Jihočeské Univerzitní a Akademické centrum transferu technologií

Strategy for the development of cross-sectoral cooperation, intellectual property management and knowledge transfer from research to practice

Subject of the strategy: the Technology Transfer Office

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STRATEGIC DOCUMENTS FOR THE AREA OF RDI IN THE CZECH REPUBLIC

INNOVATION STRATEGY OF THE CZECH REPUBLIC

The Innovation Strategy of the Czech Republic 2019–2030 was prepared by the Research, Development and Innovation Council (RDIC) in cooperation with experts from the ranks of entrepreneurs, scientists, academics and representatives of public administration.

The document also contains an analytical part – an international comparison of the innovation environment of the Czech Republic. The design part consists of nine strategic pillars. Each pillar defines the institutional and managerial responsibilities, summarises the current state of affairs, sets out the main objectives to be achieved and the instruments to achieve them.
The individual pillars cover the following areas:

- Funding and evaluation of research and development,
- Innovation and research centres,
- National start-up and spin-off environment,
- Polytechnic education,
- Digitisation,
- Mobility and the construction environment,
- Intellectual property protection,
- Smart investments,
- Smart marketing.

After its approval, the Innovation Strategy of the Czech Republic 2019–2030 has taken its place alongside other important strategic documents in the field of research, development and innovation.

There are currently four overarching concept papers for the RDI area, namely:

Innovation Strategy of the Czech Republic 2019–2030

National Policy of Research, Development and Innovation of the Czech Republic 2021+ (NP RDI)

National priorities for oriented research, experimental development and innovation (2012–2030)

National Research and Innovation Strategy for Smart Specialisation of the Czech Republic (National RIS3 Strategy)

The above-mentioned top-level strategies or policies are complemented by a number of other documents that at least partially touch on the field of research, development and innovation – for example, the National Initiative Industry 4.0, the Government Programme for the Digitisation of the Czech Republic 2018+ Digital Czechia, the National Strategy for Artificial Intelligence in the Czech Republic, the National Strategy for Open Access to Scientific Information for the Czech Republic for 2017–2020 (including an action plan for its implementation) or several ministerial research and development concepts. Other documents (e.g. the National Innovation Strategy 2012–2020 and the Strategy for International Competitiveness of the Czech Republic 2012–2020), although still formally in force, have not been actively implemented for several years.

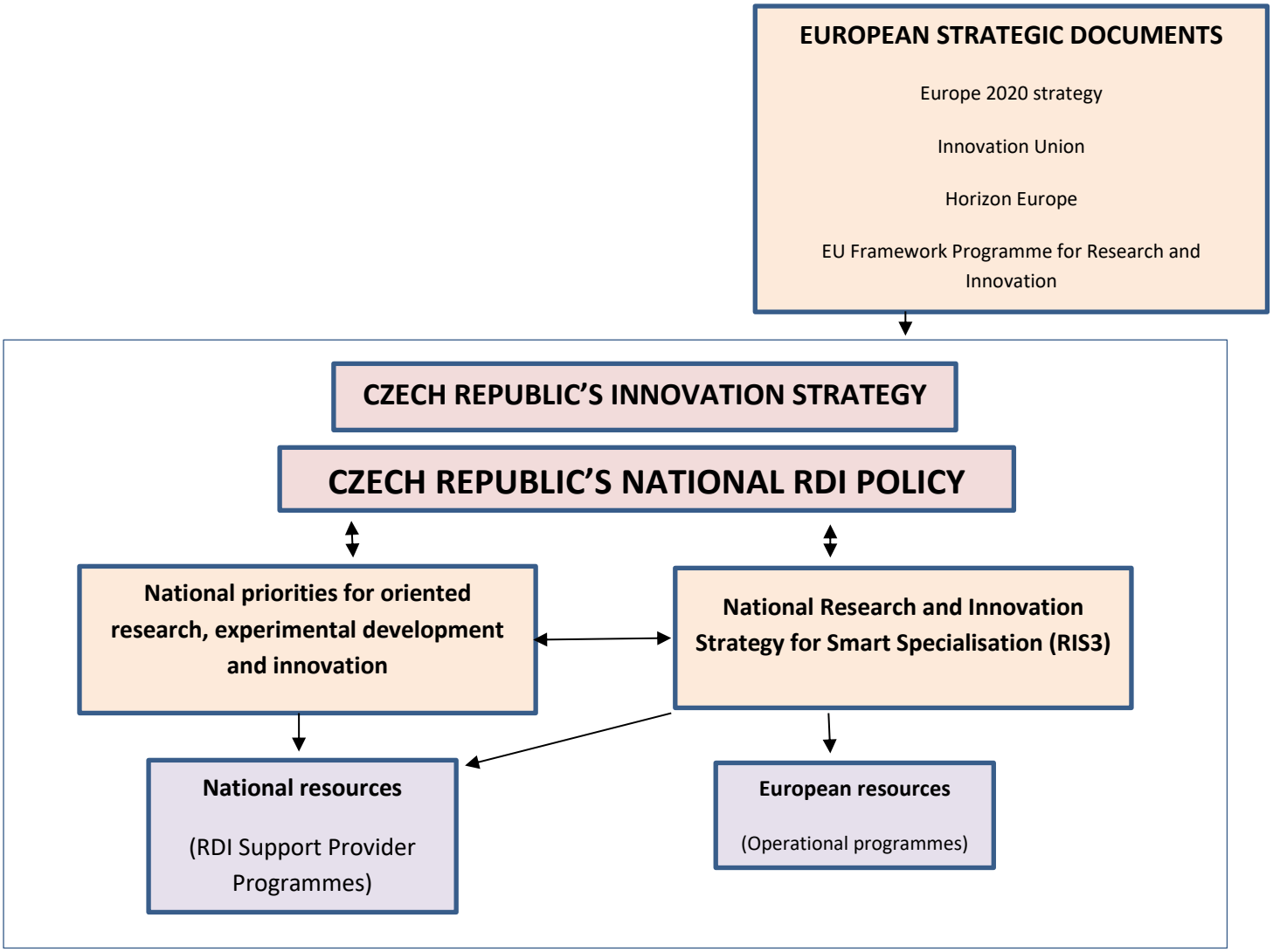
The creation of the **Innovation Strategy of the Czech Republic 2019–2030**, unlike other strategic documents, is not required by any statutory or sub-statutory regulation. According to the authors themselves, the strategy has 'a large competence overlap and concentrates the activities of a number of ministries and organisations'. The reason given for its creation is, among other things, 'to concentrate critical and ongoing plans and activities with a link to innovation and then to complement them with those that are demonstrably missing or not being developed'.

The National Policy on Research, Development and Innovation 2021+ (NP RDI) is a strategic document at the national level, which is subject to government approval and sets the main directions in the field of research, development and innovation. The National Policy aims to develop and make progress in the following key areas: management and financing of the research, development and innovation system; motivation of people to pursue a research career and development of human resources; quality and international excellence in research and development; cooperation between the research and application spheres; innovation potential of the Czech Republic. It also responds to risks and threats of a global nature in the 21st century. This umbrella document is also supportive for drawing financial resources from the European Union funds within the programming period 2021–2027. The first NP RDI was created in 2000 and its further versions were prepared for the period 2004–2008, 2009–2015, 2016–2020, 2021+.

In 2012, the **National Priorities of Research, Experimental Development and Innovation 2012–2030** (NPOV) were approved. 'The preparation of the National Priorities of Oriented Research, Experimental Development and Innovation follows the objectives and activities of the National Policy of Research, Development and Innovation of the Czech Republic for the years 2009 to 2015, which was approved by Government Resolution No 729 from 8 June 2009. The priorities were set as a specific object of state and public interest, which is a combination of a long-term goal and multidisciplinary focus, is socially applicable and desirable, the Czech Republic has sufficient material and personnel conditions for its achievement, is solvable in the long term and is achievable through RDI activities. The application of the NPOR should lead to a more efficient use of public funds for targeted support of RDI, which should thus better respond to the key needs of the development of Czech society. The main benefit and purpose of the NPOR is the strategic orientation of part (especially applied, but also part of basic) of the national RDI to areas that will help to solve the major current and foreseeable problems and challenges of the Czech Republic and will allow to use potential opportunities for balanced development of the Czech Republic. The NPOR were designed for the period up to 2030, became part of the NP RDI and were to be subsequently used in the preparation of RDI programmes for the provision of earmarked support.' (RVVI 2012:4)

The National Research and Innovation Strategy for Intelligent Specialization of the Czech Republic (National RIS3 Strategy) is a comprehensive conceptual document oriented towards applied research in the Czech Republic, in close connection with the NP RDI. The purpose of the National RIS3 Strategy is to effectively target financial resources (European, national, regional and private) to priority innovative specializations so that the knowledge potential of the Czech Republic is fully exploited. The National RIS3 Strategy is a precondition for the implementation of the European Union Cohesion Policy interventions in the field of RDI (Regulation No 1303/2013 of the European Parliament and of the Council).

Figure 1 Diagram of links between key RDI documents

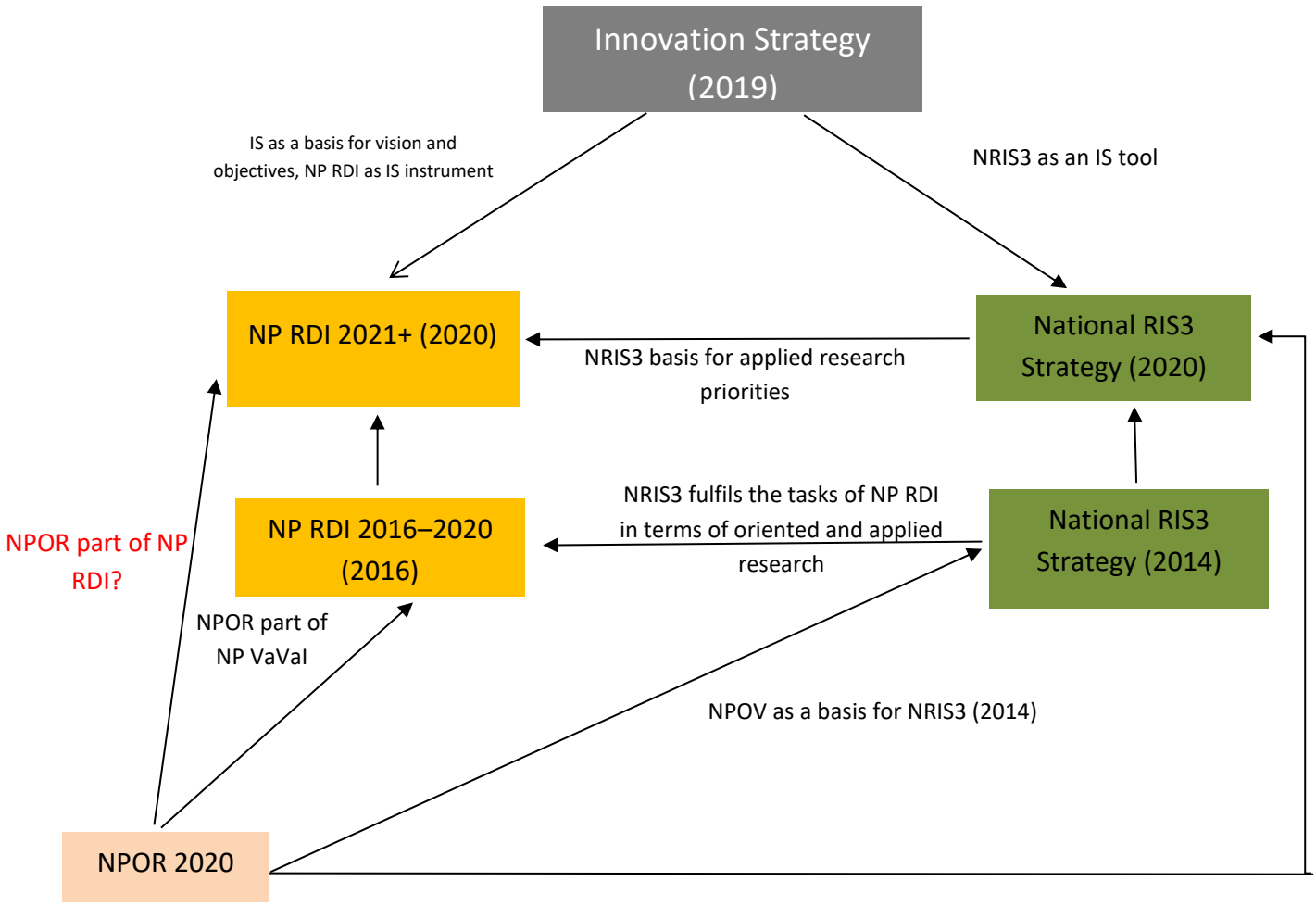


Source: Štemberková, 2021

From the point of view of setting the links of NP RDI, it follows that the key strategic document for setting the vision, main objective and basic goals of support for NP RDI 21+ is the Innovation Strategy of the Czech Republic 2019–2030. The starting point for applied research priorities is the National RIS3.

The national RIS3 strategy defines itself in relation to other documents at a relatively more general level. 'The National RIS3 Strategy is intended to shape interventions and proposals aimed at making the use of R&D (especially public R&D) in innovation more effective. In this sense, it can be seen as a national strategy for oriented and applied research. It is not a strategic document intended to influence the whole RDI policy in the country.' (MPO 2018:18)

Figure 2 Relationships between RDI strategy documents



Source: Alevia, 2020

'The diagram illustrates the position of the Innovation Strategy of the Czech Republic 2019–2030 as an umbrella strategy, where NP RDI and the National RIS3 Strategy are instruments of the Innovation Strategy. At the same time, the NP RDI is an umbrella document for the field of RDI and the role of the National RIS3 Strategy is to fulfil the objectives for the field of oriented and applied research. The National RIS3 Strategy should also be a document defining research topics and priorities, especially in the field of applied research. Thus, one of the main questions for the future remains the existence and role of the NPOR and whether the NP RDI will define research topics and priorities beyond the National RIS3 Strategy. In terms of their focus, the four strategies compared differ from each other. The Innovation Strategy is by far the broadest and addresses RDI issues in four of its nine pillars. The national RIS3 strategy focuses mostly on applied research and innovation performance of companies, while one of the five key areas of change is directed outside RDI (development of eGovernment and eBusiness). In contrast, NP RDI and NPOR focus purely on RDI.

Thus, it can be concluded that the Innovation Strategy, NP RDI and the National RIS3 Strategy are focused on and addressing the system of functioning and management of RDI. Research topics that should be a priority for the Czech Republic are set out in the National RIS3 Strategy, the NPOR and also the NP RDI.' (Alevia 2020)

REGIONAL INNOVATION STRATEGY OF THE SOUTHERN CZECH REGION (RIS 3 strategy)

'The National RIS3 Strategy (National Research and Innovation Strategy for Smart Specialisation of the Czech Republic 2021-2027) is a strategy prepared at the national level. This strategy then overarches the RIS3 strategies of all regions of the country, which form an annexe to the national document. The national RIS3 strategy ensures effective targeting of European, national and regional resources to support oriented and applied research and innovation. The main objective of the national RIS3 strategy is to support selected priority areas that have a high potential for creating a long-term competitive advantage of the Czech Republic based on knowledge exploitation and innovation. The main important objective of this strategy is to exploit the unique combination of opportunities offered by the Czech economy and research and innovation capacity. The strategy also identifies and addresses weaknesses in the innovation system. The main governing body of the regional innovation strategy is the Innovation Commission of the South Bohemian Region, which is also an advisory body to the South Bohemian Region Council in this area.

The RIS3 strategy of the South Bohemia Region identifies 4 important key areas of change:

Key area for change A – Quality human resources

Key area for change B – Cooperation and technology and knowledge transfer

Key area of change C – Business development and innovation

Key area of change D – Developing and integrating digitalisation, smart solutions and Industry 4.0

Within the Key Change Area B – Cooperation and Technology and Knowledge Transfer, the main objective of this area is to create partnerships and support cooperation between companies, scientific and research institutions and the public sector in order to contribute to increasing the competitiveness of companies and at the same time to support technological development at the level of the public sector (eGovernment, Smart City, Smart Village), which represent a great potential and challenge in the current period. Intellectual property protection needs to be properly addressed for the results of mutual research and development activities. The region's strengths, namely its territorial location in the neighbourhood of Germany and Austria, should be used to the advantage of the region in the context of cross-border/international cooperation.

The Regional Annexe of the RIS3 Strategy is fully linked to the content of the individual components of the **South Bohemian Region Development Programme for the period 2014–2020**. 1 is to improve the economic, scientific and research and innovation environment and the labour market of the South Bohemian Region so that the natural potential of the territory given by its historical context and development, as well as the response to new challenges and trends, is adequately developed, while respecting the need for an overall balanced development of the territory of the region and its

individual parts). Within Priority Axis 1 of RIS3, the strategy fulfils the content of all its measures to varying degrees:

Measure 1.1 Environment for the development and improvement of business competitiveness

Measure 1.2 Conditions for the development of science, research and innovation

Measure 1.3 Tertiary education and lifelong learning

Measure 1.4 Optimisation of the labour market

The RIS3 strategy has a direct link to the **South Bohemian Region Development Programme 2021–2027,** in particular to its specific part, which describes the application of innovation and the possible involvement of modern technologies in all areas, or within all priority axes, which the South Bohemian Region Development Programme for the period 2021–2027 deals with.

Key area for change – Cooperation and technology and knowledge transfer

The main objective of the area Cooperation and Technology and Knowledge Transfer is to create partnerships and support cooperation between companies, scientific and research institutions and the public sector in order to contribute to increasing the competitiveness of companies and at the same time to support technological development at the level of the public sector (eGovernment, Smart City, Smart Village), which represent a great potential and challenge in the current period. Intellectual property protection needs to be properly addressed for the results of mutual research and development activities. Appropriate synergies in cross-border/international cooperation should also be exploited for the benefit of the region. A key area of change is to address the following themes/issues:

- less cooperation between academic institutions and economic practitioners: legislative framework hindering effective and flexible cooperation and different expectations of stakeholders,
- protection of intellectual property in relation to the results of research and development activities,
- partial mismatch between the focus of the academic and business sectors in technical fields (in some fields, such as fisheries, there is a greater potential for the application of results abroad, thanks to the interest in cooperation of companies from the international environment),
- low interdisciplinary networking between institutions and firms,
- lower levels of company involvement in R&D programmes,
- insufficiently developed process of technology transfer to municipalities,
- increasing marketing support for newly developed technological solutions (see e.g. USB and BC technology portals, Transfera portal, etc.).

The above-mentioned facts are based, for example, on research and development indicators from CSO and IPO, on annual reports of institutions and companies, on data on public support for RDI of the RDI 2.0 information system and on qualitative knowledge of the actors involved.

STRATEGIC PLAN FOR THE DEVELOPMENT OF THE SMART REGION OF THE SOUTH BOHEMIAN REGION 2019–2023

Major technological change is a society-wide phenomenon. They will increasingly affect society and it is necessary to actively address the major trends. Thanks to the technologies of the fourth industrial revolution, the world is being digitised and it is necessary to take an active approach to changing the mindset of all persons. The response of the future society faces the challenge of change in education (development of interdisciplinarity), in social life (impact on the labour market), in research and innovation (access to innovation centres and technology transfer, establishment of innovative enterprises, development and application of innovations on the territory directly in the country). Utilising the potential of scientific workplaces in the territory of the South Bohemia Region and increasing the application of scientific research findings with the use of subsidies, venture investment, cooperation with ecosystem entities and the use of local potential are the way to a Smart Region.

The main carrier of this strategic document is the South Bohemia Region. The document is aimed at supporting activities aimed at improving competitiveness, developing innovation, protecting the environment and making governance more efficient. It is divided into several key areas where it seeks to make smart use of data and efficient use of modern information and communication technologies (ICT).

The sub-objectives of the Strategic Development Plan of the Smart Region of the South Bohemia Region are:

- Mobility
- Digitisation
- Energy industry
- Environment
- Health and social services
- Increasing the competitiveness of the region

Cooperation and technology transfer

- Development of individualisation of production
- Supporting intelligent systems based on the interconnection of the Internet of Services and Things (IoT)
- Developing digital infrastructure and supporting virtualisation
- Involvement in high added value projects
- Promoting research in the fields of consumer materials, waste, recycling and the circular economy
- Technology transfer to the public sector

Starting points of the educational structure of the South Bohemian Region

- Improving the quality of the education system

- Establishing cooperation with actors in the region on cross-border projects and partnerships
- Support for youth and sports projects
- Support for research and increased technology transfer into practice and for commercialisation
- Promoting new technologies in teaching and the use of learning centres for lifelong learning
- Development of leisure activities and social programmes
- Support for micro-regions and the creation of a regional structure of the training system for the transfer of experience
- Development of service sector and technical and science programmes with links to the employer sector
- Creating activities to develop and connect all levels of education (secondary and higher education)
- Building a Digital Innovation Hub Space
- Many activities in support of technical education.' (http://www.risjk.cz/ris.html)

METHODOLOGY FOR EVALUATING RESEARCH ORGANISATIONS AND RESEARCH, DEVELOPMENT AND INNOVATION PURPOSE-TIED PROGRAMMES

Methodology 17 +

The new principles of evaluation of research organisations, which brought major changes to the existing system of evaluation of research organisations and evaluation of programmes of special-purpose support for research, development and innovation, were approved by the government in 2017. The new evaluation system is being phased in over the next three years. Since 2017, a regular annual monitoring evaluation of research organisations has been carried out, while a full evaluation is being introduced. From 2020, the full evaluation is carried out in five-year cycles.

The basic principles of the new evaluation system, which is in line with international standards, include the division of research organisations (ROs) into three different levels, namely the national or central level, the provider level and the evaluation for the purpose of managing the ROs. Research organisations are now divided into three segments for evaluation: universities, institutes of the Academy of Sciences of the Czech Republic, departmental research organisations and industrial research organisations. Furthermore, the scaling of research organisations on an A-D scale is applied, with the first long-term scaling taking place in the year in which the complete evaluation in all segments was completed.

A new feature of the assessment was the assessment of the quality of the research organisation using the five core modules listed below:

- Quality of selected results
- Research performance
- Social relevance of research
- Viability/Variability

- Strategies and concepts

The relative importance of the modules varies according to the position of the research organisation in the research and development system. An important change from the current situation was the assessment of the level of international cooperation of individual research organisations. For the area of knowledge transfer, the most relevant modules are those listed below.

Social relevance

Module 3 is particularly relevant for ROs that perform applied RDI and directly serve users such as industry, the public sector or other ROs. This module assesses the degree of positive impact of RDI and its results on society and citizens. Societal relevance is related to the results of applied research that are of direct relevance to the economy, government and public administration as well as cultural policy. This module also assesses the results of basic research that affect individuals and society indirectly (indirect impact). In particular, the relevance and current need for the research focus, the methods proposed and used and the societal relevance of the research as a whole should be taken into account.

This module is based on the assessment of parameters that monitor in particular:

- transfer of results into practice,
- cooperation with the application sphere,
- activities for knowledge and technology transfer to non-academic actors,
- impact on the quality of life of society and the citizen,
- economic benefit, social benefit, contribution to the formation of national and cultural identity.

Other parameters include student involvement in research activities:

- selected lectures/seminars related to the research of the given RO,
- student practical training,
- the quality of education and application of doctoral students,
- international and domestic prestigious awards for scientific contribution,
- mobility of researchers between the RO and the industry and services sector, or users of research results,
- the importance of the RO in terms of the development of the region; popularisation and feedback.

Viability

Module 4 assesses the quality of the management and internal processes of the RO in the following areas:

- Research environment – organisational chart, quality of research management, personnel policy, structure and development of human resources, equipment and organisation of research infrastructure.
- International and national collaboration – membership of global and national research community, community activities.
- Funding from external sources– international and national cooperation and presentation of research and cooperation, internships of students and young researchers abroad, prestige of research, participation in activities of the professional community, success in obtaining projects or co-financing (third party funding). Successfully completed grant projects including final evaluation with the possibility of requesting evaluations. Status of the EI according to international indicators and statistics.
- Basic structure of costs and revenues in individual years of the period under evaluation - all grant and programme projects supported by public funds from national sources, EU sources and other foreign sources in the period under evaluation, of which the Institute is a beneficiary or additional beneficiary or co-recipient, contract research, collaborative research and technology transfer, external funding (earmarked and contractual), income from licences, spin-offs, revenues from the sale of patents and licence agreements.

Assessment tools:

- statistics and indicators at national and international level,

- an inventory of all grant and programme projects supported by public funds from national, EU and foreign sources in the period under review, of which the Institute is a beneficiary or co-recipient,
- self-evaluation reports, annual reports and other similar documents specified for the segment,
- international awards given to the evaluated RO,
- on-site visits to panels (instrument 3), especially in the HEIs and CAS segment.

Strategies and concepts

The quality of the formulation of the RO research strategy sets the basis for future developments and its quality is a critical factor for expert panels. The importance of this criterion applies to all ROs.

The strategy and approach includes monitoring parameters in the following areas:

- the adequacy and quality of the research strategy,
- the organisation's mission (purpose, strategic direction),
- concepts (steps on how the mission was implemented),
- implementation of the concept,
- vision for the next period,
- link to the implementation of the provider/founder's concept,
- the possible link to the implementation of higher strategic objectives and measures resulting from existing documents at national and supranational level.

Assessment tools:

- implementation of concepts,
- the appropriateness and feasibility of the research strategy,
- self-evaluation report (for the segment of HEIs and CAS), or report on the implementation of the long-term concept of the development of the RO (for the segment of the departmental ROs),
- ongoing monitoring, e.g. mid-term evaluation.

USB STRATEGIC PLAN 2021–2030

Retrieved from: https://www.jcu.cz

Objective 2.5 Technology (knowledge) transfer

Instruments utilised:

- Ensuring adequate and flexible management of university resources to develop and professionalise the system of support for collaboration with practice through the Technology Transfer Office:
- stabilisation and further development of the Technology Transfer Office,
- further support for the development and professionalisation of the Technology Scout Network,
- ensuring functional, professional and systemic support for the administration of collaboration with the practice,
- support for cooperation with companies, state and public administration,
- strengthening the transfer of research results into practice,
- the creation of a clear, structured and priced service offer in the field of measurement, analysis, expertise, consultancy, etc. and the establishment of a status of service centres providing these services,
- developing employees' competence in intellectual property protection and awareness of business opportunities in the field,
- setting staff remuneration according to the results of the evaluation of cooperation with practice organisations/results of research transfer into practice,
- ensuring a stable system of support for the first steps in the transfer of research results,
- support for the development of existing and building new tools for cooperation with practice, innovative entrepreneurship through industry platforms, technology parks, business incubators, coworking centres, etc.

Responsibility: Rector, Vice-Rector for Science and Vice-Rector for Development

Sources of funding: operational programmes, institutional plan, institutional resources, own resources, earmarked R&D funds, foreign funds

PROCESSES FOR UNIVERSITY DEVELOPMENT – PROCESS MANAGEMENT FROM THE PERSPECTIVE OF KNOWLEDGE/TECHNOLOGY TRANSFER

The role of the university is not limited to instruction and research but also includes a third role and another academic mission, namely engagement with society. In addressing the growing social and economic challenges, research institutions everywhere are facing a growing demand to link their research and instruction expertise to this so-called third role and mission of universities. The 'third mission' is not just a phrase, but it is increasingly important in establishing relationships between academia and commerce in its various forms. Fostering the knowledge economy requires greater emphasis on the links between universities and industries and the products associated with their research.

This is a significant challenge for the newly established transfer centres (most of them established in 2012) at universities in the Czech Republic. The main initiative to change this relationship comes from the Czech government through the Ministry of Education, Youth and Sports to promote the knowledge economy and link R&D results towards the commercial sphere, as well as to link impulses, current challenges and problems addressed in the corporate sphere towards the university.

A strategy for the development of cross-sectoral collaboration and the management of intellectual property is one of the strategic documents of any organisation. This strategy is intended primarily for the internal needs of the staff and management of the organisation in order to present the future vision and goals in the long term, as well as to specify the tools to achieve them.

The basic objectives of the University of South Bohemia in České Budějovice are to:

- develop cross-sectoral research and development cooperation,
- strengthen cooperation, especially with the application sector in various forms,
- create appropriate conditions for effective knowledge transfer, which include internal process set-up and effective management of research results,
- to effectively protect intellectual property, motivate its creation, protection and handling.

For newly established universities this presents a major challenge, yet the desire to reshape this relationship comes from the government and is at the heart of its vision for creating and sustaining a knowledge economy.

THE MAIN CORE ACTIVITIES OF THE TECHNOLOGY TRANSFER OFFICE

Among the main activities of the Technology Transfer Office (see figure 3) is the comprehensive protection of intellectual property, which is at the very heart of any such centre. This area requires a specialist who oversees the sub-results of the R&D and actively handles the researchers' searches in the required areas based on the available patent databases, supervises and assists within the set internal system over the entire administrative arrangements for the acceptance of the employees'

work. He also monitors and ensures the extension of intellectual property protection through internal software for this area.

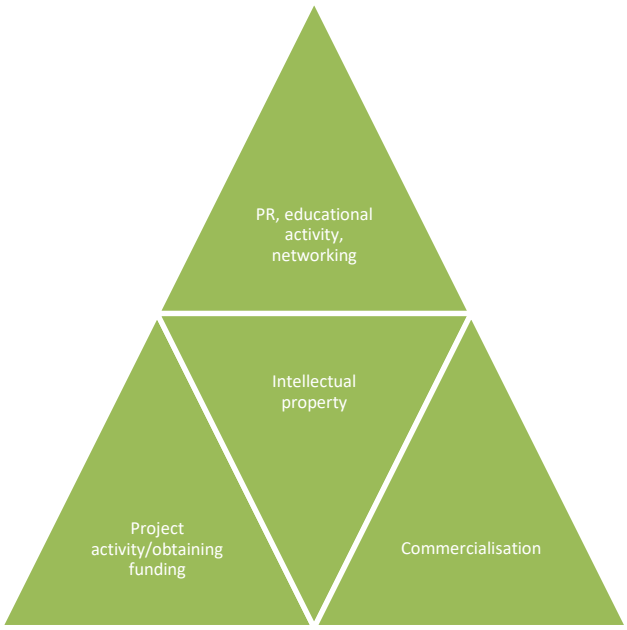
The area of intellectual property is followed by the complex area of commercialisation, which we will discuss in more detail below.

An equally necessary and important activity is the project activity focused on technology transfer. This activity is very crucial for the building and development of the office as such, but also for raising additional funds for scientists and academics, as well as further training of the office staff and the subsequent development of activities and networks not only within the university, within the region, but also at the national or international level.

Nowadays, it is impossible to imagine any effort without promotion and marketing, as well as without educational activities both towards the university and towards its surroundings. Related to educational activities is the anchoring and accreditation of a course on intellectual property protection for master's and PhD students, which is very important in terms of disseminating knowledge in this important area.

In terms of commercialisation and specificity of R&D results, an equally important role of each office is its networking within regional, national and international structures with major innovation players. This role is particularly important in the area of finding commercial entities to which the academic institution's significant R&D results could be offered. Equally, networking is important in terms of engaging and building international databases offering R&D results, sharing industry experience and examples of good and bad practice and, last but not least, for further gaining experience by increasing the internal competences of its staff.

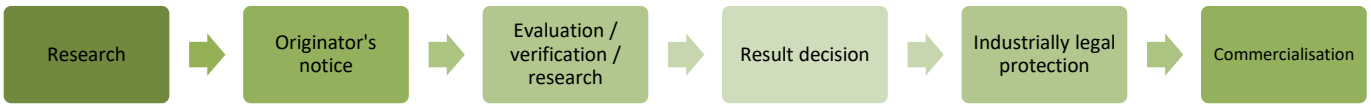
Figure 3 Diagram of the main activities of the Technology Transfer Office



Source: Štemberková, 2021

The above diagram shows the most important key areas of the Technology Transfer Office. At the centre stands the most important part of the imaginary 'heart' of any centre or office – the complex area of intellectual property, as well as project activities related to fundraising for the office itself and its development activities, as well as for researchers for PoC activities and intellectual property protection. This is followed by a comprehensive commercialisation process. The last equally important and very substantial area of PR and marketing of R&D results for commercialisation is social network development and other educational activities.

Figure 4 Basic flowchart of the technology transfer process



Source: Štemberková, 2021

Within the above diagram in figure 4, we illustrate an overview of the sub-steps within the general technology/knowledge transfer process, which comprehensively covers the whole line from the research itself to the commercialisation process.

The area of knowledge transfer or technology transfer can be divided into three key processes:

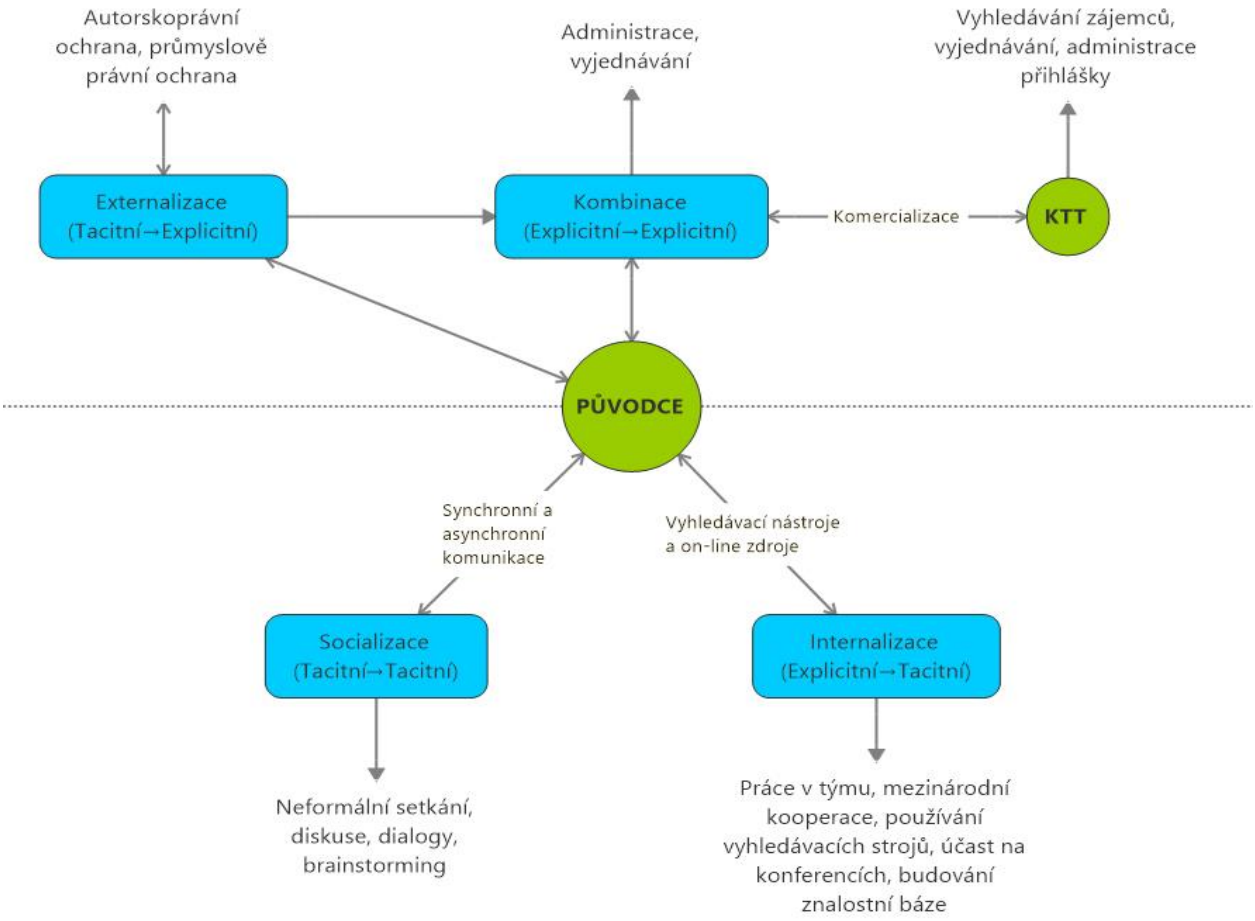
- process related to the disposal of intellectual property,
- process of proof of concept activities,
- the process of commercialisation towards the application sphere.

A/ Process related to the disposal of intellectual property

Štemberková (2019) states that 'At present, there is no professional anchoring of technology transfer management in the social sciences. The scientific discipline that has a proper theoretical basis and a link to technology transfer is knowledge management. It is based on the management of knowledge, both explicit and tacit, both of which are absolutely crucial for effective technology transfer. The interrelation and transformation of this knowledge within the discipline of knowledge management is described by the so-called SECI model (Mládková, 2013). The processes of internalization, externalization, socialization and combination are also crucial for technology transfer.

The knowledge management model is a model that explains how tacit and explicit knowledge is transformed or converted into organizational knowledge. At the centre of this model is the originator or group of co-originators, from and to whom knowledge and information flows. In the direction of externalisation, it is mainly about the disclosure of intellectual property, i.e. the conversion of tacit knowledge into explicit knowledge. In the combination process, explicit knowledge plays a dominant role, namely: the activities of the technology transfer office, the search for interested parties for R&D results and the processing of all follow-up steps. This also includes comprehensive IP protection and patent portfolio management, as well as project administration and project management.'

Figure 5 Knowledge management model for effective technology transfer ZNATechTrans – based on SECI model



Source: Štemberková, 2019

Another downstream process is the process of internalization, in which explicit knowledge is transformed into tacit knowledge. In this part we count, first of all, teamwork, selection of appropriate tools, comprehensive searches of patent literature in publicly available databases, participation in conferences and trade fairs and creation of personal contacts, etc., international cooperation.

In the next downstream process called socialization, from the perspective of technology transfer, synchronous communication, informal meetings, discussions, dialogues or brainstorming take place. It is also about establishing communication with people in general or international cooperation.

'It is therefore true for all disciplines that internalization through search tools and online resources and through teamwork, international cooperation, participation in conferences,

and thus building a knowledge base changes explicit knowledge into tacit knowledge. As such, externalisation turns tacit knowledge into explicit knowledge. A typical example is the results of R&D, whether in copyright or industrial law protection. In the course of the combination, the transfer of tacit knowledge to explicit knowledge takes place precisely during the application administration, negotiation and commercialisation process itself.

According to the diagram in figure 5, it is clear that this is a generalizing scheme that is applicable to any sub-model of sub-disciplines without differentiating them, for the reason that all these steps or parts of the model are the same and solved for all disciplines in the same way, without sub-differentiating them into humanities, engineering, or science and medicine.

A model of effective knowledge management related to the creation of intellectual property as an employee work at universities according to the structure of individual faculties and their main area of focus. The model is understood here in the context of this work as a proposal for improved procedures, processes, as a set of rules and recommendations on how to work with knowledge, intellectual property from its creation to its commercial use. The design of the model is based on the following areas:

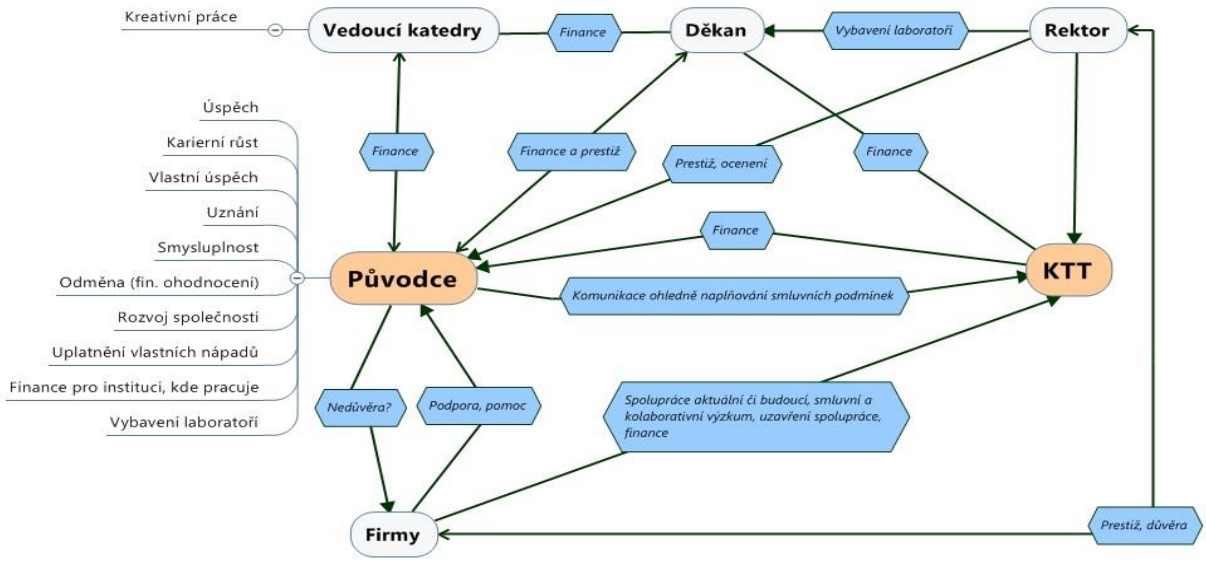
- research of knowledge management methodologies, both their original forms and modified versions applied in a specific field; the focus was particularly on working with tacit and explicit knowledge, which is also crucial for intellectual property protection,
- literature research on the state of intellectual property protection and technology transfer in the Czech Republic and worldwide, benefits, barriers and key activities,
- analysis and patenting activities at universities in the Czech Republic by faculty,
- analysis of selected internal factors of the university with the assumption of influence on patent activity at the university,
- analysis of the motivation of scientists at universities in the Czech Republic,
- analysis of the current remuneration of originators in the Czech Republic and abroad.

With considerable simplification, the main findings in these areas can be summarised as follows. In the literature search, the SECI model (Nonaka, Takeuchi; 1995) was selected as the starting point and framework for the development of the knowledge management model in the field of intellectual property protection, which in its research focuses on the transformation of different forms of knowledge, conversion and creation of knowledge in the specification of processes on both individual and organizational perspectives. This model has been modified over time by other authors and applied in different fields – Glisby and Holden (2003) and Weir and Hutchings (2005), Hofstede (2001), Gourlay (2003) and Zhu (2004).

The literature review also identifies key barriers to effective technology transfer: lack of training in the field, long approval procedures, insufficient and opaque incentive system focused primarily on research results, too frequent changes to the system, legislation and regulations, and lack of budget appropriations for technology transfer start-up costs.' (Štemberková, 2019)

In summary, the elements of motivation can be illustrated in figure 6, where they are shown in relation to the competent actors at the university.

Figure 6 Elements of motivation for academics in the field of industrial protection



Source: Štemberková, 2019

THE CURRENT SETTING OF THE PROCESS AT CZECH UNIVERSITIES

'The current state of the "common general practice" setup of technology transfer in universities in the case of the existence of a TT office is characterized by Figure 7. The originator produces the R&D result through his creative activity during his employment. Subsequently, it is necessary to evaluate, independently or with the help of the technology transfer office, whether such a result is eligible for industrial-law protection. The technology transfer office, which is set up at most universities, informs the originator of this result, and it is also advisable for the originator to inform his or her supervisor. From the date of the notification by the originator, the time limit under the Inventions Act begins to run in order to decide whether the university will accept the result as an employee work in its possession. This time limit is set by law at 3 months. This decision usually requires an opinion from the technology transfer office and a decision by the dean of the faculty where the result was created, as well as a decision by the rector of the university. The originator is then informed immediately and signs a consent to transfer the result to his/her home institution.

The employees of the technology transfer office actively address the necessary issues with the originator, agree on the procedure and make recommendations for the preparation of the actual transfer of the identified R&D result.

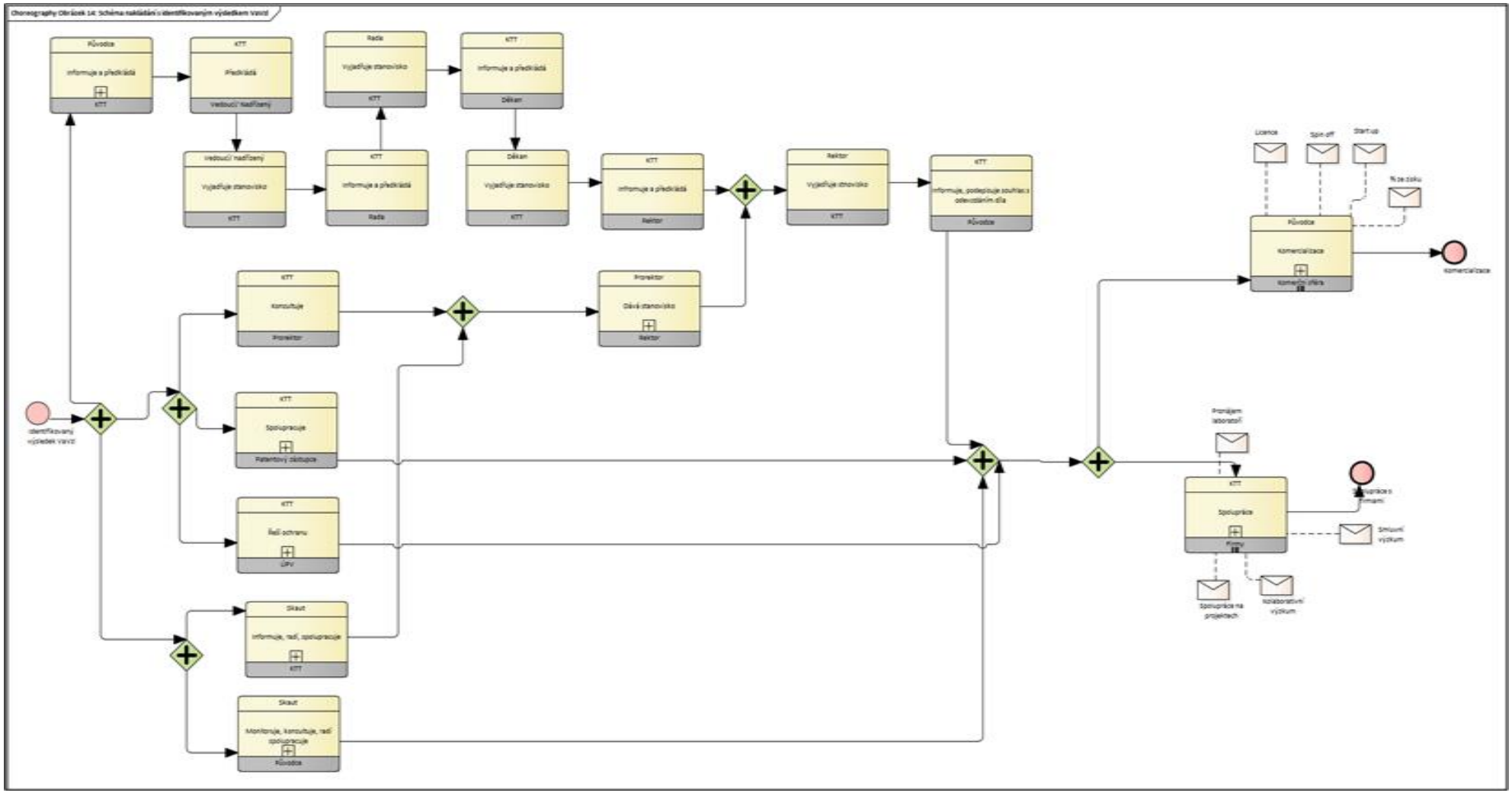
Subsequently, the technology transfer office begins to administer and prepare the required application for the selected industrial legal protection to the Industrial Property Office or hires a specialized patent office if it does not have experts in the field. If a patent office is hired, it usually communicates through the technology transfer office with the originator(s) regarding the exact description. After the

application is prepared, it is sent to the originator for final examination according to the usual practice, then filed with the Industrial Property Office and an administrative fee is paid. In the course of the procedure for granting the targeted selected protection, in the case of sent statements or other requirements, the Industrial Property Office communicates with the applicant, i.e. either through the patent office or the technology transfer office. They then communicate in the same way, if necessary, towards the originator. Once all the legal requirements have been met, industrial protection is granted and the applicant is informed. Once this information is received by the technology transfer office, it informs the originator and registers the result in its system, including the setting up of the monitoring of renewal periods. At the same time, there is usually an administrative fee associated with this action, which is again handled by the technology transfer office.

However, this is the moment that is important for the following steps related to the commercialisation of the result itself. This is the prerogative and competence of the technology transfer office, which must prepare a commercialisation plan. Subsequently, the office must identify suitable companies in the field and start communicating with them about the possible and appropriate way of commercialising the result, which may be different each time, according to the possibilities mentioned in the model. However, the cooperation with the originator(s) itself is very important in this step, because of the absolute knowledge of the R&D result itself. However, despite the links set up in this way, the results of the technology transfer offices are often below the expectations of the university management and often the inefficiency of the processes is assessed by the employees of the technology transfer offices themselves.

From the point of view of sustainability of the commercialisation system set up at the University of South Bohemia in České Budějovice, it can be stated that the commercialisation system is set up in a functional and nowadays well-tested and proven way for the needs of the university, however, it is necessary to address the sustainability of financial resources for the area of knowledge transfer in the future years also with regard to its greater consolidation and establishment at the national level in strategic governmental and legislative policies, laws and standards. According to past practice, there are scientific research institutions that finance technology/knowledge transfer more from their own resources and then scientific research institutions that still use tripling from other sources - especially project sources. It is quite obvious that in the future a balance will have to be found between these possibilities of sourcing or financial support and thus the development of technology/knowledge transfer.

Figure 7 Technology transfer – general key practice



Source: Štemberková, 2019

In summary, it seems crucial to support these sites throughout the process:

- the originator / group of co-originators – his/her/their motivation – i.e. to ensure the administration related to the protection of the intellectual property itself and to ensure links to experts and leaders in the field for possible follow-up work,
- the workplace of the originator/co-guides - here is very crucial: a well-functioning team - a working collective with a transparent overview of internal rules, an environment of support and motivation, related adequate equipment of their workplaces for a good background for their work,
- technology transfer office – good knowledge of internal processes for dealing with intangible goods, clearly defined notification of the creation of an employee's work (R&D result) that needs to be addressed in terms of intellectual property protection and determination of the appropriate type of industrial-legal protection, conducting a search on freely accessible searchable databases and evaluation of novelty and industrial applicability,
- commercialisation process - to approach suitable application partners in the field with the protected result and offer them the R&D result, then communicate and facilitate the conclusion of a contractual relationship or possible follow-up mutual cooperation. In the case of concluding a contractual relationship, the main task of the technology transfer office is to monitor the fulfilment of the individual points concluded on the part of the scientific research organisation towards the application partner, and vice versa,
- cooperation with other scientific teams (internal, national and international); with regard to the given R&D result, look for the possibility of linking to other teams in the given field or a necessary follow-up field at national or international level for its possible further development or extension, increase the possibilities of its use, etc.
- in relation to the above points, the position of technology scouts (or the selection of staff for this responsible position) needs to be considered in relation to their effectiveness in the overall process. From past experience, some scouts function seamlessly and with their own passion/activity/commitment, some do not actively perform the position. However, this particular position can very effectively influence the development and support of technology transfer or knowledge transfer in general, the capture of interesting R&D results for the actual transfer at the faculty in question and last but not least, foster the passion of researchers and academics throughout the process.

The key knowledge in the whole model is:

- knowledge related to the R&D result itself – i.e. its content, uniqueness, novelty and uniqueness, industrial applicability, searches in available databases to verify the novelty and uniqueness of the resulting R&D result,
- protection of the resulting intellectual property - expert evaluation and knowledge of whether it will be protected by a utility model, patent, trademark or other form of industrial law protection, where the patent will be filed and whether any extension of its protection to other countries will be claimed within the time limit,
- handling of the R&D result in the process of commercialisation - knowledge of the size of the potential market, possible customers, possibilities of concluding a contractual relationship and

under what conditions, in case of concluding an agreed contractual relationship - monitoring the fulfilment of individual set conditions.

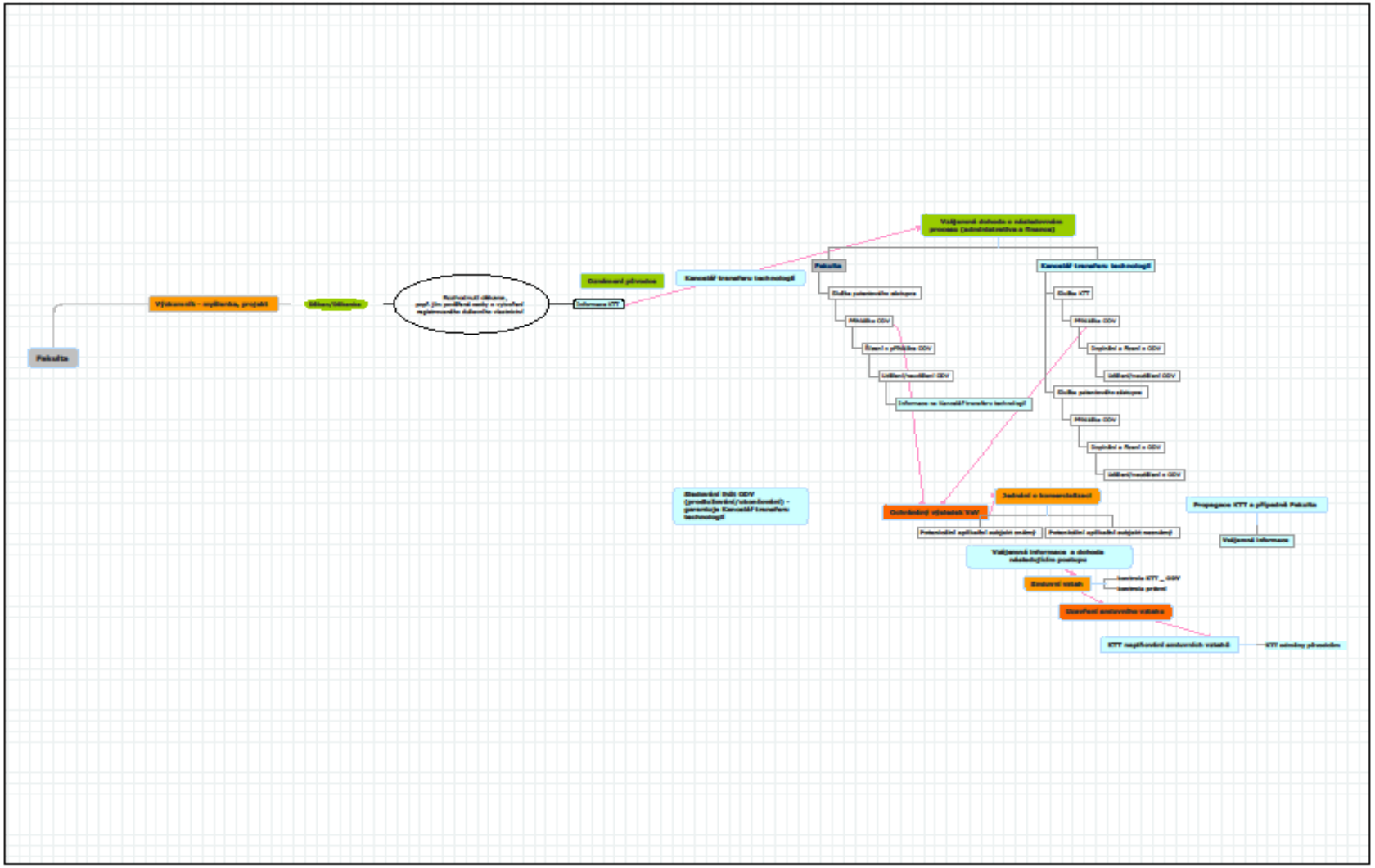
The key processes are:

- internal process for notification of the creation of an employee work,
- internal process for accepting/rejecting reported employee work,
- the process of protecting intellectual property,
- the process of commercialisation.' (Štemberková 2019)

At the University of South Bohemia, we based the Technology Transfer Office on the above general proposal for a model for the key technology transfer process. The currently discussed and approved model at the University of South Bohemia is presented below. This model is supplemented by the possibility of faculty advancement through their faculty staff – technology scouts, who are part of the Technology Transfer Office, but have the obligation to report on the comprehensive advancement and partial results of the development on an ongoing and continuous basis.

With regard to the development of the national platform for technology transfer in the Czech Republic with the name Transfera.cz since 2014, there is more and more use among its members for regular exchange of information, advice, expert consultations, raising awareness of the cases that individual representatives solve, as well as sharing good and bad practice. It is certainly thanks to this national networking, also thanks to this existing and by now established platform, that the current setting of the process in Czech universities is being deepened and consolidated.

Figure 8 Model for the TT key procedure at USB



B/ Proof of concept process

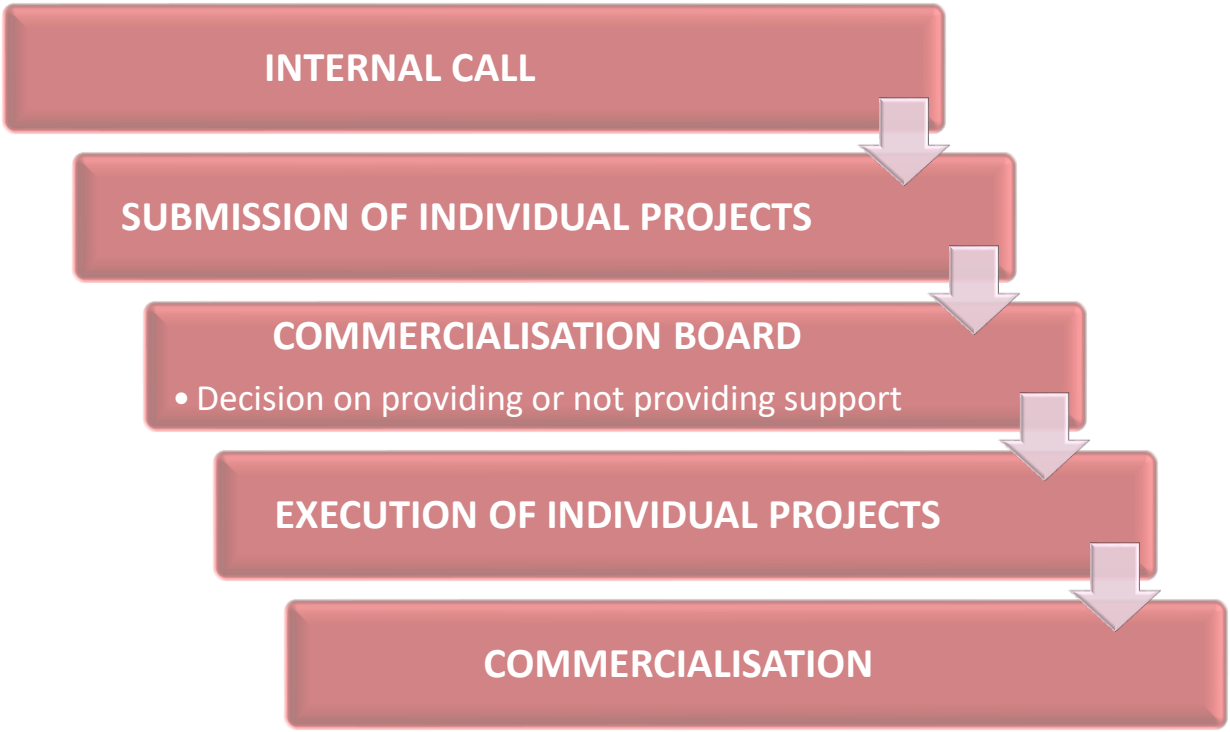
Proof of Concept (PoC) is a phase where a concept/idea or theory is verified as having the potential for application and establishment in the real world. PoC is therefore evidence that a project or product is feasible and sufficiently proven to 'justify' the costs required to support and develop it to some extent. A PoC is therefore to some extent a prototype that is intended to determine feasibility. In most cases, this validation is required by investors who need tangible proof that the launch of their subsequent business proposal can guarantee a healthy return on investment. Project managers use PoC to identify gaps in processes that could prevent the product from succeeding. It is therefore a very important intermediate step in the commercialisation process itself, leading to a successful eventual subsequent contractual transaction, providing both partners with significant certainty in the functionality and feasibility and applicability of the R&D result.

The whole process is covered and administered by the Technology Transfer Office of the University of South Bohemia (TTO USB), which is responsible for this area, among others. First of all, an internal call is launched within the University of South Bohemia with the specification of conditions (in particular the maximum required budget, the duration of the sub-project, the outputs of the sub-project, the structure of eligible costs, etc.). In the course of the call, the TTO USB reviews, consults and recommends project proposals to the researchers. As a rule, TTO USB also organises an informative seminar for the submission of sub-projects and on the detailed rules of the call, which is usually of great interest. After the end of the internal call, an administrative compliance check is carried out and, if necessary, additional documents are requested. In addition, the TTO USB performs a preliminary check of the patent databases for novelty as well as a search of the current project databases. The TTO USB verifies by means of the search the commercial potential of the future application of the proposed R&D result to be verified. Subsequently, all partial projects are submitted for decision to the so-called Commercialisation Board, in which one third of the members are representatives of the commercial sphere, the financial sphere and the scientific sphere of the USB. The decision of the Commercialisation Board (recommendation/non-recommendation) is communicated to the research teams.

The TTO USB communicates with the research teams that implement their PoC activities throughout the entire duration of the sub-project, which comprehensively ensures the administration of the entire sub-project (dealing with orders, invoices, advice and consultation, etc.). The Commercialisation Board approves quarterly reports, changes to sub-projects, and evaluates the implementation of the verified R&D results during the sub-project.

Subsequently, the Technology Transfer Office commercialises the results of R&D to application entities through various instruments (licences, spin-off companies, contract or collaborative research, etc.).

Figure 9 Process of PoC activities at USB



What happens after the PoC proof of concept is completed, again using the example of the University of South Bohemia

After the completion of the sub-project implementation, the TTO USB requires from the principal investigator, according to the conditions of the financial support allocation, a final report, the result/results of the PoC activity intended for commercialisation, identification of areas and companies for commercialisation; this activity is also related to the discussion of the method and form of commercialisation.

Following the submission of the final report and the required documents (see above), TTO USB publishes the results for commercialisation on its website and in project databases where the latest technologies are presented (jctt.cz, HKTD, IPI, Transfera database, etc.). In parallel, the commercialisation manager approaches companies in the field and initiates negotiations with representatives of the commercial sphere. Once a year, the principal investigator, in cooperation with the head of the TTO USB, presents the progress of the implementation to the Commercialisation Board.

SUSTAINABILITY PLAN FOR THE COMMERCIALISATION SYSTEM AT THE UNIVERSITY OF SOUTH BOHEMIA IN ČESKÉ BUDĚJOVICE

In terms of the long-term sustainability plan of the commercialisation system, the result of R&D is recorded in the internal documentation system of TTO USB and in the system of software for tracking intellectual property of the University of South Bohemia, which monitors both the complete documentation of intellectual property of the University of South Bohemia and economic statistics, or all financial costs related to this issue, including possible commercial application. This record is kept from the moment of identification of commercial potential onwards. At the same time, the head of the TTO USB uses this system to involve the necessary specialists in the sub-projects, delegate tasks, monitor outputs and at the same time evaluate the progress and performance of the sub-projects. All this with the aim of applying the results in commercial practice. Information on the progress of commercialisation of results is provided by the head of the TTO USB to the Vice-Rector for R&D and to the members of the Commercialisation Board in the form of regular interim reports. If the commercialisation is successfully completed and generates a profit, it is proceeded according to the applicable internal guidelines and the distribution of the commercialisation income is carried out according to the Rector's measure on the disposal of intangible assets R 493_2022. At this stage, communication with the research team and subsequent communication at the regular monthly meetings of the TTO USB is crucial.

TTO USB provides the following activities within the implementation period:

- costs including marketing and promotion of R&D results,
- targeted contacts and negotiations with companies (licensing negotiations, etc.),
- presentations at exhibitions and trade fairs,
- operating material,

- fees for access to databases, clusters and platforms,
- if necessary, the professional services of external experts,
- PR –on web platforms Jctt.cz, IPI Singapore, HKTD, Transfera.cz, DEIP, etc.

C/ Commercialisation process

The commercialisation process is generally defined as the process of turning an idea into commercial products or services. For most scientific research institutions, this means commercially developing the intellectual property (IP) that has been created as part of the research, with the aim of producing successful commercial outcomes that have a positive impact for wider application in society. This is usually achieved through commercial licensing of the IP to an existing commercial organisation or the creation of a new spin-off company to ensure the distribution of new products or services to the market, etc.

From the point of view of the current activities of the TTO USB, we can state that within the framework of intersectoral cooperation and knowledge/technology transfer, the following activities are being implemented:

- Research conducted in collaboration with application partners. This is especially research where the application partner is known in advance, is interested in the future results and actively collaborates on them. These research activities are mainly funded by the application partner.
- Consultancy, expert activities. It is mostly carried out on request by the application sphere, e.g. state administration. These are R&D results that have been produced over several years of research.
- Putting the results of independent research into practice. This is the area of knowledge/technology transfer. Such R&D results usually arise in the framework of independent research or PoC activities and the application partner is not known in advance and must be found in a suitable way. The rights are usually granted in the form of a licensing agreement, establishment of a start-up or spin-off company, etc.
- Knowledge mobility in the form of staff intersectoral mobility. This is where the application partner acquires skilled staff in addition to the results of the joint project. Most of the mobilities so far are between research institutions and a smaller part of the mobilities are with the application sector.

SUMMARY

The main goal of every public university, including the University of South Bohemia, is to conduct quality scientific research that reflects the current and predictable needs of society, in addition to teaching. An integral part of this mission is to support the wide use of research results in practice through knowledge/technology transfer. The following important aspects of cross-sectoral collaboration and knowledge transfer are among those to be supported.

Social relevance. The area of knowledge transfer should also be seen in the context of the responsibility of the scientific community towards society in general. Given the fact that scientific research is publicly funded, the scientific community has a societal responsibility to help ensure that the potential of R&D results is beneficial to society and ideally also becomes beneficial. By applicability we mean in the broadest sense, including the application of R&D results within the non-commercial sphere, not only in the sense of pure commercialisation with financial benefit.

Funding source. A significant motivating factor is the prospect of financial revenue from commercialisation. In this context, it is important to mention the fact that this is both a financial incentive for the originator(s)/co-inventor(s) themselves and a financial support for the continued scientific endeavours of the originator(s)/co-inventor(s)' department.

Promotion. The popularisation of science and specific R&D results towards society is crucial for cultivating the environment and public perception that public universities or research institutions can generate usable results in practice. Promotion in the public media is generally perceived positively among the originators and co-researchers themselves, as it raises the profile of their scientific team, the results of their work and the institution within which the results are generated at regional, national or international level. Positive perception of the benefits of science is another important factor for transfer efforts and their support by government and other institutions.

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