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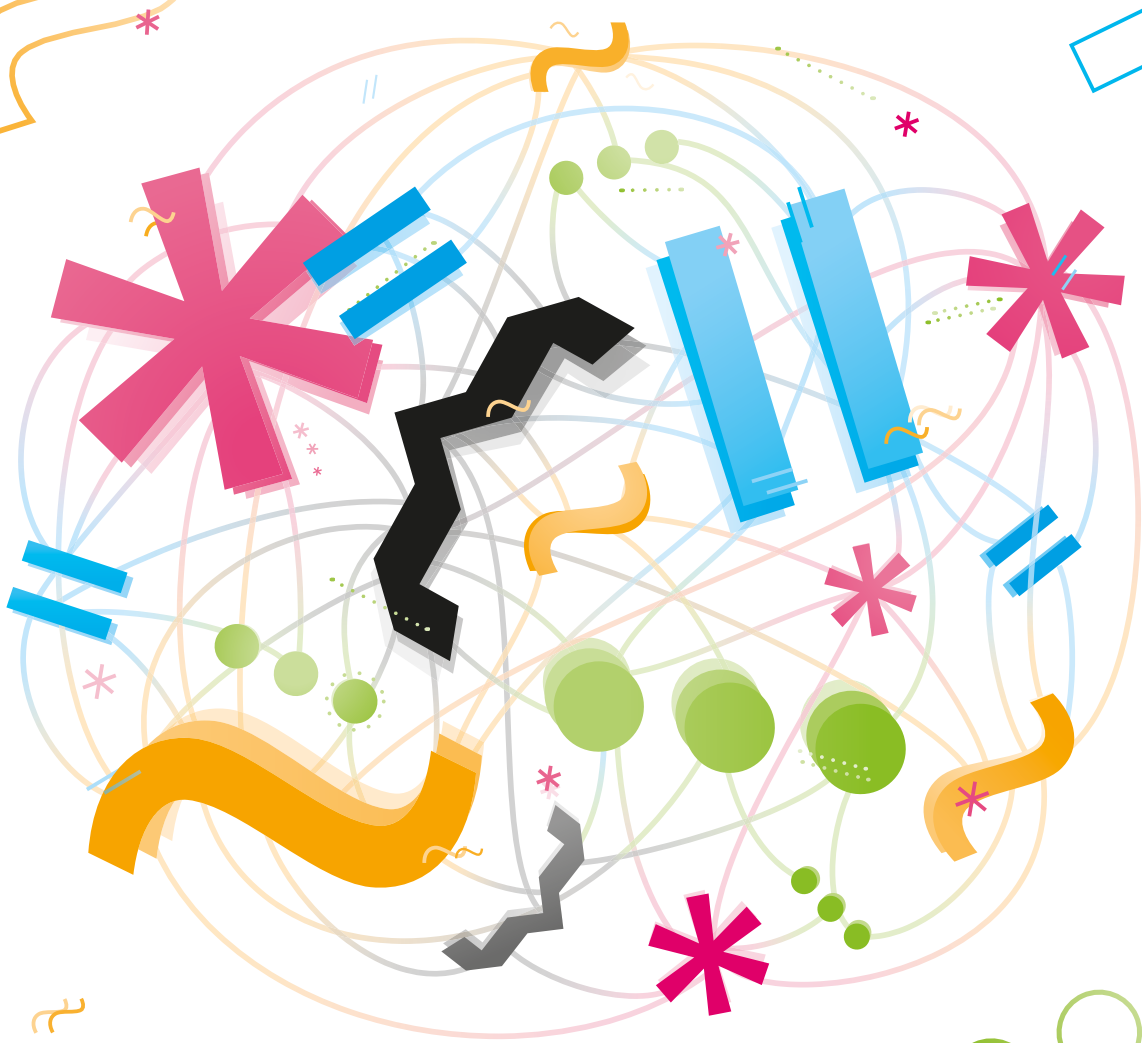
M09 Technology Transfer Process at the University of Hradec Králové

Study material



University of Hradec Králové

TECHNICAL UNIVERSITY OF KOŠICE

UNIVERSIDAD DE GRANADA

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Introduction

The module focuses on two areas related to technology transfer. The first area focuses on explaining the importance and link between R&D and technology transfer, in general knowledge. The definition of technology transfer is followed by a description of the three-step transfer process. This starts with the identification of promising R&D projects, followed by the process of reformulating the achieved scientific results into technology for non-academic applications. In the last phase, the key part – commercialization – is followed by the presentation of the applied research results of the academic research to potential investors. The second area of the module presents the technology transfer process implemented and described by the Rector's decree at the University of Hradec Kralove. The procedure guides the manager from the moment the result is generated by the originator through its registration, assessment of its potential, the commercialization project to the renewal of the existing types of intellectual property protection.

Keywords

- Technology Transfer, Technology Transfer Process, Technology Transfer Model, Technology transfer Management, Intellectual Property.

Results of creative activity

The aim of research and development is always new knowledge, but generally, the results of creative activity other than research and experimental development (R&D) can also be protected. These are produced by creative and systematic work to increase the level of knowledge, including knowledge of humanity, culture, and society, and to propose new ways of applying available knowledge (OECD, 2015).

R&D is therefore typically characterized by the need to meet five basic criteria:

- it must contain an element of novelty,
- it must be creative,
- it must contain an element of uncertainty,
- it must be systematic,
- it must be transferable and/or reproducible.

Not all results of creative activity have to meet the conditions of R&D. What is and is not considered R&D can be demonstrated, for example, in the field of software. The software development component can be classified as R&D only if it leads to advances in computer software. The following examples illustrate the concept of R&D in computer programs according to (OECD, 2015):

- development of new operating systems and languages,
- design and implementation of new search engines based on original technologies,
- effort to resolve conflicts within hardware or software, based on the process of system or network transformation,
- creating new or more efficient algorithms based on new techniques,
- creating new and original coding or security techniques.

The examples of computer software activities to be excluded from R&D are as follows:

- software development of business applications and information systems using the well-known methods and existing software tools,
- adding user functionality to the existing application programs (including basic data input functionality),
- development of web pages or software using the existing tools.

Software may or may not be the result of R&D, but it can be copyrighted regardless of it. The design of an "ordinary" website does not fall under R&D as it does not advance the field. Again, however, it may be protected by industrial design and other reserved rights.

R&D results	**Results of scientific research activities**	**Area of creative activity**	**Intended object of protection**	**The appropriate method of protection**
R (if the conditions above are met)	Software	Information technologies	Source code	Copyright

Not R&D	Web page	Webdesign	Graphical display of the website	Industrial law
J	Research article (peer-reviewed in a research journal)	Science in its broad sense	Form of expression of the professional topic	Copyright

Table 1: An illustration of the concept of R&D results and outputs of creative activity

Focusing only on R&D may lead to the omission of the results of creative activity that can be protected.

With copyright, protection arises immediately and applies to works of authorship defined as follows:

- literary work,
- other work of art – dramatic, choreographic, mime, film, music, visual, photographic, sculptural, graphic, pictorial, or cartographic,
- research study,
- a computer program, a photograph, and a work expressed by a process similar to photography, which are original in the sense that they are the author's intellectual creation,
- a collection of independent works (magazine, etc.),
- a database which is the author's intellectual creation by way of selection or arrangement of the content, the components of which are systematically or methodically arranged
- and individually made available electronically or by other means, is a collective work.

Nevertheless, the main importance of technology transfer is due to the application for the establishment of intellectual property protection on the issue of industrial law.

Type of protection	Protection period	Extension of protection	Terms and conditions of protection	Cannot be protected
Patent	usually up to 4 years	up to 20x1 year	The inventions which are novel in the world are the result of inventive activity, i.e., if they are not obvious to an expert, and are capable of industrial application.	Discoveries, scientific theories, and mathematical methods, aesthetic creations, plans, rules, and methods of performing an intellectual activity, playing games or conducting business, as well as computer programs and the mere giving of information.

Type of protection	Protection period	Extension of protection	Terms and conditions of protection	Cannot be protected
Utility model	4 years	2x3 years	The novel technical solutions, go beyond mere technical skills and are industrially applicable – in particular equipment, wiring, products, machines, tools, chemical compounds.	Discoveries, scientific theories, mathematical methods, mere external modifications of products, plans, rules and methods of carrying out the intellectual activity, computer programs, the mere presentation of information, technical solutions which are contrary to general interests, in particular to the principles of humanity and public morality, plant varieties and animal breeds, as well as biological reproductive materials, methods of production or working activities (protected by patents).
Industrial design	5 years	4x5 years	The appearance of the product or its parts, consisting in particular of the lines, contours, colors, shape, structure, or material of the product itself or its decoration if it is of an individual nature (if the overall impression it gives to the informed user differs from the overall impression given to such user by an industrial design which was made available to the public before the date of filling out the application or before the date of priority).	Technical and design solution, the transfer of a known external modification of a product to a product of another kind, or a modification produced by enlarging or reducing the well-known external modification of the product, the substitution of material for the external modification of the product, architectural design of the building (can be protected by copyright), external modification of the product, detectable only with special attention, color, unless used in conjunction with the shape, outline or drawing, functional principles or material composition.
Topography of semiconductor products	15 years		The topographies of semiconductor products which are the result of the creative activity of the originator and which are not common in the semiconductor industry.	

Type of protection	Protection period	Extension of protection	Terms and conditions of protection	Cannot be protected
Plant varieties and animal breeds	25 up to 30 years		In the case of a new variety, the variety which is different from the existing varieties and if it shows stability.	
Trademark	10 years	unrestricted x10 years	A label capable of graphic representation, in particular words, including personal names, colors, drawings, letters, numerals, the shape of the product or its packaging, if the label is capable of distinguishing the products or services of one person from another.	
Business company	unrestricted		The name under which the entrepreneur is registered in the Commercial Register and under which s/he is obliged to perform legal acts.	
Designation of origin	unrestricted		If the quality or characteristics of the labeled goods are exclusively or predominantly due to the specific geographical environment with its characteristic natural and human factors and if the production, processing, and preparation of such goods take place in the designated territory.	
Geographical indication	unrestricted		The goods originating in that territory if those goods have a certain quality, reputation, or other characteristics attributable to that geographical origin and if the production or processing or preparation of such goods takes place in the designated territory.	

Table 2: An overview of the institutes of industrial law

The process of knowledge and technology transfer at UHK

For clarity, it is useful to describe the process in a structured way so that it is clear what the university employee is expected to do to become an originator of employee work. The Office of Science and Knowledge Transfer (OSKT) and the Technology Transfer Office (TTO) are particularly helpful in this matter. The different stakeholders involved in this process (e.g., the OSKT, the Dean of the Faculty, the head of the originator's department, etc.) may have slightly different responsibilities at each university or their tasks may be arranged in a slightly modified order. The following stakeholders are involved in this whole process:

- Originator – a natural person in an employment or other similar employment relationship with the university who has participated in the creation of the object of the industrial property.
- OSKT – a coordinator of the whole process (ensuring the protection of the intellectual property and the implementation of all identified activities necessary for the commercialization process).
- The Intellectual Property Evaluation Committee (hereafter referred to as the "Evaluation Committee"), assesses the quality of the notified result and recommends exercising or denying the rights to the result. It also proposes the appropriate form of intellectual property protection.
- Commercialization Board – among other things, assesses the applied results, whether or not they should be commercialized.
- Rector – decides whether the university will exercise the rights to the result.

The process itself can be described in five stages:

Creation and notification

1. The originator produced an R&D result that the originator believes could be commercialized, or at least should be protected.
2. The originator notifies in writing the creation of the result to OSKT by submitting the Notification Form of the Result of Research and Development to the Administrator of Science and Research projects. A sample table is provided for completion.

Check and proposal

3. The Administrator of Science and Research projects carries out a formal check and registers it.
4. The TTO then considers the inclusion of the result on the agenda of the Evaluation Committee on the exercise of rights to the R&D result.

Assessment

5. Upon inclusion on the agenda of the Evaluation Committee, the Committee makes a recommendation to exercise or not to exercise the UHK right. In the latter case, it shall propose an appropriate form of intellectual property protection.

Decision

6. Based on the recommendation of the Evaluation Committee, the Rector will decide on the exercise of the rights of the UHK to a given result. In the case of an improvement proposal, s/he will do so within 2 months at the latest, in other cases within 3 months.

Recording the result

7. The originator will create a result record in the Personal Bibliographic Database (PBD) if required at this stage.

This step does not end the whole process, but in fact, it is only just becoming more realistic, as the result is officially taken under the administration of the university and the chosen forms of protection need to be written up in compliance with formal criteria and filed with the relevant industrial property office (patent, utility or industrial design, or trademark) or registered in the Personal Bibliographic Database – PBD (software, functional sample or prototype, etc.). In this step, the result is further implemented and refined can be submitted to the Commercialization Board (hereinafter referred to as the "Board") for consideration whether or not to commercialize the result.

The steps are as follows:

Decision on commercialization

1. Convening a Commercialization Board to consider the proposal.
2. If the Board decides to commercialize, the Vice-Rector for Research and Creative Activities will approach eligible persons to develop a commercialization project.

Commercialization project

3. Within 2 months of the Rector's positive decision, the commercialization project is prepared.

Agreements

4. This is followed by the creation of a cooperation agreement and an agreement for the use of the results.
5. The originator is invited to conclude a cooperation agreement with UHK and to cooperate in the preparation of the agreement on the use of the results (UHK and the other party, if any).
6. The agreements are checked by the lawyer, approved by the Vice-Rector and forwarded for the Rector's signature.
7. The signed agreements are handed over in original to each party.

In the case of exercising the right of the UHK to the R&D result, the originator is entitled to a one-off remuneration according to Rector's Decree 17/2020. The remuneration shall be divided among any co-inventors according to the share of the originator stated in the R&D result notification. The decision of the Rector of the UHK to grant the remuneration for the exercise of the UHK right to the R&D result is preceded by the approval of the Vice-Rector for Science and Creative Activities. The reward will be paid as part of the salary. Its amount depends on the type of result, the share, the point value in a given year, and, in general, on the internal regulation of the Criteria for the Evaluation of Research Work at the relevant faculty.

The process itself is described point by point and summarised below:

1. Once an employee has achieved a research and development result that s/he believes may be commercializable, or at least should be protected (so as not to alienate an idea that may be transferable in the future),
2. s/he must notify the TTO in writing of the creation of such a result by submitting a fully completed form entitled „Notification of the R&D Result" („Notification").
3. The employee has a duty to the employer to notify this and becomes the originator of the result. The main part of the form is in the form of a table:

Notification of the R&D Result			
		To be completed by the originator	Explanations of TTO
1.	Name of the result		
2.	Field of the result		
3.	Originator and co-originators, the share of intellectual contribution of each co-originator		
4.	Contact person authorized to act for the co-originator		
5.	Description of the result		
6.	Description of the research and scientific work carried out on the result, including information on the time and place of achievement of the result		
7.	Advantages of the result compared to the status quo		
8.	Disadvantages of the result compared to the status quo		
9.	Potential use (areas, stakeholders, demand)		
10.	Method and time of publication of the result		
11.	Demonstration of novelty		
12.	Readiness for use (steps to be taken for practical use, description of follow-up research and development)		
13.	Proposed method of protection or contractual use and features of the new solution to be protected or used		
14.	Related project (if subsidy or support has been provided)		
15.	Supporting materials to be attached (texts, drawings, graphs, performance data, reports, agreement between co-originators)		
16.	Form and location of the documentation of the result		

Table 3: Notification of the R&D Result

4. The completed Notification will be sent by the originator to the OSKT, currently to the Administrator for Science and Research Projects (as of 2022, Ing. Jana Kukáková). This notification is the formal start of the OSKT activities.

5. The first activity is to perform a formal check of the Notification and confirm its receipt. In case of need for modification or completion, the OSKT will contact the originator. Then the OSKT will register it and assign a registration number. The Notification contains all the necessary information for the further process, in particular the legal protection of the result itself.

6. On the date of receipt of the Notification, the inclusion of the result in the decision of the Evaluation Committee can be addressed.

    a. In the case of an obvious exercise of rights to the R&D result due to the planned output of the scientific research project, the TTO may decide not to use the procedure for convening the Evaluation Committee. In this case, the recommendation of the Committee and the proposal of an appropriate form of IP protection is replaced by the recommendation of the Vice-Rector for Science and Creative Activities. Steps for convening the Committee, evaluation, and the decision on the recommendation are then skipped and the Administrator for Science and Research projects will forward it, based on the recommendation of the Vice-Rector for Science and Creative Activities, to the Office for the final decision of the Rector.

    b. The OSKT can begin to plan the date and often the composition of the Committee that is to decide on a recommendation to the Rector of the university on the application of the law to the submitted result. The Committee is usually composed of representatives of the OSKT as well as of the faculty responsible for reporting the result (originators) and representatives of the Rector's Office. The OSKT is to make a recommendation to the Committee on the suitability of selected types of protection (usually patent or copyright) and may request an assessment of patentability (i.e., novelty) from the patent attorney (patent office). The composition of the Committee is usually formed with regard to the field in which the result has been produced, and the assessment of a patent attorney or an expert in the field is usually provided.

7. The Committee will assess the quality of the notified R&D result and recommend the exercise or refusal of the rights to the R&D result in question. In the case of a recommendation to exercise the UHK right, the Committee will propose an appropriate form of intellectual property protection, e.g., a patent or utility model. However, this does not say what scope of patent protection the patent should cover, as this is subject to further searches and specifications of the patent claims and an assessment of the differences of the result against a selected portfolio of national, European PCA, or worldwide patents. It should also be noted here that the patent protection in one country does not guarantee protection in another country, i.e., a patent valid in the Czech Republic has no validity, e.g., in Slovakia. Another parameter that should be assessed by the Evaluation Committee is the appropriate

form of protection, especially in terms of not disclosing the know-how, since the aim is not the intellectual protection of the result itself, but commercialization, e.g., in the form of a license or purchase of rights. Here, one of the appropriate instruments appears to be the filing of a patent application, which is not published and which, in the case of the Industrial Property Office of the Czech Republic (hereinafter referred to as the „IPO"), is usually examined for one year, a full search is carried out, often the originator is invited to supplement or modify the patent claims, and only after this period, which involves a longer process, is the patent granted, with its validity starting from its publication in the IPO Bulletin. Until this time, the patent application can be withdrawn, which represents an interesting option for negotiating the sale of know-how to a commercial buyer, since until the time of publication of the patent application, the content is still unknown and therefore cannot be misused/copied by anyone or a competitor. Therefore, if the university sells it to a company, the patent does not have to be published and therefore there is no risk of misuse of the patent. Another aspect is the appropriate breadth of the portfolio that will be used to protect the outcome. For example, for a software algorithm, protection can be used in the form of a patent (where it must be proven that the algorithm works) and also in the form of R-SW, which is not registered with the IPO or other patent offices but is registered in PBD and RIR. This is another level of notification of the result within the project implementation, where for applied outputs of this form it is also possible to use the form of notification by entering it into the PBD, where the output is entered by the originator and submitted for review by the PBD administrator, who is obliged for applied outputs to request the cooperation of the TTO, which then proceeds in the standard way.

8. The final recommendation of the Committee, including the proposed form of intellectual property protection, will be forwarded by the Administrator of the Science and Research projects to the Office for the Rector's final decision on the exercise of the UHK right to the R&D result.
9. The Rector will decide whether the UHK will exercise its rights to the result. In the case of an improvement proposal, s/he shall do so within 2 months at the latest, in other cases within 3 months of the submission of a complete Notification. The originator is then entitled to remuneration for the implementation of the result, specific to the type of protection and the university where the Notification is filed and the rights to it are exercised. Of course, if the university does not exercise the rights, then the right reverts to the originator. Both the originator and the university as the employer are obliged to maintain confidentiality with third parties about the offered knowledge during this period.
10. PBD – The originator shall make a notification of the result in PBD if required at this stage.

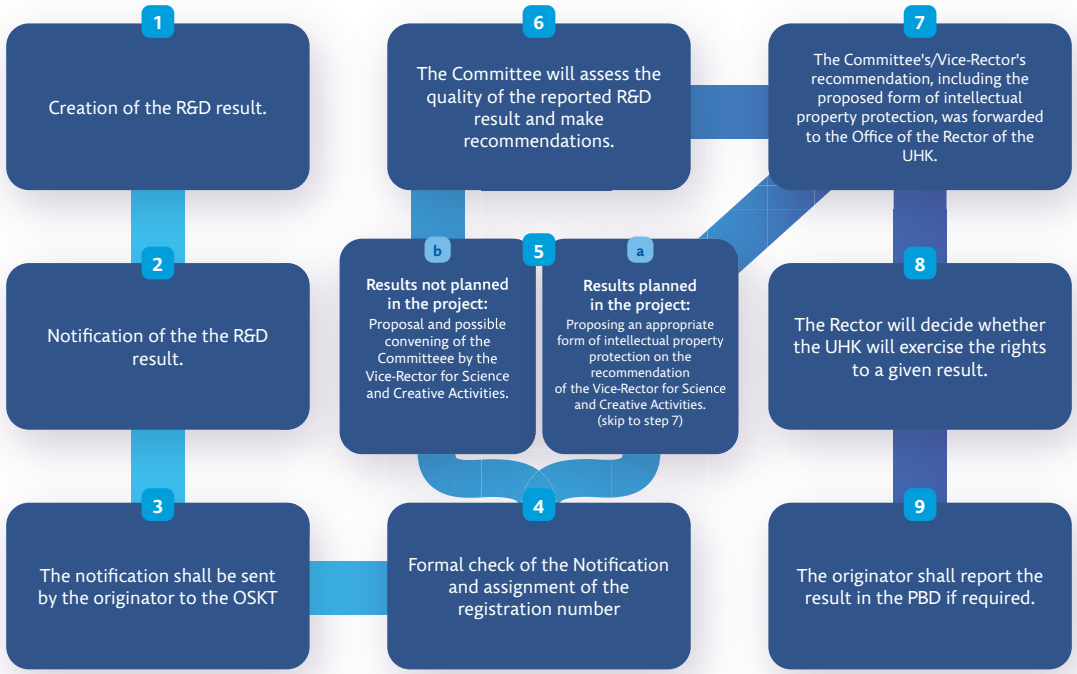


Figure 1: Diagram of the sequence of steps after the creation of the result

1. The Project and Finance Manager (as of 2022, Ing. Dana Jirousková) will convene the Board and submit the R&D results to it for consideration in terms of commercialization (in her absence, she will be replaced by the Coordinator for Science and Research Projects, as of 2022, Ing. Veronika Hrůzová). The timing of convening the Board depends on the commercialization potential of the result, which is not easy to assess. The ideal case may be the existence of an interested party or the potential for the creation of a company where the result would be further developed (e.g., StartUP).
2. If the Board decides on commercialization, the Project and Finance Manager in collaboration with the Vice-Rector for Research and Creative Activities will approach eligible persons to develop a commercialization project. Probably the most important factor in the Board's decision is the chance of real commercialization. Therefore, considerable care must be taken in preparing these documents. Just a very basic example of the possible direction of considerations at this stage is:
    a. When targeting the product sales, the manufacturing price is usually considered as 50 % of the final selling price. Let us not forget that the price of components decreases with the number of products produced, and of course, the product life cycle must also be planned – for example, to ensure that components are available throughout the implementation (production and life cycle). Therefore, this is related to the real possibility of commercial interest in the result to be produced.

b. The sale of the result as a lump sum payment: when setting the market price, it is appropriate to base the price on the market research carried out before the submission of the project, of which the result is output (if it exists). Further consideration should be given to the potential for the outcome to contribute to the increased sales to the company that would buy it.

c. For example, the company would increase sales by about 10 million CZK per year. The usual royalty rate for know-how is between 1-4 % of the final sales price of the products. Let us consider 2.5 % of 10 million CZK, which is 250 thousand CZK. Furthermore, the planned timeframe for a market lifetime is, e.g., 10 years. The price for the sale of know-how (or exclusive license) would then be approx. 2.5 mil. CZK.

3. The commercialization project will be prepared by eligible persons within 2 months from the moment of the Rector's positive decision on the exercise of the UHK right to the R&D result. As a rule, the commercialization project proposal must contain the following information:

   - designation of the result of research (technology, invention, improvement proposal, computer program, database, etc.);
   - the chosen methods of the legal protection of the result of variant methods of legal protection;
   - the planned way of commercialization application, variations and financial frameworks for the planned commercialization models, at least licensing models;
   - planned steps of technical, market, commercial nature for the planned increase of the value of the scientific result for commercial exploitation (e.g., proof of concept activities, verification of demand in target markets);
   - a time and financial plan, including sources of funding, for the implementation of the above steps;
   - a substantive or, where appropriate, a timetable for further action, including ‚STOP/GO' decision points;
   - information on the co-ownership structure, previously used and planned sources of financing, and their terms;
   - an overview of the existing contractual relationships and planned contracts;
   - the terms and conditions of cooperation, the considered benefits, and their implications for the contractual terms if the intention is to set up a spin-off company.

4. Based on the results of the Board's recommendations, the Project and Finance Manager will prepare a collaboration agreement and a contract for the exploitation of the results (if required by the project) and will arrange for a review and the opinion of the legal department.

5. The Project and Finance Manager will invite the originator to conclude a cooperation agreement (contract between the originators of the R&D result and the UHK) and cooperation in the preparation of a contract for the exploitation of the result (contract between the UHK and the other party, the contract regulates, inter alia, the share of property rights to the intellectual property of the participating project partners).
6. The Project and Finance Manager will submit the formally checked contracts and attached documents to the Vice-Rector for Research and Creative Activities for his/her approval.
7. The agreements and the attached documents, approved by the Vice-Rector for Science and Creative Activities, will be forwarded by the Project and Financial Manager to the Rector's Office for signature by the Rector of the UHK.
8. The agreements signed by the Rector of the UHK will be forwarded by the Project and Financial Manager to the legal department, registered at the OSKT and the remaining copies will be returned to the originators (in the case of a cooperation agreement) or the partner (in the case of a contract for the use of the result).

Figure 2: A chart of commercialization steps

In the case of exercising the right of the UHK to the R&D result, the originator is entitled to a one-off remuneration according to Rector's Decree 17/2020. The remuneration shall be divided among any co-inventors according to the share of the originator stated in the R&D result notification. The process of evaluation of the originators has the following steps following the Rector's decision on the exercise of the UHK right to a given R&D result:

1. Ing. Dana Jirousková will prepare the documents for the decision of the Rector of the UHK on granting the remuneration for the exercise of the UHK right to the R&D result and provide the approval of the Vice-Rector for Science and Creative Activities and then forward the decision to the Rector's Office for the Rector´s signature.
2. Ing. Dana Jirousková will submit the signed decision of the Rector on granting the remuneration for the exercise of the right of the UHK to the R&D result to the Payroll Department and the remuneration will be paid to the originators. The remuneration will be paid as part of the salary.

3. Ing. Dana Jirousková will inform the originator by e-mail about the approval of the decision on payment of the remuneration for exercising the UHK right to the R&D result.

As part of the protection of the UHK right to the R&D results, it is necessary to ensure their renewal after the expiration period:

1. A key role is to regularly check the validity of patents/utility models against the IPO database. The check is carried out by the Administrator for Science and Research projects.
2. If the patent/utility model is about to expire, the Administrator for Science and Research projects will prepare an extension form.
3. The form will be sent by the Administrator for Science and Research projects to the originator and then to the Vice-Dean for the R&D at the relevant faculty so that they can express their opinion on the extension.
4. After the opinion of the originator and the Vice-Dean of R&D, the Administrator for Science and Research projects will provide the opinion of the TTO and the Vice-Rector for Science and Creative Activities. In the case of:
    a. Upon a positive opinion, the officer for science at the relevant faculty will create an order and send it to the Administrator for Science and Research projects. S/he will then arrange payment. If the faculty's opinion is negative and the Rector's Office's opinion is positive, the maintenance fee will be paid from the accounting contract of the Rector´s Office and the order will be created by the Administrator for Science and Research projects.
    b. A negative opinion will be recorded by the Administrator for Science and Research projects in the OSKT form signed by all parties. The patent/utility model will automatically enter the post-approval period by non-payment of the fee. During the post-acceptance period, payment can still be made, but at double the amount.

The importance of knowledge and technology transfer

Universities are one of the sources of innovation. They seek to streamline the existing knowledge management processes in universities in the context of greater applicability of selected types of scientific research results. In this context, the project implementation team sees the key place of the set links between the stakeholders and the sharing of their knowledge, which will be the focus of attention in this document, and which aims to specify the key roles, active stakeholders, and knowledge flow between them.

Using the characteristics of knowledge management processes related to the support of R&D activities (support of research projects, motivation of scientists, team collaboration, publication activity) to show how this activity can ultimately lead to a better position of the university within the network of collaborating stakeholders, companies, universities, grant agencies.

Surprisingly, there is often no clear line between knowledge and technology transfer. Most studies in both technology transfer and knowledge transfer regularly use and confuse the term. Probably the broadest definition of technology transfer is provided by the National Research Board: "Technology transfer can cover a wide range of activities, from the exchange of ideas between visiting researchers to contractually structured research collaborations involving the sharing of facilities and equipment" (Lee, 1997). TT is understood to be the transfer of technology from its point of origin towards the organization or company receiving the technology. The transfer includes the granting of exploitation rights (Wahab et al., 2011). TT is a set of processes whose output is the application of knowledge results from universities and other research organizations in the marketplace (Kumar et al., 1999).

Technology transfer as defined by (Lee, 1998), is part of the innovation process based on university research. The first thing to be emphasized here is the existence of a huge gap between the horizons of academic knowledge on the one hand and the technologies usable in the real market on the other, even when scientific research is carried out with a view to the applicability, which is the task of the follow-up applied research that usually takes many years. Let us describe the key imperatives of each phase step by step.

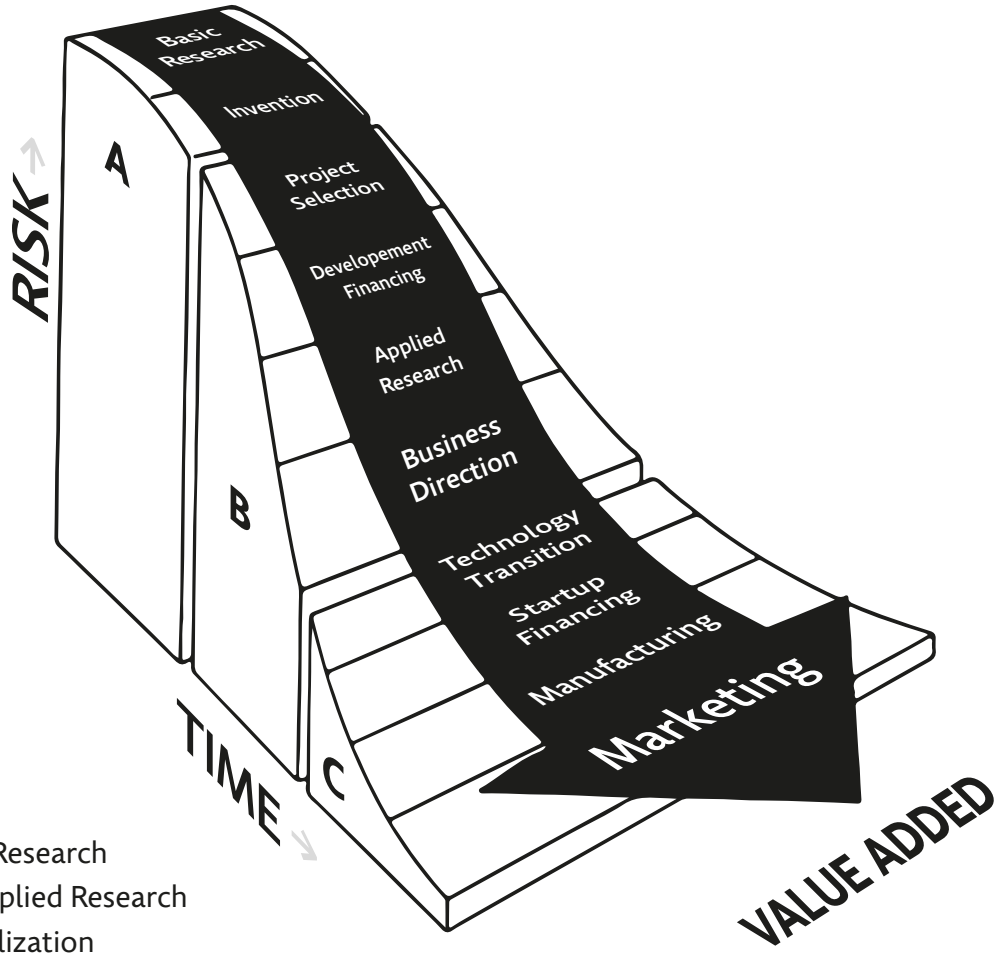
In Phase A, the key task is to identify industrially promising R&D projects. The criteria for the selection are (i) an existing, completed, and proven concept in basic research and (ii) potential for commercial application of the invention under consideration. The projects thus selected were supplemented by the researchers with (1) an estimate of the scope of the targeted applied research, (2) identification of unique attributes of the invention that define a competitive advantage over existing technologies, and (3) an opinion on the patentability of the invention. The Technology Transfer Office (TTO) has an indispensable role here, i.e., a market initiative that has a higher impact than a marketing approach. As a result, the otherwise time-consuming and costly process of assessing the market and technology potential is greatly simplified (Lee, 1998).

Phase B, i.e., focused applied research, has as its basic task to reformulate the scientific results achieved in basic research into technology for non-academic applications. I.e., to reduce the „gap" often cited in the theory of technology gaps and to bring it closer to commercially more easily seizable concepts, i.e., to create patents, industrial designs, prototypes, methodological procedures, or specialized software tools. If an industrial partner already exists at this stage, which should be made a condition, the TTO coordinates the building of research teams, including academic scientists and industrial engineers. Mutual interaction and its effectiveness are usually the keys to successful technology transfer (Lee et al., 1996).

Phase C, when the results of academic research are already presented to potential investors, we get to the so-called phase C, specifically to commercialization. Technology commercialization is the process by which the university licenses the technology to a company and the company invests in fine-tuning the product to meet specific market and production needs in preparation for the start of production. This includes many activities already well known to commercial investors, such as technology licensing, experimental testing (β tests), raising investment resources of a predominantly venture nature with follow-on production development, capital investment, and marketing. In this part of the innovation process, the university usually

no longer has sufficiently developed capabilities and competencies and usually narrows the scope of its activities to intellectual property management, including royalties, licensing disputes, and potential or actual litigation (Lee, 1998). This phase also includes university activities related to the organization and operation of research parks where start-ups can be more easily incubated and capital can be raised or shared. In addition, if a company contributes original ideas to a project and has even partially paid for R&D expenses, it can claim ownership or at least joint ownership of a patent resulting from the project. Such a situation usually creates a dilemma for the university, because such a transfer of ownership amounts to „privatization of research"; moreover, the university is thus deprived of the possibility of collecting the rents (royalties and license fees) needed to reinvest in basic research. And the inventor is also deprived of the remuneration for the invention (Lee, 1998).

The solution to this complicated situation may be preliminary agreements with the collaborating companies, concluded before the collaborating companies have committed to invest resources and intellectual potential in research. In this way, depending on the extent of their intellectual and financial contributions to the development of the cooperation, it is possible to correctly contractually treat patent ownership rights, to set maximum royalty rates for the partner companies, depending on the extent of their intellectual and financial contributions to the development of the cooperation.



A – University Research
B – Focused Applied Research
C – Commercialization

Figure 3: The University-Based Technological Innovation Process, adapted from (Lee, 1997)

Furthermore, it is also important to realize that TT is a process involving groups and individuals who can and do hold different views on the phenomenon. Therefore, rather than presenting several sets of definitions differing in detail and scope, I have chosen a set of perspectives on TT that come specifically from the aforementioned opinion groups. Economists define TT based on characteristics and general knowledge that relate directly to production (Kumar et al., 1999). Sociologists define TT in relation to innovation and the ability of teams to adopt the transferred technology. Anthropologists examine TT in the context of cultural changes related to TT to specific firms. Management research focuses on the various stages of technology transfer, design, and related future sales. Knowledge management research links TT closely to the transfer of information and the creation and preservation of know-how embedded in products, processes, and management (Wahab et al., 2011).

An important aspect of the TT issue is also the question of the „ease" with which universities acquire investment partners or are successful in obtaining grant support. Marketing support for TT has already been mentioned above, but here let us pay attention to the level of commitment of the university to its technology transfer. It turns out that universities whose faculties engage in faculty consulting for companies, participate in collaborative or internship programs, or involve graduate students in „field" work for industrial projects, and exhibit a transparent patent policy, are universities that are more easily attracting investment partners or are more successful in obtaining grants. This idea is further developed in more recent research studies, which argue that academic research too often focuses on outputs related to the creation and commercialization of intellectual property (Cesaroni & Piccaluga, 2016). Many authors (Cesaroni & Piccaluga, 2016; Schaeffer et al., 2020), argue that broader engagement activities, i.e., those mentioned above involving higher levels of interaction, can be a more valuable source of knowledge transfer to the private sector and also a significant form of revenue for universities (Perkmann et al., 2011). However, it is important to note that engagement is not purely about generating income, but is often a natural extension of core research activities (Perkmann et al., 2013). For example, it can be a source of learning for academics who test their research in the field and gain new insights (Lee, 1997; Cesaroni & Piccaluga, 2016; Schaeffer et al., 2020).

Knowledge management allows explaining the reason why knowledge cannot be well transferred or communicated during the technology transfer process. The explanation is described in Figure 2, based on (Anderton & Watson, 2018). The model, which includes both the technology provider organization (the university) and the technology receiver organization (the companies between which the TT takes place), works with two basic theoretical concepts – ecological knowledge management and absorptive capacity. Knowledge management helps explain the reasons why complications occur during the technology transfer process when knowledge is transferred or shared. The concept of absorptive capacity allows understanding how to positively influence the relationships between manufacturing companies and higher education organizations to „smooth the course" of technology transfer. Examining both actors simultaneously through the same lens also appears to be a key aspect, an element we have already encountered above (Leonard-Barton, 1999).

In the aerospace industry, we have documented the direct impact of knowledge management on successful TT (Rafiei et al., 2016). The results of the study suggest that it is advisable for managers (here in the aerospace industry) to pay more attention to the following three topics: (1) the actual technology transfer, (2) preparing the environment to facilitate the flow of technology transfer and enhance its performance by allocating sufficient resources and space for these activities, and (3) building and developing relationships with supporting organizations, research institutes, and universities, which enables the transfer of relevant knowledge and technology in less time and at a lower cost.

The first point is closely related to both the sharing of experience and the transfer of formalized know-how in the form of documentation, manuals, and training, which resonates with the SECI model (Nonaka, 1994). The second point can be placed in the Ba model (Nonaka et al., 2000). Within the same model, the third point can be identified with the following Ba types „*Originating Ba*" and „*Dialogue Ba*" (Nonaka et al., 2000).

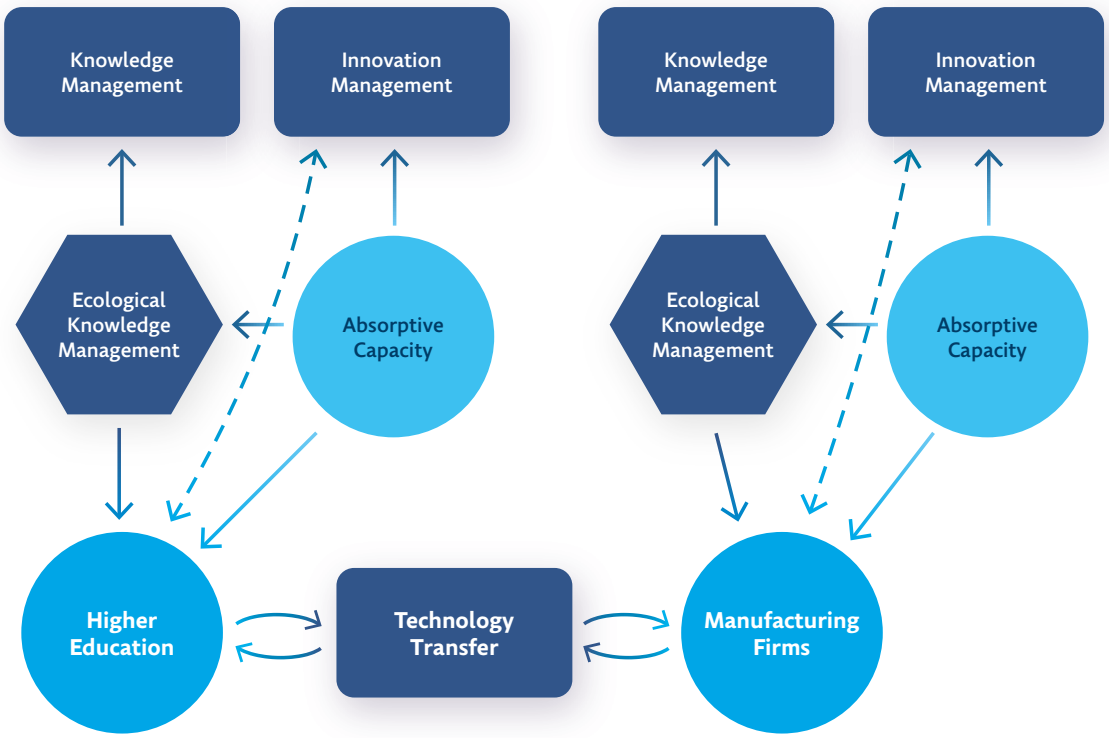


Figure 4: Relationship between knowledge management and TT, adapted from (Anderton & Watson, 2018)

The absorptive capacity is one of the determinants of a company's ability to absorb new knowledge and be able to benefit from it for its innovation activities. A company or unit with a high absorptive capacity has a well-developed ability to effectively transfer the knowledge it acquires from surrounding units or companies (Tsai, 2001). This is also in line with the results of related studies that have confirmed that knowledge is usually distributed unevenly within a network (Tsai, 2001; Borgatti, 2003). It is also important to note that the process concept of absorptive capacity (Lane et al., 2006) as an element indicating the above-described ability to effectively receive and transfer, i.e., further distribute the received properties, is directly related to the position of the organization or company (Burt, 1976), thus making the position

of the organization one of the primary determinants of the success of the transfer process (Tsai, 2001; Kotler et al., 2013). One of the key studies related to the topic of innovation, TT, and the position of universities in the structure of networks focuses on the biotechnology sector, which is a relatively young sector, but here too the position of universities was found to indicate their importance. In addition, in the same study, the findings indicate that position, i.e., the nature of ties and relational involvement, is an indicator of centrality and positional power in these networks and the nature of the preceding ties is a determinant of the resulting position (Powell et al., 1996). The studies dealing with the role of universities as "open innovators" also highlight the importance of the position that a university occupies or is able to occupy and also to defend within specific network structures (Jonsson et al., 2015; Kim et al., 2018). The structural network position today, given the global nature of knowledge networks and TT, is often no longer even related to one's geo-position, which appears less and less relevant for TT (Huggins et al., 2019).

It is clear from the above that the position of the university is taken as a starting point from which the capabilities of universities or their research teams are usually predicted, such as productivity (Racherla & Hu, 2010), openness to innovation capabilities (Powell et al., 1996; Smith et al. 2014) or the ability of companies to create a new value for customers in a broader sense (Tsai, 2001; Perkmann et al., 2011; Schaeffer et al., 2020). Based on the information described above, the question „How is the position shaped?" is very crucial for any institution; it is advisable to continuously monitor the position, assess changes, and the impact of efforts to promote overall technology transfer and research.

Abbreviations

CR – Czech Republic

TTO – Technology Transfer Office

PBD – Personal Bibliographic Database

OSKT – Office of Science and Knowledge Transfer

PCA – Patent Cooperation Agreement

RIR – Results Information Register

SW – software

TT – Technology Transfer

UHK – University of Hradec Kralove

IPO – Industrial Property Office

R&D – Research and Development

References

Anderton, A., & Watson, K. (2018). Knowledge Management: A Technology Transfer Perspective. *SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3241729*

Borgatti, S. (2003). The Network Paradigm in Organizational Research: A Review and Typology. Journal of Management, 29(6), 991–1013. https://doi.org/10.1016/S0149-2063(03)00087-4

Burt, R. S. (1976). Positions in Networks. Social Forces, 55(1), 93. https://doi.org/10.2307/2577097

Cesaroni, F., & Piccaluga, A. (2016). The activities of university knowledge transfer offices: Towards the third mission in Italy. The Journal of Technology Transfer, 41(4), 753–777. https://doi.org/10.1007/s10961-015-9401-3

Huggins, R., Prokop, D., & Thompson, P. (2019). Universities and open innovation: The determinantsof network centrality. The Journal of Technology Transfer. https://doi.org/10.1007/s10961-019-09720-5

Jonsson, L., Baraldi, E., Larsson, L.-E., Forsberg, P., & Severinsson, K. (2015). Targeting Academic

Engagement in Open Innovation: Tools, Effects and Challenges for University Management. Journal of the Knowledge Economy, 6(3), 522–550. https://doi.org/10.1007/s13132-015-0254-7

Kim, T., Park, K., & Kim, E. (2018). Complementary or contradictory? The effects of structural holes and status on innovation. Innovation, 20(4), 393–406.

https://doi.org/10.1080/14479338.2018.1478733

Kotler, P., Keller, K. L., Juppa, T., & Machek, M. (2013). Marketing management. Grada.

Kumar, V., Kumar, U., & Persaud, A. (1999). Building Technological Capability through Importing

Technology: The Case of Indonesian Manufacturing Industry. The Journal of Technology Transfer, 24(1), 81–96. https://doi.org/10.1023/A:1007728921126

Lane, P. J., Koka, B. R., & Pathak, S. (2006). The Reification of Absorptive Capacity: A Critical Review and Rejuvenation of the Construct. Academy of Management Review, 31(4), 833–863. https://doi.org/10.5465/amr.2006.22527456

Lee, Y. S. (Ed.). (1997). Technology transfer and public policy. Quorum.

Lee, Y. S. (1998). University-Industry Collaboration on Technology Transfer: Views from the Ivory Tower. Policy Studies Journal, 26(1), 69–84. https://doi.org/10.1111/j.1541-0072.1998.tb01925.x

Leonard-Barton, D. (1999). Wellsprings of knowledge: Building and sustaining the sources of innovation (3. [print]). Harvard Business School Press.

Nonaka, I. (1994). A Dynamic Theory of Organizational Knowledge Creation. Organization Science, 5(1), 14–37. https://doi.org/10.1287/orsc.5.1.14

Nonaka, I., Toyama, R., & Konno, N. (2000). SECI, Ba and Leadership: A Unified Model of Dynamic Knowledge Creation. Long Range Planning, 33(1), 5–34. https://doi.org/10.1016/S0024-6301(99)00115-6

Perkmann, M., King, Z., & Pavelin, S. (2011). Engaging excellence? Effects of faculty quality on university engagement with industry. Research Policy, 40(4), 539–552. https://doi.org/10.1016/j.respol.2011.01.007

Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lissoni, F., Salter, A., & Sobrero, M. (2013). Academic engagement and commercialisation: A review of the literature on university–industry relations. Research Policy, 42(2), 423–442. https://doi.org/10.1016/j.respol.2012.09.007

Powell, W. W., Koput, K. W., & Smith-Doerr, L. (1996). Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology. Administrative Science Quarterly, 41(1), 116. https://doi.org/10.2307/2393988

Rafiei, A., Akhavan, P., & Hayati, S. (2016). Knowledge management in successful technology transfer (Case study: Iranian aerospace industries and knowledge-based centers). Aircraft Engineering and Aerospace Technology, 88(1), 178–188. https://doi.org/10.1108/AEAT-11-2013-0220

Racherla, P., & Hu, C. (2010). A social network perspective of tourism research collaborations. Annals of Tourism Research, 37(4), 1012–1034. https://doi.org/10.1016/j.annals.2010.03.008

Schaeffer, V., Öcalan-Özel, S., & Pénin, J. (2020). The complementarities between formal and informal channels of university–industry knowledge transfer: A longitudinal approach. The Journal of Technology Transfer, 45(1), 31–55. https://doi.org/10.1007/s10961-018-9674-4

Tsai, W. (2001). Knowledge Transfer in Intraorganizational Networks: Effects of Network Position and Absorptive Capacity on Business Unit Innovation and Performance. Academy of Management Journal, 44(5), 996–1004. https://doi.org/10.5465/3069443

Univerzita Hradec Králové. (2020). *NAKLÁDÁNÍ S DUŠEVNÍM VLASTNICTVÍM NA UNIVERZITĚ HRADEC KRÁLOVÉ.* rektorský výnos č. 17/2020.

Wahab, S. A., Rose, R. C., & Osman, S. I. W. (2011). Defining the Concepts of Technology and Technology Transfer: A Literature Analysis. *International Business Research, 5(1). https://doi.org/10.5539/ibr.v5n1p61*

Recommended literature

Anderton, A., & Watson, K. (2018). Knowledge Management: A Technology Transfer Perspective. *SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3241729*

Čada, K. (2014). Chránit/nechránit to je otázka. alevia.

Jansa, L., & Otevřel, P. (2018). Softwarové právo (3. aktualizované a rozšířené vydání). Computer Press.

Rector's Decree 17/2020 and subsequent internal regulations of the University of Hradec Kralove.