MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

SELF-EVALUATION REPORT MODULE 3

EVALUATED UNIT: Faculty of Transportation Sciences, Czech Technical University

FORD: 2. Engineering and Technology

MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

MODUL 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:

FTS CTU has been involved in significant national and international collaboration in scientific projects funded by various providers. The faculty's R&D&I has increasingly been oriented towards intelligent transport systems and smart cities. In this context, the faculty has been working on the enhancement of safety and security in transportation, and on opportunities for saving time & money in logistics and in the commuting of citizens. Other topics have been opportunities for reducing traffic and emissions from transport in the urban environment, thus reducing the environmental footprint. Opportunities for creating resilience of the transport infrastructure to climate change have been identified. Improved communication between authorities and citizens on urban transport issues has also been developed.

HTML links to additional documentation:

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:

Managing Automated Vehicles Enhances Network (MAVEN)

Solutions for managing connected and automated vehicles in an urban environment (with signalized intersections and mixed traffic). A unique local-level routing algorithm for optimal infrastructure-assisted routing of automated vehicles. A solution for impact assessment combining user assessment, field tests and microscopic simulation has been adopted.

Global traffic model of the City of Prague (GLOMODO)

A global model for qualitative and quantitative assessment of traffic situations in the metropolitan area of Prague. The complex model that has been developed assesses the real-time traffic quality with the use of sensors, monitors long-term changes in traffic quality, and supports the decision-making process.

C-ROADS Czech Republic

Implementation of cooperative systems on specific highway sections in the Czech Republic, cities, public transport and railway crossings and test operation of services for drivers. The project is a part of the European platform for implementing harmonized cooperative systems and service operation for end users in all EU states.

Smart City – Smart Region – Smart Community (SMART)

SMART addresses travel behavior, especially the reasons for using personal vehicles and the potential for change, and also the potential for using new transport services, such as car-sharing or ride-sharing. SMART uses surveys, mathematical modeling and agent-based traffic simulation to determine the potential and also the impacts.

Research and development of progressive methods for measuring aviation organizations safety performance

Software tools that use safety indicators for the safety management and safety performance management of aviation organizations. Various types of indicators with their mutual interactions have been developed to provide a comprehensive model of the safety risks for the organizations. The tools that have been developed include the INBAS Reporting Tool, Aviation Vocabulary Explorer and a Web service for filtering contributory factors.

HTML links to additional documentation:

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:

Contract research is carried out both for the commercial sector and for state institutions, e.g. railway and road infrastructure managers (certification, safety inspections). The private sector is represented e.g. by Škoda Auto (development of alternative propulsion, optimization of the design of vehicle systems and HMI, 3D model development), and AŽD Praha - cooperation in the area of development and certification of the railway infrastructure and infrastructure components. Contract research for foreign partners is rare; international cooperation is mainly conducted in research projects.

HTML links to additional documentation:

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:

Most of the results were transmitted in the framework of contract research. Three licenses were sold to domestic entities (ŘSD ČR, Rieder Beton). Donations from private individuals and from commercial entities were remitted to FTS prior to the reporting period.

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:

System AirTracker & Sensors AirTracker

A comprehensive solution for continuous monitoring of air pollution and covering the entire information chain. A modular system with unlimited scalability for various types of monitoring. Three types of sensors: outdoor & indoor monitoring nodes (noise, dust & CO2) and a meteorological node.

High-load bearing deformation block and its production process

A deformation block was developed for traffic congresses, bridges, level crossings and entrances that are built in road ditches. The block was then introduced into mass industrial production. A HPC composite for mass production and advanced forming technology were used. Patent and Sold Licence.

GLOMODO

A global model for quantitative and qualitative assessment of transport in Prague. The resulting model and its SW implementation is to be sold to the Prague city ICT operator for use as a part of the analysis layer on top of their GOLEMIO data processing platform.

UNIR - Universal intelligent control unit

A modular universal intelligent control unit able to cooperate with existing subsystems and with third-party solutions. UNIR has been used for testing V2I communication, the mobile telematics system used on highways for mobile trucks and other transport systems.

Pilot operation of data collection and processing system for aviation safety

Methodological and SW tools that use indicators of the safety and of the safety performance management of aviation organizations. For implementation in four types of aviation organizations (airports, air navigation services, aircraft maintenance and in the flight school environment). An ontology-based reporting tool (software) for managing safety data in the aviation industry.

HTML links to additional documentation:

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:

Methodology of driver visual field with participation of vulnerable traffic participants with a focus on advertising – a methodology for assessing the ability of a driver to react to vulnerable traffic participants. There is an additional methodological tool for analysing road construction projects, and also for forming a basis for training, testing and assessing drivers with the use of an advanced vehicle simulator.

The Utilization of Crisis Management, Risk Management, Systems Engineering Tools and Modern Technologies to Improve Security at International Airports – A set of methodologies and recommendations that introduces modern systems analysis and risk management tools. The resulting model of airport security system behavior describes all participants of security events and activities.

BlindNavi – A data model of navigation maps for handicapped people and a methodology for interpreting and implementing the model. The results are used by the producers of navigation devices for creating a fully-fledged navigation system for handicapped people. International level - transport telematics committee.

TRAINING AID - Training for the police, the probation service, the state administration, NGOs and research organizations in the area of radicalization and deradicalization, the phenomenon of foreign fighters and recruitment narratives of terrorist organizations.

DERAD - Development and operation of the HERMES pan-European e-learning platform focused on counter-terrorism issues. DERAD has been recommended by the EC as an important means for enhancing the knowledge and the qualifications of all involved parties.

HTML links to additional documentation:

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:

Typical users of the results of research and development work carried out at the faculty are private companies and state institutions operating in the transport sector - transport planning (ŘSD, ELTODO, Operátor ICT), public transport, transport safety (Škoda Auto, Porsche), transport infrastructure (AŽD Praha), telematics, logistics (UBER), and others. Cooperation is based on public demand, contract research and national or international research projects.

- Safety inspections of roads and motorways - ŘSD ČR
- Analyses, studies, measurements - Škoda Auto
- Measurements of railway signals and other infrastructure - AŽD Praha
- The Radlická impact study for the Barrandov Bridge area - Prague City Hall
- Traffic surveys and measurements - Technical Road Administration
- Study on Smart Cities in the Danube Region and the Policy Paper - Government Office

HTML links to additional documentation:

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 and Intellectual Property protection system of CTU in Prague has a centralized base at the rectorate of the university, consisting of the Technology Transfer Office, the InQBay incubator, and a strategy for the commercialization of IP. In addition, there is a working group for Technology Transfer. FTS has two representatives (one related to Smart Cities).

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:

CTU has a central Technology Transfer Office, the InQBay incubator, and a strategy for commercialization of IP.

HTML links to additional documentation:

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:

Distinguished FTS employees and young researchers:

- prof. Petr Moos, Medal of Merit (state award of the Czech Republic)
- Ing. Alena Rybičková, Josef Hlávka Award
- Dr. Petr Zlámal, the Prof. Valenta and Prof. Cihak Award
- prof. Ondřej Přibyl, Literary fund of the Slovak Republic award for scientific literature (for a book on Applied Telematics)
- prof. Miroslav Svítek, Felber medal (gold medal, awarded by the university)
- Ing. Markéta Vavrová - European Platform of Transport Sciences Award, European Fridrich-List-Award
- prof. Petr Moos, Josef Hlávka Medal
- TAKEDOWN project, Success Story among Horizon 2020 security projects
- HERMES platform, Ministry of Justice of Italy award and an EC recommendation

HTML links to additional documentation:

3.11 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:
In addition to the participation of staff members in the editorial boards of international journals (see table), FTS is the publisher of Neural Network World (IF 1.08), a journal presenting the latest developments in the field of informatics. Faculty members also serve in international technical committees and working groups (ISO TCs/WGs), standardization bodies and committees (e.g. CEN).

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 participates in nationwide scientific and technical popularization events (CTU is often the main organizer of these events). Members of the general public are allowed to visit the laboratories and have an opportunity to look into areas that are normally not accessible to the public. In addition to these events, FTS organizes special events devoted to transportation and/or single-purpose events. Examples of the most important events:

- Night of scientists
- Children's Transport Academy
- Exhibitions of historical motorcycles and cars
- Public demonstrations of crash tests
- Prague Aerospace Summer Schools
- UZEL (First miles for conveyors)
- Workshop of the Institute of Planning and Development Prague and FTS CTU
- Open science – a network for popularizing science

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 Int CR	The Utilization of Crisis Management, Risk Management, Systems Engineering Tools and Modern Technologies to Improve Security at International Airports in the Czech Republic	118,08	121,03			
Min Int CR	Influence of Advertising Devices on the Road Safety			45,91	9,61	
Min Int CR	The Development of Innovative Method for Detection of Crimes Within Road Transportation System Using Electronic Accident Data				308,01	188,08
TA CR	Research in driver's visual workload and attentiveness	7,74	14,37	14,20		
TA CR	Research and development of progressive methods for measuring aviation organizations safety performance	41,91	103,18	104,46	74,21	
TA CR	Tools for improvement of quality and quantity of traffic information provided in the RDS-TMC	26,91				
TA CR	Optimization of technological equipment of road tunnels with respect to safety and investment and operational cost (HADES)	44,56	45,60			
TA CR	Automated Monitoring of Hazardous And Dangerous Driver's Behaviour	45,69	45,19			
TA CR	Sensoric networks in transportation	148,73	163,29			
TA CR	Increasing the usage of parking capacity on highways using prediction models	104,78				
TA CR	Technical support and methods for verifying interoperability of electronic fare collection, information and management and travel information systems in public transport.	249,63	38,82			
TA CR	Creating a pilot plant national system of collection, analysis and evaluation of data needed for regulatory supervision of organizations of civil aviation pursuant to Commission Regulation (EU) no. 965/2012 Annex II		66,27	139,53		
TA CR	Conformity assessment of ITS components, applications and services		20,16	75,50		
TA CR	Interoperability elements proposal on regional railways network		16,27	48,57		
TA CR	Prediction of traffic excesses using neural networks					77,60
TA CR	Research of Intelligent Components for Safety Data Collection and Processing Systems				12,61	82,21
TA CR	Research of Quantitative Methods for Safety Studies Risk Analysis and Evaluation				6,19	38,30

TA CR	Synergy in Railway Public Transport Line Planning – Improvement of Efficiency of Spatial Public Railway Transport Service				2,96	36,54
TA CR	Value of Air Transport in Czech Republic					28,58
Total		**788,04**	**634,17**	**428,18**	**413,60**	**451,31**
As another participant						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
Min Fin CR	Development of urban adaptation strategies using ecosystem-based approaches to adaptation		40,90	24,53		
Min Ind Trade CR	The CNG powered locomotive research and development of the 714 series (Compressed Natural Gas - CNG)	44,67	6,60			
Min Ind Trade CR	Implementation of Industry 4.0 principles during production and repairs of constructional layers of surface transportation				25,07	52,65
Min Int CR	Vehicles safety increasing by a passengers and goods transport on the infrastructure critical points.	63,16				
TA CR	Advanced emission processor utilizing new data sources	5,41	35,37	35,70	39,73	
TA CR	Instrument flight procedures for rotary wing aircraft	4,54	11,00	10,36	13,29	
TA CR	Using cooperative system for influencing of traffic flow	3,09	5,13	7,40		
TA CR	The extended data model for the disable people and the methodology of its interpretation in the navigation	4,65	13,01	15,35		
TA CR	Kamelot - Complex solution for distributing traffic information in standardized formats.	4,36	11,91	12,80		
TA CR	Universal intelligent control unit	26,51	23,93			
TA CR	Development of a new generation of RLTC and testing environment (SIRID)	18,52	9,90			
TA CR	New methods for urban traffic control in congested areas	16,13				
TA CR	Rapid services of metropolitan areas, effects of a new accessibility on labour market			12,02		
TA CR	Optimalization of development of the railway system of the Czech Republic in terms of transport needs		2,38	13,17		
TA CR	Josef Bozek Competence Centre for Automotive Industry	755,31	764,58	730,44	749,87	
TA CR	Josef Bozek Competence Centre for Automotive Industry	755,31	764,58	730,44	749,87	
TA CR	Transport systems development centre	119,67	146,13	116,64	119,79	30,73
TA CR	Using of new authentication and security procedures for ITS				0,00	12,83
TA CR	Integrated Quality Measurement System (InQMS)					6,16
TA CR	Preparation of transport infrastructure action elements				25,83	26,91
TA CR	Advanced RGB LED display panels for transport applications				17,70	16,77

TA CR	Application of nonparametric methods (DEA, FDH) to analyze and to compare the efficiency of municipalities					8,46
Total		**1821,34**	**1835,43**	**1708,84**	**1741,13**	**154,51**

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	Programme Support Action (PSA) for the maintenance, adaptation and further development of a European ITS Framework Architecture for Intelligent Transport Services (ITS).	6,97	12,45			
EC	GLOMODO - Global traffic model of the City of Prague					52,18
Total		**6,97**	**12,45**			**52,18**
As another participant						
Provider	Project title	Support (EUR thousand)				
		2014	2015	2016	2017	2018
EC	C-ROADS Czech Republic			1,44	6,08	6,39
EC	Mobile Assistance interagency teams to detect and prevent the esclation of violent radicalism			13,50	15,00	
EC	Managing Automated Vehicles Enhances Network			34,55	103,65	103,65
EC	Range of Electric SOlutions for L-category Vehicles		62,00			
EC	Strategic AssessmenT for LAW and Police Cooperation					10,05
EC	Judicial Strategy Against all Forms of Violent Extremism in Prison					42,24
EC	The emerging threat of transversal terrorist alliances and the radicalization of the EU social climate	12,24	6,24			
EC	ISDEP (IMPROVING SECURITY BY DEMOCRATIC PARTICIPATION)	40,64				
EC	Easy-OBU (Enhanced (EGNOS/EDAS) Accuracy System with GNSS Outage Bridging Unit)	18,31				
EC	CITI-SENSE Development of sensor-based Citizens' Observatory Community for improving quality of life in cities	42,39	62,64	35,64		
EC	Network of European Asian Railway Research Capacities	18,12				
EC	The Experimental Development for Production in The Company SPEL, a.s.		0,00	0,00	0,00	228,33
EC	Smart City - Smart Region - Smart Community					193,35
(other foreign provider)	H2AC4schools				7,66	81,75
(other foreign provider)	Use of modern visualization and simulation technology in the field of transport systems			42,84	58,37	76,32
(other foreign provider)	pecialized center for applied simulation and visualization	56,33				

Total	**188,03**	**130,88**	**137,97**	**190,76**	**742,06**

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
AF Consult	Risk study	11,14	0,00	0,00	0,00	0,00
ATEM	Model scenario studies	12,96	14,10	0,00	13,94	0,00
AŽD	Rail signal study	0,33	1,97	15,71	6,76	11,62
AŽD	KOA3 - analysis of track circuits	0,00	29,24	25,33	22,43	6,48
AŽD	SOD 02-2017 - TNR	0,00	0,00	0,00	4,65	0,00
AŽD	SOD 01-2014 - balise	8,19	14,76	17,17	4,04	0,00
AŽD	Sum of other studies	24,85	17,59	80,16	74,98	89,48
Brněnské komunikace a.s.	Anonymized	0,00	0,00	6,66	0,00	0,00
Central Bohemia Region	Study of railway crossings	0,00	0,00	0,00	0,00	22,42
Central Bohemia Region	Cooperation and Provision of Consulting Services in the Field of Transportation Issues	6,74	9,81	3,59	0,00	0,00
Town of Děčín	Measurement and analysis of traffic intensity	0,00	0,00	0,65	3,17	0,52
Town of Kolín	Anonymized	0,00	0,00	1,19	3,67	0,00
Town of Lysá nad Labem	Anonymized	0,00	6,31	0,26	0,00	0,00
Town of Milovice	Study of New Milovice area	0,00	0,00	0,00	0,00	9,13
Town of Prachatice	Traffic surveys and an assessment of the Small Square project	0,00	0,00	8,47	0,00	0,00
Town of Prachatice	Relocation study II/141	0,00	0,00	0,00	6,46	0,00
Town of Tuchoměřice	A study of traffic and traffic signs	0,00	0,00	0,00	7,03	6,43
CzechTourism	Design of an information portal system	4,20	0,00	0,00	0,00	0,00
ČD a.s.	A study in preparation for the purchase of portable personal cash registers	0,00	0,00	4,33	0,00	0,00
ČD Cargo a.s.	Comparative Study - Train sorting variant	18,31	0,00	0,00	0,00	0,00
ČD Cargo a.s.	Comparative Study - Hanušovice - Zlaté Hory	0,00	10,85	0,00	0,00	0,00
ČD Telematika a.s.	Anonymized	0,00	0,00	2,79	1,88	0,00
DEKONTA, a.s.	Cooperation in CBRN decontamination	0,00	0,00	1,74	2,39	0,00
DS Logistics s.r.o.	Analytical study - Autonomous Dispatching Software	0,00	0,00	0,00	0,00	11,70
ELTODO a.s.	Anonymized	0,10	0,19	0,00	0,00	6,77
ETC s.r.o.	Feasibility study of the logistics center for Eastern and Central Europe	0,00	0,00	0,00	4,39	5,48
Ferona s.r.o.	Traffic services in the Ferona area	0,00	0,00	0,00	13,53	0,00

GISAT s.r.o.	Development and implementation of the SEVIRI sensor	0,00	8,80	0,18	0,00	0,00
Haskoning DHV	Traffic surveys	0,00	0,00	0,00	7,98	0,00
HE3DA	Anonymized	0,00	0,00	0,00	0,00	7,70
Hradec Králové	Traffic service study	0,00	0,00	0,00	1,44	17,67
Hradec Králové	Traffic service study	0,00	0,00	0,00	0,00	6,55
Hradec Králové & Pardubice	A study of electronic passenger handling	0,00	0,00	7,00	7,65	0,00
IDS a.s.	City circuit	0,00	14,06	1,80	0,00	0,00
IDSK, o.p.s.	Anonymized	0,00	0,00	0,00	0,00	7,21
IMA s.r.o.	Testing and optimization of the identification system	0,00	9,47	0,53	0,00	0,00
JmK VLAKY	Profitability study	0,00	0,00	2,46	7,15	0,25
Judicial system	Expert opinions	11,26	15,75	14,91	24,90	26,42
Koordinátor Integrovaného dopravního systému Olomouckého kraje	How to resolve the assignment of contracts on the railway for the period until 2019	0,00	0,00	0,00	5,70	0,00
Koordinátor ODIS s.r.o.	Traffic service study	0,00	0,00	0,00	0,00	5,46
KORDIS JMK a.s.	Track revitalization and electrification study	1,89	0,00	0,00	0,00	0,00
KORDIS JMK a.s.	How to modernize the check-in equipment, a study on regional buses	0,00	0,00	5,04	0,00	0,00
Liberec Region	Determining the cost price of transport performance	6,43	0,00	0,00	0,00	0,00
Logica Czech Republic	A specialized analysis of Galileo	5,40	0,00	0,00	0,00	0,00
LOKEL s.r.o.	Safety module	0,00	0,00	0,00	8,36	4,99
Ministry of Health of the Czech Republic	Expert opinion on the Air Rescue Service in the Czech Republic	0,00	11,89	17,49	0,00	0,00
Operátor ICT, a.s.	Anonymized	0,00	0,00	0,00	0,00	7,72
Organizace v civilním letectví	Anonymized	11,62	14,66	0,00	1,99	14,52
Pilsen region	Study – the concept of regional transport solutions in the Pilsen Region, phase B	0,00	0,00	0,00	0,00	8,58
Pilsen region	Study - Central purchasing	17,13	0,00	0,00	0,00	0,00
Pilsen region	Study - concept of regional transport solutions in the Pilsen Region	0,00	0,00	0,00	15,19	0,00
Plzeňské městské	Expert opinion of FD CTU on solving MAP	0,00	0,28	5,26	3,72	0,00

dopravní podniky a.s.						
Porsche Engineering Services, s.r.o.	Create a 3D model of the Handling Track	0,00	0,00	6,27	0,00	0,00
Porsche Engineering Services, s.r.o.	NARDO 2	0,00	0,00	0,00	14,28	0,00
Prague City Hall	Data mining from the central vehicle register	0,00	0,00	0,00	8,77	0,00
Prague City Hall	OSI - MO	0,00	0,00	0,00	18,42	0,00
Prague City Hall	Analysis of functional and technical requirements	0,00	0,00	0,00	7,53	0,00
Prague City Hall	Radlická radial impact study for the Barrandov Bridge area	0,00	0,00	0,00	0,00	66,29
Prague Public Transit Company	Study of NDA	0,00	0,00	0,00	0,00	12,79
PUDIS a.s.	Parking space studies	0,00	10,07	7,26	0,00	0,00
Rail Infrastructure manager	Safety analysis	50,34	0,00	0,00	0,00	0,00
Rail Infrastructure manager	Optimization study	1,22	10,30	0,00	0,00	0,00
Rail Infrastructure manager	Process analysis	0,00	5,13	0,00	0,00	0,00
Regions, cities and municipalities	Road Safety Inspections and Audits	0,00	2,14	17,96	24,62	61,97
Regions, cities and municipalities	Traffic surveys	0,00	0,00	0,00	0,00	166,31
REGONIK CZ s.r.o.	ZHB	0,00	3,71	5,50	0,21	0,00
ROPID	Passportization and classification of intersections	2,64	1,98	13,68	0,00	0,00
ŘSD ČR	An assessment of the Prague Ring Road	0,00	0,00	42,06	6,02	0,00
ŘSD ČR	Transport telematics	0,00	0,00	0,00	7,10	0,00
ŘSD ČR	Unification of technological documentation in tunnels	0,00	0,00	0,00	0,00	8,89
ŘSD ČR	Risk analysis of the D1 motorway	3,67	0,00	0,00	0,00	0,00
ŘSD ČR	Modernization of the D1 motorway - supervision and review	4,18	0,00	0,00	0,00	0,00
ŘSD ČR	Safety inspection of TEN-T	0,00	33,55	1,76	0,00	0,00
ŘSD ČR	Study of the database and model for passportization of motorway network elements	0,00	0,00	0,00	55,41	0,00
ŘSD ČR	URSA project management	0,00	0,00	0,00	0,00	24,18
ŘSD ČR	Expert opinion	5,73	0,00	0,00	0,00	0,00
ŘSD ČR	Peer review of the pilot project of cooperative systems	0,00	0,00	7,21	0,00	0,00
ŘSD ČR	FCD study	0,00	0,00	0,00	9,30	0,00

ŘSD ČR	Consulting and expert activities	267,64	373,62	475,75	305,29	206,45
ŘSD ČR	Safety inspections	21,60	8,14	48,18	163,04	210,85
SDT, z.s.	Telematics studies	0,00	0,00	0,00	3,80	0,00
SIGNALBAU	Expert opinion on security equipment	0,00	19,45	7,55	0,70	1,01
SIGNALISM s.r.o.	A study of traffic safety measures	0,00	1,06	4,46	0,00	0,00
SILMOS s.r.o.	TNK 136-12/16	11,91	8,07	15,78	17,70	4,87
SmartPlan s.r.o.	Anonymized	0,00	0,00	0,00	11,39	0,00
South Bohemia Region	Operational Conception Studies	0,00	0,00	0,00	6,70	2,48
SPEL a.s.	LoRa	0,00	0,00	8,52	19,99	0,00
Škoda Auto a.s.	Tests on original and non-original spare parts of Fabia II bonnets	0,00	15,26	0,11	0,00	0,00
Škoda Auto a.s.	Design of transport strategy in MB	0,00	0,00	0,00	20,89	0,00
Škoda Auto a.s.	SMART CITY Study	0,00	0,00	0,00	9,49	0,00
Škoda Auto a.s.	Analysis of Standards	0,00	0,73	4,99	0,00	0,00
Škoda Auto a.s.	Horizontal marking measurements	0,00	3,84	6,67	0,00	0,00
Škoda Auto a.s.	Anonymized	2,23	39,69	23,50	60,56	34,02
Škoda Auto a.s.	Analysis of the possibility of automatic parking of cars produced by Škoda Auto in the Czech Republic	0,00	0,00	11,10	15,42	0,00
Technical Road Administration (Prague)	Strategic study	0,00	0,00	5,07	9,80	0,00
Technical Road Administration (Prague)	Consultancy in the field of transport telematics	0,00	0,00	0,00	11,61	0,00
Technical Road Administration (Prague)	Study of the use of cooperative systems	9,07	2,63	0,00	0,00	0,00
Technical Road Administration (Prague)	Traffic surveys and measurements	0,00	0,00	0,00	39,16	0,00
Technologická agentura	Evaluation of methodology E1	0,00	0,00	0,00	5,21	1,05
Telefonica O2	eCALL pilot project	4,79	2,69	0,00	0,00	0,00
Telematix	Evaluation of test operation	3,63	0,18	0,00	0,00	0,00
Prague 2 city district	The basic conceptual document for Prague 2 SMART CITY	0,00	0,00	0,00	9,49	0,00
Prague 3 city district	Anonymized	0,00	0,00	16,83	0,00	0,00
ÚAMK	Consulting, traffic surveys and measurements	0,00	5,60	0,00	0,00	0,00
Ústí Region	A study of Mmltimodal freight transport	0,00	0,00	0,00	0,98	3,22
VÍTKOVICE Doprava	Design and operation of the CNG monitoring system for locomotives	0,00	0,55	3,22	0,00	0,00

Total	**529,20**	**728,13**	**956,16**	**1116,30**	**1081,47**

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
WheelTug, plc	A feasibility study for parallel parking and the optimal Wheeltug terminal	0	2,03	0	0	0
Volkswagen Aktiengesell-schaft	A study of the needs of elderly drivers; a simulator study concerning digital assistants	0	0	0	0	27,3
APAC Gmbh	A study on the general principles for redistributing Czech airspace in a way to allow IFR arrivals/departures to/from uncontrolled aerodromes and to ensure a sufficient safety level of air traffic on the state level.	0	0	0	5,01	0
Total		0	2,03	0	5,01	27,3

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
Licences	0	37,97	0	0	0
Total					

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	The internal structure of the deformation block, especially of a construction element of slip roads
Other foreign patents		

Licences sold		
	2017	Central register of road safety analyses
	2017	The internal structure of the deformation block, especially of a construction element of slip roads
	2017	Access bridge with integrated deformation zone
Significant analyses / surveys / studies		
	2015	Improving Safety in Road Tunnels Through Real-Time Communication with Users
	2015, 2016	Ensuring the safety of the participants of the festival SIGNAL
	2016	Analysis of the development of toll collection on toll roads in the Czech Republic
	2016	A comprehensive assessment of alternative SOKP (Prague circular road)
	2017	Traffic Quality Assessment Using Floating Vehicles
	2018	Structure No. 9567 Radlická radiála JZM Smíchov - Traffic Engineering Study for the Barrandov Bridge - Dobříšská
Spin-off with a stake held by the evaluated unit		
Spin-off with no stake held by the evaluated unit		
Prototypes		
	2015	Prototype of an educational driving simulator for driving schools
	2014	An acoustic noise sensor
Varieties and breeds		
Other		
Czech patent	2016	Centrifugal compressor rotor with serial arrangement of blades (305885)
Czech patent	2016	Centrifugal compressor rotor with serial arrangement of blades (305886)
Czech patent	2017	A method of controlling the stability of a vehicle, in particular a utility vehicle, and a system for performing this method

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
Results reflected in legislation and standards	An analysis and recommendations for the current state of legislation in relation to advertising facilities	Increased traffic safety and reduced consequences of traffic accidents
Patent	The internal structure of deformation blocks, especially as a construction element of slip roads The internal structure of the deformation block, especially of a construction element of slip roads	Increased safety and resilience of the transport infrastructure, and a reduction in the number of road accident victims
Verified Technology & Pilot Plant	Uniqway Carsharing	Increased availability of mobility, reduced costs, and less environmental burden from the use of individual car transport
Applied Certified Methodology	Optimization of the Utilization of Railway Lines with Exhausted Capacity	Improved interaction between the infrastructure and the parameters of vehicles, regarding the impact on public services and final customers (price reductions, improved capacity utilization, an increase in speed).
Applied Certified Methodology	A methodology for drawing up contingency plans for international airports	To minimize the consequences of emergencies, especially in terms of saving lives and ensuring the operation of aircraft. This methodology was set up to help the person in charge of the airport operator to draw up an airport emergency plan.

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
prof. Dr. Ing. Miroslav Svítek, dr. h. c.	Neural Network World, CTU + VSB - Technical University of Ostrava + Institute of Computer Science (CAS), Prague + Ostrava, CZ
prof. Dr. Ing. Miroslav Svítek, dr. h. c.	Intelligent Transportation Systems Magazine, IEEE
prof. Ing. Mirko Novák, DrSc.	Neural Network World, CTU + VSB - Technical University of Ostrava + Institute of Computer Science (CAS), Prague + Ostrava, CZ
prof. Ing. Zdeněk Votruba, CSc.	Neural Network World, CTU + VSB - Technical University of Ostrava + Institute of Computer Science (CAS), Prague + Ostrava, CZ
prof. Ing. Ondřej Přibyl, Ph.D.	Transportation Letters, Taylor & Francis, London, GB
doc. Ing. Petr Bouchner, Ph.D.	Advances in Transportation Studies, Aracne Editrice, Roma, IT
doc. Ing. Jakub Kraus, Ph.D.	Acta Avionica, Technical University of Kosice, Kosice, SR
prof. Ing. Ondřej Jiroušek, Ph.D.	Frontiers in Built Environment, Frontiers Media SA, Lausanne, SUI

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
doc. Ing. Tomáš Horák, Ph.D.	Introduction to Smart Cities	The University of Texas at El Paso, USA
doc. Ing. Petr Bouchner, Ph.D.	Alternative fuels and drives in transport	S. Toraighyrov Pavlodar State University, Pavlodar, Russia
prof. Ing. Ondřej Jiroušek, Ph.D.	An investigation of the structural and mechanical properties of cellular materials using nanoindentation, micromechanical testing and micro-FE models	University of Saarbrucken, Germany
Ing. Jana Kaliková, Ph.D.	Studying the Key Technologies of Machine-to-machine Communications	National Taiwan University of Science and Technology, Taiwan
prof. Ing. Ondřej Jiroušek, Ph.D.	Digital volume correlation for verification of microstructural FE models of cellular materials	Joint Research Centre in Ispra, Italy
prof. Ing. Ondřej Jiroušek, Ph.D.	Using DIC and DVC for assessment of mechanical properties of cellular materials	University of Maribor, Slovenia
prof. Dr. Ing. Miroslav Svítek, dr. h. c.	Ciudades inteligentes: Perspectiva y retos	Conferencia Magistral, Bucaramanga, Columbia
prof. Dr. Ing. Miroslav Svítek, dr. h. c.	ITS and Smart Cities	XIX CILA, Medellín, Columbia
doc. Ing. Petr Bouchner, Ph.D.	Interactive Driving Simulators – Modern Tools for Training and Research and Development in the Area of the Human–Machine Interaction (HMI) in Transport	10th International Conference on Dynamical Systems and Control, Budapest, Hungary
prof. Ing. Zdeněk Votruba, CSc.	Reliability Problems in Prediction Diagnostics for Uncertain Systems	Recent Advances on Systems, Signals, Control, Communications and Computers, Budapest, Hungary

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. Carlos Ferregut	UTEP, USA	Challenges for New Engineers and Scientists, Safety of Infrastructure Facilities
prof. Vera Novak	Beth Israel Deaconess Medical Center, Harvard Medical School, USA	The Impact of Ageing on Cerebrovascular Reserve and Balance
Dr. Matthias Krist	CSC Switzerland	Rail Control System (RCS)

Charly Simmen	Alptransit Gotthard AG, Switzerland	The world's longest railway tunnel - Gotthard Tunnel 2016
Prof. Andrew McNaughton	Strategic advisor - Railway manager, United Kingdom	High-speed rail in the Czech Republic
Prof. K. C. Park	Department of Aerospace Engineering Sciences, University of Colorado Boulder, USA	Method of localized Lagrange multipliers and its recent applications
Prof. Zoran Ren	University of Maribor, Faculty of Mechanical Engineering, Maribor, Slovenia	Cellular structures and materials – fabrication, properties characterization and applications
Prof. Marc Gutermann	University of Applied Sciences, Bremen, Germany	Experimental Safety Evaluation of Structures
Prof. Leon Rothkrantz	TU Delft, Netherlands	Flood control of the smart city Prague
prof. Giangiacomo Minak	Department of Industrial Engineering, Università di Bologna, Italy	Towards sustainable mobility: A solar vehicle for a new quality of life

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
prof. Ing. Ondřej Jiroušek, Ph.D.	ERRAC Academia Permanent Advisory Group	Ordinary member
prof. Ing. Ondřej Jiroušek, Ph.D.	International Society for Biomechanics	Ordinary member
doc. Ing. Petr Bouchner, Ph.D.	ISO/TC 022/SC 39/WG 08 "TICS on-board-MMI" & ISO/TC 204/WG 14 "Vehicle/roadway warning and control systems"	Ordinary member
doc. Ing. Daniel Kytyr, Ph.D.	Technical Committee No. 15 (Experimental mechanics) of IMEKO (International Measurement Confederation)	Scientific secretary
prof. Ing. Miroslav Vlček, CSc.	Advisory Board of the Texas Institute of Science	Ordinary member
Ing. Bc. Dagmar Kočárková, Ph.D.	PIARC Committee on Terminology	Ordinary member
RNDr. Magdalena Hykšová, Ph.D.	European Society for the History of Sciences	Ordinary member

Note: List a maximum of ten examples.

SUMMARY LIST OF ADDITIONAL DOCUMENTATION IN MODULE M3

Document Title	Criterion	Location (HTML link)