MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

SELF-EVALUATION REPORT MODULE 3

EVALUATED UNIT: Faculty of Biomedical Engineering, Czech Technical University

FORD: 2. Engineering and Technology

MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

MODULE 3 SOCIAL RELEVANCE

SOCIAL RELEVANCE / SOCIAL BENEFIT OF THE EVALUATED UNIT[1]

3.1 General self-assessment of the social benefit of R&D&I in the fields of research at the evaluated unit, and of the evaluated unit as a whole

The evaluated unit gives a concise, general but informative account of the benefit of R&D&I in the fields in the 2014–2018 reporting period.

Self-evaluation:

The faculty produces graduates who become professionals. Their efforts can save human lives in the areas of comfortable pre-hospital emergency care, hospital care and subsequent health care. Research carried out within the faculty has resulted in many practical medical implementations that help in everyday clinical practice. For example, the faculty is developing new types of biocompatible thin films for implant surfaces, stents, and sensors for telemedicine. It has pioneered the introduction of new Health Technology Assessment methods in the Czech Republic. The Faculty is based on an interdisciplinary concept at the interface between technology and medicine. It is the only public university located in the Central Bohemia Region.

HTML links to additional documentation:

Information about the R&D etc. of the Faculty (on the University Website)

Information about the R&D etc. of the Faculty (on the Faculty Website)

APPLIED RESEARCH PROJECTS

3.2 Applied research projects[2]

The evaluated unit presents a maximum of the five most significant (from the perspective of evaluated unit) applied research projects in the 2014–2018 reporting period from the complete list in the appendix (tables 3.2.1 and 3.2.2), particularly with regard to the results achieved or a project's potential for application.

[1] *In accordance with Section 22(1) of Act No 111/1998 on universities, amending certain acts (the Universities Act), as amended.*

[2] *Under Section 2(1)(b) of Act No 130/2002, applied research is theoretical and experimental work aimed at gaining new knowledge and skills for the developing of new or substantially improved products, processes or services; applied research includes industrial research or experimental development, or a combination of both. Under Article 2 of Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, industrial research means planned research or critical investigation aimed at the acquisition of new knowledge and skills for developing new products, processes or services, or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of component parts of complex systems, and may include the construction of prototypes in a laboratory environment or in an environment with simulated interfaces to existing systems as well as of pilot lines, when necessary for the industrial research and notably for generic technology validation; experimental development means acquiring, combining, shaping and using existing scientific, technological, business and other relevant knowledge and skills with the aim of developing new or improved products, processes or services. This may also include, for example, activities aiming at the conceptual definition, planning and documentation of new products, processes or services.*

Self-evaluation:

1. FlexiGuard – a personal biotelemetry system for FireFighters, Soldiers and Medical Rescue Teams, provider Ministry of the Interior, Czech Republic
The aim of this unique biotelemetric system is to provide enhanced overall safety to health in the course of rescues and other missions. Measurements of various physiological and environmental parameters are made for each team member (e.g. heart rate, body temperature, motion, presence of radiation effects), and the data are wirelessly transmitted to the commander`s visualization unit. This system has already been used by the Czech Fire Rescue Service and by the Czech Army. FlexiGuard is protected by a valid Czech patent.

2. Research on critical information structures of the state, focusing on a unified system for warning and informing the population, provider Ministry of the Interior, Czech Republic
This project was focused on research, implementation and validation of the new system for warning and informing the population in the Czech Republic. This system will increase the safety of people in crisis situations. A further outcome of the project was the methodology for transferring information between the dispatching center and the system for warning and informing the population.

3. A complex software and hardware system for heartbeat monitoring, OP - EU Operational Programme, coordinated by the Ministry of Industry and Trade
In cooperation with TELAB company, a comprehensive software and hardware system was developed for monitoring the heart activity in home care patients. The solution includes a robust real-time cardiac rhythm detector in embedded hardware, including cardiac arrhythmia detection, automatic motion artifact detection and patient physiological assessment.

4. Concept Prague - Personal health systems, OP - EU Operational Programme, coordinated by the Prague Municipality
This project was focused on the practical implementation of systems for remote monitoring of patients with diabetes, and on the use of telemedicine. Support was provided on the basis of the feasibility and the commercial potential of the project, and the implementaton of successful practical training. A secondary objective of the project was to proved support the Center for Technology Transfer of CTU in Prague.

5. Development of an aortic heart valve based on pericardium using primary and stem cells and mechanical loading in a bioreactor, provider Ministry of Health, Czech Republic
In this project, new biological aortic heart valve prostheses were developed. The prostheses were based on human or porcine pericardium seeded with autologous human adipose tissue-derived stem cells and endothelial cells for further in vivo experiments in minipigs.

HTML links to additional documentation:

Ad 1) FlexiGuard web info , FlexiGuard - photo-gallery of the system, Info about the FlexiGuard project

Ad 2) Info about the project VI20152020019

Ad 3) Info about the project UH0365

Ad 4) Info about the project NV15-29153A

3.3 Contract research [3]

The evaluated unit briefly comments on revenues from contract research for the 2014–2018 reporting period from the complete list in the appendix (tables 3.3.1 and 3.3.2).

Self-evaluation:

In the 2014–2018 period, the Faculty implemented contract research projects with a total volume of EUR 466 thousand, mainly in research and construction of new biomedical devices, development of diagnostic algorithms, introduction of new methods of telemedicine into clinical practice, and the development of new nanomaterials for medicine.

HTML links to additional documentation:

Table with accounting details of contract research at the faculty

3.4 Revenues from non-public sources (besides grants or contract research) from research work

The evaluated unit briefly comments on revenues for the 2014–2018 reporting period for R&D&I from non-public sources, besides grants or contract research (e.g. licences sold, spin-off revenues, gifts, etc.). It presents a complete list in the appendix (table 3.4.1).

Self-evaluation:

There has been increasing year-on-year income from license sales, expert opinions and analyses (especially in Health Assesment Technologies), and also increased numbers of expert training sessions, seminars and conferences. These are indicators of the strengthening of the position of the Faculty on the applied research market and its good reputation among companies engaged in biomedical research.

HTML links to additional documentation:

[3] For a definition of contract research for the purposes of evaluation in the universities sector, see Article 2.2.1 of the Community framework for State aid for research and development and innovation (2014/C 198/01).

APPLIED RESEARCH RESULTS

3.5 Applied research results with an existing or prospective economic impact on society

The evaluated unit briefly comments on a maximum of the five most significant (from the perspective of the evaluated unit) applied research results that have already been applied in practice, or that will realistically be applied, in the 2014–2018 reporting period from the overview in the appendix (table 3.5.1).

Self-evaluation:

1. A biotelemetric system to provide support for monitoring the psychophysiological state of a human being. The system set up and has developed the biotelemetry system applied in the Czech Army and in Firefighter teams. The intellectual property is protected by CZ patent 306895, and licences have been sold to FlexiCare s.r.o and to CleverTech s.r.o.

2. A device to support patients suffering from multiple sclerosis, intellectual property protected by CZ utility model 26256, licence sold to CleverTech s.r.o. company. This device and system is already in active use by clients, and forms a part of the ProtectU assistant service for elderly people.

3. The Bluetooth gateway for biomedical sensing for the Tecomat/Foxtrot home automation system is used by Teco s.r.o as a medical extension of the company's home automation system. The intellectual property is protected by CZ utility model 26591 System for Measuring both Biological and Technical Variables in Natural Human Environment

4. A device for sensing and/or monitoring and/or analysing psychophysiological signals from the surface of a horse's body, CZ patent 301867, licence sold to CleverTech s.r.o.

HTML links to additional documentation:

Ad) Web info of the pat.306895 related product,

Ad 2) Web pages of the product ProtectU

3.6 Significant applied research results with an impact other than an economic one on society

The evaluated unit gives a concise account of a maximum of the five most significant (from the perspective of the evaluated unit) applied research results with an impact other than an economic one on society in the 2014–2018 reporting period (typically results from disciplines in the humanities and social sciences) from the overview in the appendix (table 3.6.1).

Self-evaluation:

1. DIANI - this system is mainly used to support distance therapy in patients with diabetes type II. It is an example of the research results at our faculty with a direct impact on public health. At present, the system is used in the implementation of several clinical studies in the Czech Republic concerning the application of new methods in telemedicine.

2. VLV system - this is a unique pocket medical polygraph that is provided under open-source license to researchers in the fields of psychology, human research, etc., where it opens a new way to quantify psychophysiological quantities. In practical application, it has been used for more than 3 000 participants in trials at various research institutions.

HTML links to additional documentation:

Ad 1) Diani project info

Ad 2) VLV lab project info

COOPERATION WITH THE NON-ACADEMIC ENVIRONMENT AND TECHNOLOGY TRANSFER

3.7 The evaluated unit's most significant interactions with the non-academic application/corporate sphere

The evaluated unit gives a concise account of the most typical users of its outputs. It explains whether and how it identifies them and how it works with them. It provides examples of a maximum of ten of the most significant interactions with the non-academic environment in the 2014–2018 reporting period.

Self-evaluation

The Faculty engages in long-term cooperation with partners including:

Rehabilitation Institute Kladruby - cooperation in the fields of accredited education in physiotherapy and the development/testing of medical devices.

Companies such as LINET s.r.o and BEZNOSKA s. r. o. Cooperation in the field of teaching, and in practical internships for students, assigning and co-supervising bachelor and master theses. Some employees of these companies teach at FBMI, and also cooperate in the area of research and development.

A second large group of cooperating organizations consists of large hospitals based in Prague. They are the main purchasers and users of medical technology, and thus they are partners in teaching biomedical engineering students and also expert partners for research and development. This group includes in particular the General University Hospital, Motol University Hospital, Královské Vinohrady University Hospital, Na Homolce Hospital, the Institute of Clinical and Experimental Medicine, Thomayer University Hospital, Bohnice Psychiatric Hospital, and the Central Military Hospital.

Organizations that engage in long-term cooperation with FBME also include: the Institute of Physics AS CR, the State Institute of Nuclear Safety, Chemical and Biological Protection Milín-Kamenná, the Association of Manufacturers and Suppliers of Medical Devices, BTL Group, Johnson & Johnson,

ERILENS s.r.o., and EMARK s.r.o. FBMI also cooperates with the Ministry of Health of the Czech Republic, the Fire Rescue Service of the Czech Republic, ACR, the Czech Police, and the General Inspection of Security Corps.

HTML links to additional documentation:

- BEZNOSKA s.r.o company (www pages)
- LINET company (www pages)
- Rehabilitation Institute Kladruby (www pages)

3.8 System and support of technology transfer and intellectual property protection (can be extended to the whole university, emphasising the specific features of the evaluated unit)

The evaluated unit gives a concise account of its system of technology transfer. It conducts an evaluation of the quality of its applied research and the effectiveness of technology transfer using the data presented in the appendix (table 3.5.1). This commentary will highlight the number of filed and granted patents (Czech and international) and licences sold.

Self-evaluation:

The Technology Transfer system and the Intellectual Property protection system of the Czech Technical University have a centralized base within the rectorate of the university. The faculty also supports intellectual property protection and technology transfer through its own project department.

HTML links to additional documentation:

3.9 Strategy for setting up and support of spin-off firms or other forms of commercialization of R&D&I results (can be extended to the whole university, emphasising the specific features of the evaluated unit)

The evaluated unit gives a concise account of the practical use of its intellectual property in the form of setting up spin-off firms or other forms of commercialising R&D&I results (both with or without the participation of the university) established by the evaluated unit (university), another entity controlled by the evaluated unit (university), or an employee of the evaluated unit, presenting the model for their functioning and coordination, and control of intellectual property management of the evaluated unit (university).

Self-evaluation:

The Czech Technical University has a Technology Transfer Office, the InQBay incubator, and a strategy for commercialization of IP.

The Faculty of Biomedical Engineering has one active spin-off company (CleverTech s.r.o) with no stake held by the unit evaluated here. The relationships with the faculty/university are contractually treated.

HTML links to additional documentation:

Web pages of the faculty spin-off company CleverTech s.r.o

RECOGNITION BY THE SCIENTIFIC COMMUNITY

3.10 The most significant individual awards for R&D&I

The evaluated unit presents a maximum of ten examples of the most significant R&D&I awards received (in the Czech Republic and in other countries) in the 2014–2018 reporting period.

Self-evaluation:
Selected awards in individual years:

1. 2018 - Ing. Anna Miltová et al. - Design and verification of the spirometric examination method using electrical impedance tomography "REALIZATION OF SPIROMETRY MEASUREMENT USING EIT" - the best contribution at YBERC 2018 – the Young Biomedical Engineers and Researchers Conference held in Košice, Slovakia.

2. 2017 – A Microwave Hyperthermia System for the Head and Neck Area with Noninvasive UWB Temperature Change Detection – the best contribution at PIERS 2017 - Progress in Electromagnetics Research Symposium in St. Petersburg, Russia

3. 2016 - Ing. Václav Ort won the John H. Emerson Award, a prestigious award for his contribution to the development of methods and technical support for artificial lung ventilation. Awarded in Salt Lake City, Utah, USA.

4. 2015 - Ing. Kristýna Buzková - the Hlávka Foundation Award for outstanding creative thinking, CZ

5. 2015 - Václav Ort and Karel Roubík won the Special Prize of the Faculty of Medical Bioengineering at IEEE Conference EHB 2015 in Iasi, Romania. The title of the winning contribution is The Effect of Dynamic Hypoinflation during High Frequency Oscillatory Ventilation in an *in vitro* Model of the Respiratory System.

HTML links to additional documentation:

Ad 1) Diploma / Award YBERC 2018
Ad 2) Diploma / Award EMERSON 2016
Ad 3) Diploma / Award HLAVKA 2015
Ad 4) Diploma / Award EHB 2015

3.11 Recognition by the international R&D&I community

The evaluated unit provides the following information / examples demonstrating recognition by the international scientific community in the 2014–2018 reporting period, with a commentary:
It presents a maximum of ten examples of its academic staff's participation on the editorial boards of international scientific journals (e.g. editor, member of the editorial board) in the appendix (table 3.11.1),
It presents a maximum of ten examples of the most significant invited lectures by the evaluated unit's academic staff abroad in the appendix (table 3.11.2),
It presents a maximum of ten examples of the most significant lectures by foreign scientists and other guests relevant to the R&D&I field in the appendix (table 3.11.3),
It presents a maximum of ten examples of the most significant elected memberships of professional societies (table 3.11.4).

Self-evaluation:

Selected individual examples are presented in tables 3.11.1, 3.11.2, 3.11.3 and 3.11.4.

The faculty is also a member of the **European Alliance for Medical and Biological Engineering and Sciences** (EAMBES).

Since 2016, the Faculty of Biomedical Engineering of the Czech Technical University in Prague has been a member of the **Association of University Educators of Non-Medical Health Professions** in the Czech Republic. This membership enables us to participate fully in the activities of this Association, to get acquainted with the knowledge accumulated in other medical and health facilities in the Czech Republic, where study programs focused on health issues are also accredited, and to participate in changes resulting from the amendment to the Higher Education Act (Act No. 137/2016 Coll.).

HTML links to additional documentation:

POPULARISATION OF R&D&I

3.12 The most significant activities in the popularisation of R&D&I and communication with the public

The evaluated unit gives a concise account of its main activities in the area of popularisation of R&D&I and communication with the public in the 2014–2018 reporting period, and presents a maximum of ten examples that it considers the most significant.

Self-evaluation:

The Faculty has engaged in long-term cooperation with the Halda civic association on Science Café, a cycle of events for the general public held in Kladno. More than 40 science-based thematic evenings were held between 2014 and 2018.

The Faculty regularly exhibited at the university stand at the Future Forces and IDET exhibitions (2016, 2017, 2018), and participated actively in presentations and workshops for the general public (Science Fair in Prague, Museum Night in Prague, etc.)

The faculty also prepared several professional lectures and educational events for the public and for students, with lectures given by experts or personalities in the Czech administration, for example:

- A discussion for students and staff, and also for the public, with arm. gene. Ing. Peter Paul, M.A., Chief of the General Staff of the Army of the Czech Republic (ACR), on the topic of crisis management and further development of the ACR, and with Major General. Ing. Jaroslav Kocian, Deputy Chief of the General Staff of the ACR, on Current Problems, Challenges and Security Policy in the Concept of NATO.

- A lecture by plk. Ing. Jiří Roma, Director of the Analytical Section of BIS (Czech Security Information Service) on the Role of the Security Information Service within the Security System of the Czech Republic and the Current Security Threat**.**

HTML links to additional documentation:

APPENDICES (TABLES)

3.2 Applied research projects

3.2.1 Projects supported by a provider from the Czech Republic

As the beneficiary						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
Min Fin CR	Caring for the physical health of the mentally ill and practicinge independent life skills		29.58	14.17		
Min Int CR	FlexiGuard – personal biotelemetry system for FireFighters, Soldiers and Medical Rescue Teams	214.4	143.46			
Min Int CR	Research on critical information structures of the state, focusing on a unified system for warning and informing the population		113.55	217.92	221.15	226.65
Min Health CR	Information system for monitoring the purchase of medical devices	50.41				
Min Health CR	Novel scaffolds for osteochondral regeneration based on core/shell nanofibers enriched with a drug delivery system	101.19	100.87			
Min Health CR	Medical Technology Assessment	47.69				
Min Health CR	Influencing the symptoms of degenerative diseases of the locomotive apparatus by means of high-induction magnetic stimulation			72.87	71.97	69.65
Min Health CR	Functionalized nanofibres for external coating of colorectal anastomoses			67.1	92.25	90.9
Min Health CR	Nanofiber drug carriers for controlled release of wound healing substances based on the encapsulation of functionalized nanodiamond particles		51.97	55.93	58.34	57.95
TA CR	An intelligent medical device for peripheral barotherapy	66.47	68.98			
CESNET	A system for managing, viewing and storing large volumes of data from medical examinations for data storage			7.4		
Total		**480,16**	**508,41**	**453,39**	**443,71**	**445,15**
As another participant						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
Min Ind Trade CR	A Composite Material For Filling Bone Defects	75.0	35.55			
Min Ind Trade CR	A multichromatic treatment laser with flexible transfer of radiation and feedback control	22.7				
Min Ind Trade CR	Therapeutic ultrasound with fully new parameters					53.43

Min Ind Trade CR	Development of an advanced rehab-stroller for children with special needs				36.08	29.25
Min Ind Trade CR	Development of nanofibrous scaffolds for the application of cellular products, including a physical stimulation effect, for the treatment of chronic wounds.				56.59	74.09
Min Ind Trade CR	Development of an advanced rehab-stroller for children with special needs				39.08	29.25
Min Ind Trade CR	A transportable personalized medical device for vacuum compression therapy			19.98	34.18	35.1
Min Ind Trade CR	An integrated device for universal rehabilitation - robotic arms and legs with a motivational biofeedback			17.76	36.46	37.44
Min Int CR	Research support for the Fire Rescue Services of the Czech Republic (FRS) and for other bodies of the Integrated Rescue System of the CR	63.16	58.39			
Min Health CR	An analysis of bradykinesia and speech in Parkinson's disease	19.76	21.04			
Min Health CR	Development of a system and software for structured functional assessment, collecting and processing data on the quality of, and the demand for, long-term care,	26.01	26.46			
Min Health CR	New materials for cardiovascular surgery based on modified decellularized tissues					21.76
Min Health CR	Development of an aortic heart valve based on pericardium using primary and stem cells and mechanical loading in a bioreactor		35.19	50.86	52.22	49.21
Min Health CR	Diagnostics and Therapy of Orofacial Pain		36.8	46.31	44.89	46.09
Min Health CR	An analysis of movement disorders for the study of extrapyramidal disease mechanisms using motion capture camera systems			22.34	33.42	34.79
TA CR	Small-diameter vascular prostheses seeded with endothelial cells and bone marrow-derived stem cells in a bioreactor	14.82	31.7	32.52	13.52	
TA CR	System for Monitoring and Detection - SYMOD	13.08	26.39	26.63	13.67	
TA CR	Validation and verification of the model distribution and dispersion of heavy gases in specific situations		13.93	14.43	14.81	14.82
Total		**234,53**	**285,45**	**230,83**	**374,92**	**425,23**

3.2.2 Projects supported by a provider from another country

As the beneficiary						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
EC	Advancement of the BIO-XUV Research Team at FBME CTU	217.7				
EC	Concept Prague - Personal health systems					564.1

EC	Innovation and modernization of teaching methods and the content of education in specific areas at the Faculty of Biomedical Engineering in Kladno	424.3	45.6			
Total		**642,0**	**45,6**			**564,1**
As another participant						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
EC	Diagnostic Imaging Strategies for Patients with Stable Chest Pain and Intermediate Risk of Coronary Artery Disease: Comparative Effectiveness Research of Existing Technologies	19.1		5.1		
EC	A complex software and hardware system for heartbeat monitoring					325.7
Total		**19,1**		**5,1**		**325,7**

3.3 Contract research

3.3.1 Research work contracted by a client from the Czech Republic

Client	Research title	Revenues (EUR thousand)				
		2014	2015	2016	2017	2018
Telab, s.r.o.	Research in the field of ECG sensors enabling wireless transmission of medical data					19.5
C SYSTEM NET s.r.o.	Research on algorithms for data processing and research on the data workflow of a telemedicine system for diagnosis in obesitology					48.66
C SYSTEM CZ a.s	Research on algorithms for data processing and research on the data workflow of a telemedicine system for diagnosis in obesitology					99.91
CleverTech s.r.o.	Research on algorithms for data processing and research on the data workflow of a telemedicine system for diagnosis in obesitology					196.2
URC Systems, spol. s r.o.	A reflective and transmission pulse oximeter with control and data transmission via BAN-BT / ANT - verification system, finishing	3.3	4.76	27.74	13,67	
ŠKODA AUTO a.s.	Studies evaluating the possible current state of a driver			7.94		
ŠKODA AUTO a.s.	Development of peripheral vision simulation glasses depending on age		13.35			
PHYSTER TECHNOLOGY, a.s.	Contract research on an experimental system for distance monitoring of patients in home care.		4.24			
Student Science, s.r.o.	Optimization of the physico-chemical composition of nanofiber systems, verification of detection capability in gaseous and liquid environments.		4.29			

ŠKODA AUTO a.s.	A comparison between conventional on-board instrumentation and on-board instrumentation realized by active display in terms of eye load.	6.0				
ŠKODA AUTO a.s.	A comparison between conventional on-board instrumentation and on-board instrumentation realized by active display in terms of eye load.	7,3				
	Other contracts (3)	1.83			3.55	3.9
Total		**18,43**	**26,64**	**35,68**	**17,22**	**368,17**

Note: List and describe contract research work with the revenue for the calendar year in question.

3.3.2 Research work contracted by a foreign client

Client	Research title	Revenues (EUR thousand)				
		2014	2015	2016	2017	2018
Total						

Note: List and describe contract research work with the revenue for the calendar year in question.

3.4 Revenues from non-public sources (besides grants or contract research)

3.4.1 Overview of revenues from non-public sources raised for the 2014–2018 reporting period

Revenue type	Revenues (EUR thousand)				
	2014	2015	2016	2017	2018
gifts	8.1	8.2	6.5	6.7	5.5
rentals	36.27	27.28	27.06	29.63	29.65
training, seminars, conferences	5.71	17.14	4.6	7.25	13.25
expert opinions and analyses	12.49	12.54	1.2	4.89	4.63
sale of licenses and goods	5.67	4.4	28.26	5.59	12.13
Total	**68,24**	**69,54**	**67,62**	**54,06**	**65,16**

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

3.5 Applied research results with an economic impact on society

3.5.1 Overview of applied research results in the 2014–2018 reporting period

List and describe the results that have already been applied in practice, or that will realistically be applied, with an existing or prospective economic impact on society. Under "patents" and "licences sold", list all the results; under other results list a *maximum* of five items. Unless otherwise specified below, the definition of a result must correspond to the definitions under the Methodology for Evaluating Research Organisations and Research, Development and Innovation Purpose-Tied Aid Programmes, Appendix No 4: Definitions of Types of Results.

Results	Year	Title
European patent		
American patent		
Czech licenced patent		
	2017	A biotelemetric system in support of monitoring the psychophysiological state of a human being (306895), licences sold to FlexiCare s.r.o and to CleverTech s.r.o.
Other foreign patents		
Licences sold		

	2016	Multifunctional Biotelemetry Support System for Psychophysiological Monitoring, CZ patent, licence sold to FlexiCare s.r.o
	2017	A System for Measuring Biological and Technical Quantities In a Strong and Variable Electromagnetic Field, CZ patent 307752, CleverTech s.r.o
	2018	A device For sensing and/or monitoring and/or analysis of psychophysiological signals from the surface of a horse's body, CZ patent 301867, CleverTech s.r.o.
	2018	A system for encrypted communication with a mobile biotelemetric unit in real time, utility sample 26483, CleverTech s.r.o.
	2018	A system for measuring and long-term monitoring of physical activity, utility sample 26328, CleverTech s.r.o.
	2018	A device in support of patients suffering from sclerosis multiplex disease, utility sample 26256, CleverTech s.r.o.
Significant analyses / surveys / studies		
	2014	Analysis of the Effect of Electroblowing on Coaxial Electrospinning
	2014	A study of possibilities of 64/128 slice CT scanners
	2014	A study on NMR utilization in research in the field of neurosciences
	2015	Verification of price adequateness - devices for anesthesiology, Monitors, Medical respiratory devices, Devices and instruments for operating rooms, Devices and instruments for infusion, an X - ray device
	2015	Verification of price adequateness - Modernization and renovation of devices for quality care in MMN in Jilemnice I, III
Spin-off with a stake held by the evaluated unit		
Spin-off with no stake held by the evaluated unit		CleverTech s.r.o.
Prototypes		
	2017	Bluetooth gateway for biomedical sensing for the Tecomat/Foxtrot home automation system
Varieties and breeds		
Other	2018	Positioning device for a rehabilitation robot, Patent CZ 307670.

	2018	A method for detecting liquid chemical warfare agents, Patent CZ 307382
	2018	A cannula containing a base tube with two adjacent longitudinally leading lumens, Patent CZ 307196.
	2017	A cultivation chamber for stimulation of planar samples of decellularized pericardium, Utility Model CZ 30705
	2014	Layer protecting the surface of zirconium alloys used in nuclear reactors, Utility Model CZ 26367

Note: "Licence" refers to a licence for a result of R&D&I in the broadest sense of the word (licences for patents, utility models, industrial designs; copyright licences for software and other works, and any other licences).
For the purposes of this methodology, a "spin-off" is a juridical person established to commercialise knowledge, usually with the inclusion/transfer of the rights to this knowledge to such juridical person. List all instances of legal persons.

3.6 Significant applied research results with an impact other than an economic one on society

3.6.1 Overview of applied research results for the 2014–2018 reporting period with an impact other than an economic one on society

Result type	Name	Anticipated impact
Functional Sample	DIANI – a system in support of of diabetes mellitus type II patients	Direct impact on public health in Czech Republic
Utility Sample	VLV lab – Wireless Medical Pocket Polygraph	Opens new possibilities for research on psychophysiological states in psychology, human-research etc.

Note: List and describe a maximum of five results (in line with the Definitions of Types of Results) that have already been applied in practice, or that will realistically be applied. These are typically results from disciplines in the humanities and social sciences, for which you should briefly describe their anticipated impact.

3.11 Recognition in the international R&D&I community

3.11.1 Participation of the evaluated unit's academic staff on the editorial boards of international scientific journals in the 2014–2018 reporting period

Name, surname and title(s) of the evaluated unit's member of staff	Title, publisher, city(-ies) and country(-ies) of origin of the scientific journal
Peter Kneppo, prof., Ing., DrSc.	Measurement, Elsevier, London, GB (IF=2,79)
prof. MUDr. Leoš Navrátil, CSc.	Crisis management, University of Žilina, Slovak Republic, ISSN 1336-0019
Lenka Lhotská, assoc. prof. PhD, member of the editorial board	Transactions on Large-Scale Data- and Knowledge-Centered Systems, Springer Nature, Switzerland

Note: List a maximum of ten examples of academic staff's participation on the editorial boards of international scientific journals (e.g. editor, member of the editorial board, etc.).

3.11.2 The most significant invited lectures by the evaluated unit's academic staff at institutions in other countries during the 2014–2018 reporting period

Name, surname and title(s) of the evaluated unit's member of staff	Invited lecture title	Name of the host institution, conference or other event
Ilya Ivlev, M.D., Ph.D.	Multi-criteria decision analysis for supporting the selection of medical devices under uncertainty	Portland State University (Health Technology Innovations series of presentations), Portland, OR, USA, March 31, 2015
Gleb Donin, Ing., Ph.D.	Evaluation of medical equipment	Centre for Research on Health and Social Care Management (CERGAS), Bocconi University, Milan, Italy
Associate Prof. Barbora Vegrichtová, Ph.D.,MBA	Radicalisation – A Definition of Violent Extremism, Different Aspects of Radicalisation	CEPOL (Central European Police College) course, Radicalisation, 23 – 27. September 2019
Associate Prof. Barbora Vegrichtová, Ph.D.,MBA	Profiling of Risky Persons	ICMPD (International Centre for Migration Policy Development), Baku, Azerbaijan, March 2019
Associate Prof. Barbora Vegrichtová, Ph.D.,MBA	Organized Criminal Groups – Detection of Suspicious Persons	ICMPD (International Centre for Migration Policy Development), Yerevan, Armenia, November 2019
Jan Mužík, Ing., Ph.D.	Teaching eHealth in the Czech Republic	HIMSS eHealth Summit Austria, Vienna, 2014
Jan Mužík, Ing., Ph.D.	eHealth in the Czech Republic	International Workshop on ICT Tools for Telemedicine and eHealth, Tromso, Norway, 2014
Jan Mužík, Ing., Ph.D.	Lessons learned from using the MBTI – Myers-Briggs Type Indicator	Tromsø/Chicago seminar & ADMIT workshop, Tromsø, Norway, 2016
Jan Mužík, Ing., Ph.D.	State of eHealth and Medical Data Exchange in the Czech Republic	partner meeting, Tromsø, Norway, 04/2018

Note: List a maximum of ten examples.

3.11.3 The most significant lectures by foreign scientists and other guests relevant to the R&D&I field at the evaluated unit during the 2014–2018 reporting period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title
prof. Aleš Iglič, Ph.D.	University of Ljubljana, Faculty of Electrical Engineering,	1. Interactıons between cells and titanium nanostructures

	Trzaska 25, 1000 Ljubljana, Slovenia	2. On the mechanisms of membrane tubulation
Peter Michael van Dam, Ph.D.	Peacs BV, Arnhem, Herkenboschstraat 42, 6845 HN, Arnhem, The Netherlands	Solving the inverse problem: A solution to the clinical problem of localizing PVCs for catheter ablation
prof. RADU-GEORGE CIORAP	Grigore T. Popa University of Medicine and Pharmacy, Faculty of Medical Bioengineering, Str. Universitatii nr. 16 700115, Iasi, Romania	1. Trauma-event simulation tension pneumothorax The importance of training with "real patient" simulators in neonatology
Univ.-Prof. Dr.-Ing. Dr. med. Steffen Leonhardt	Philips endowed Chair for Medical Information Technology (MedIT), Helmholtz-Institute for Biomedical Engineering, RWTH Aachen University, Pauwelsstr. 20, D-52074 Aachen, Germany	Progress in Perfusion Imaging with EIT
Prof. Stephen Rees	Respiratory and Critical Care group (rcare), Center for Model-Based Medical Decision Support Systems, Department of Health Sciences and Technology, Aalborg University, Denmark	1. A physiological model based decision support system for mechanical ventilation 2. A mathematical model based method for replacing arterial puncture with venous
PD Dr.- Ing. Ute Morgenstern	Institute of Biomedical Engineering, Faculty of Electrical Engineering and Information Technology, Technische Universität Dresden, Fetscherstraße 29, 01307 Dresden, Germany	Mathematical and physical models for simulation of biomedical engineering processes in comparison to real patient data for research, education, and training
prof. Veronika Kralj-Iglič	University of Ljubljana, Faculty of Health Sciences, Zdravstvena pot 5, 1000 Ljubljana	Biomechanics of the hip
Prof. Dr.-Ing. Vladimir Blazek, Dr. h.c.	Senior Advisor & Executive Team Member, Philips Chair for Medical Information Technology, Helmholtz-Institute for Biomedical Engineering, RWTH Aachen University, Pauwelsstrasse 20 D-52074 Aachen, Germany	1. Modelling and simulation of photon distribution in biotissue 2. Modeling and simulation of human hemodynamics using the electrical line theory 3. Opto-electronical vital signs detection
prof. Steen Andreassen	Faculty of Medicine, Institute for Medicine and Technology, Center for Model-based Medical Decision Support, Aalborg University, Dept. of Health Science and Technology, Fredrik	TREAT - A decision support system for antibiotic treatment of moderate-to-severe infections

	Bajers Vej 7, Bygning: E4-205, 9220 Aalborg Ø, Danmark	
Prof. RNDr. Emil Kormuth, Ph.D.	Mongosuthu University of Technology, Durban South Africa	Epigenetic gene regulation and the importance of epigenetic relationships in the prevention of civilization diseases

Note: Relevant solely for the R&D&I field. List a maximum of ten examples.

3.11.4 The most significant elected membership in foreign of professional societies relevant to the R&D&I field at the evaluated unit during the 2014–2018 reporting period

Name, surname and title(s) of the evaluated unit's member of staff	Name of professional society	Type of membership
Milan Tyšler, Assoc.prof., PhD.	International Society of Electrocardiology	International Council member 2000-present, Secretary 2014-2019
Jiri Hozman	Czech Society for Biomedical Engineering and Medical Informatics of the Czech Medical Association of J. E. Purkynje	Chairman
Peter Kneppo, prof. Ing. DrSc.	International Academy of Medical and Biological Engineering	Fellow
Lenka Lhotská, assoc. prof. PhD	Czech Society for Biomedical Engineering and Medical Informatics	Scientific secretary (member of the board)
Lenka Lhotská, assoc. prof. PhD	European Federation of Medical Informatics	Council member
prof. MUDr. Leoš Navrátil, CSc., MBA, dr.h.c.	Society for Radiobiology and Crisis Planning of the Czech Medical Association of Jan Evangelista Purkyně	Chairman
prof. MUDr. Leoš Navrátil, CSc., MBA, dr.h.c.	The International Academy for Lasers Medicine Surgery	Council member
prof. MUDr. Jozef Rosina, Ph.D., MBA	Czech Society of Medical Physics Czech Medical Association of Jan Evangelista Purkyně	Council member

Note: List a maximum of ten examples.

SUMMARY LIST OF ADDITIONAL DOCUMENTATION IN MODULE M3

Document Title	Criterion	Location (HTML link)
Information about the R&D etc. of the Faculty (on the University Website)	3.1	https://www.cvut.cz/en/faculty-of-biomedical-engineering
Information about the R&D etc. of the Faculty (on the Faculty Website)	3.1	https://www.fbmi.cvut.cz/en
FlexiGuard web info	3.2	http://www.flexiguard.cz/
FlexiGuard - photo-gallery of the system	3.2	https://media.cvut.cz/cs/foto/20180523-projekt-flexiguard-fbmi-cvut
Info about the FlexiGuard project	3.2	https://starfos.tacr.cz/en/project/VG20102015002
Info about project VI20152020019	3.2	https://starfos.tacr.cz/en/project/VI20152020019
Info about project UH0365	3.2	https://starfos.tacr.cz/en/project/UH0365
Info about project NV15-29153A	3.2	https://starfos.tacr.cz/en/project/NV15-29153A
Table with accounting details of contract research at the faculty	3.3	http://evaluation-cvut.cz/files/F7_contract_research.xlsx
Web info about the product related to patent 306895	3.5	http://www.flexiguard.cz/
Web pages of the ProtectU product	3.5	https://www.protectu.cz/?lng=en
Diani project info	3.6	https://www.albertov.cz/en/projects/diani/?lang=en
VLV lab project info	3.6	https://www.albertov.cz/en/vlv-lab/?lang=en
BEZNOSKA s.r.o company (www pages)	3.7	https://beznoska.com/
LINET company (www pages)	3.7	https://www.linet.com/en/
Rehabilitation Institute Kladruby (www pages)	3.7	http://www.rehabilitace.cz/about-us/
Web pages of the faculty spin-off company CleverTech s.r.o	3.9	http://www.clevertech.cz/index.php?lang=EN
Diploma / Award YBERC 2018	3.10	https://webik.fbmi.cvut.cz/sites/default/files/2018-10-fotogalerie/yberc.jpg

Diploma / Award EMERSON 2016	3.10	https://ventilation.fbmi.cvut.cz/news/vaclav-ort-won-the-19th-john-h-emerson-award-in-salt-lake-city-ut-usa/
Diploma / Award HLAVKA 2015	3.10	https://ventilation.fbmi.cvut.cz/news/kristyna-was-awarded-price-of-hlavka-foundation/
Diploma / Award EHB 2015	3.10	https://ventilation.fbmi.cvut.cz/news/vasek-and-karel-won-special-prize-at-ehb-2015-conference/