2022-2025	5.3	https://doc.tul.cz/14420
Implementation Plan of the Strategic Plan of the Technical University of Liberec 2025	5.3	https://doc.tul.cz/14416
Strategy of the Technical University of Liberec for the years 2020 – 2030	5.3	https://doc.tul.cz/14425
Personnel Development and Evaluation of Employees of the Technical University of Liberec	5.3	https://doc.tul.cz/14419

Internal Wage Regulations of The Technical University of Liberec	5.3	https://doc.tul.cz/14417
Regulations of the Selection Procedure for Filling the Positions of Academic Staff and Other Employees of the Technical University of Liberec	5.3	https://doc.tul.cz/14422
Career Development Regulations of the Technical University of Liberec	5.3	https://doc.tul.cz/14414
The Ethics Code for TUL Employees and Students	5.3	https://doc.tul.cz/9840
Work Regulations	5.3	https://doc.tul.cz/14430
Gender Equality Plan (GEP) for the period 01/01/2022 – 31/12/2025	5.3	https://doc.tul.cz/10596
Code for Gender-Sensitive communication at the Technical University of Liberec	5.3	https://doc.tul.cz/14415
The Regulations of the Habilitation and Appointment to Professor Procedure of the Technical University of Liberec	5.3	https://doc.tul.cz/14428
Rector's Directive No. 4/2023 - Using artificial intelligence in teaching and creative work	5.3	https://doc.tul.cz/14429
Rector's Order No. 3/2023 - Cyber security	5.3	https://doc.tul.cz/14448

Protection and processing of personal data at the Technical University of Liberec	5.3	https://doc.tul.cz/14421
Rector's Directive No. 2/2023 - Open Science	5.3	https://doc.tul.cz/14418
Report on the internal evaluation of the quality of educational, creative and related activities of the Technical University of Liberec	5.3	https://doc.tul.cz/14423
Addendum to the Report on the internal evaluation of the quality of educational, creative and related activities of the Technical University of Liberec	5.3	https://doc.tul.cz/14409

Organizational structure of the TUL



Organizational structure of the faculties

