Technical Training Centre Dipoli

Patenting for Industry and Technology 2009 - 2010

Special Work

# Sale and Licensing of University-Based Intellectual Property Rights

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Espoo 25 February, 2011

ABSTRACT

In this study, special characteristics of the sale and licensing of University-based intellectual property rights are considered. A starting point for the study has been the new University invention legislation, which has clarified the legal status of inventions made in Universities. On the other hand, the growth of entrepreneurial activity and a close university-industry relationship have led to the academic technology transfer and importance of protection of intellectual property. Universities have been forced to develop both their technology transfer processes and organizations to coincide whit the new University invention legislation. Similarly, new means to commercialize University based intellectual property have been adopted.

These issues have reviewed in terms of University's intellectual property practices. University's innovation process and role of Technology Transfer Office are considered in details. In this part evaluation of innovation and protection of intellectual property are emphasized. In addition, typical University agreements are discussed. Commercialization of intellectual property has focused on licensing and direct selling. Extensive issue of University based spin-off companies is excluded. Different type of licenses is discussed and main points of direct sale of intellectual property are shown.

Valuation of intellectual property is done in terms of cost based, market based and income based approaches and examples are presented to clarify the selected approach. Practical checkpoints for pricing a patent are listed to assist commercialization process. Massachusetts Institute of Technology (MIT) is selected as an example of best practices. MIT's major technology transfer processes and results are presented and a comparison between Finnish Universities is depicted. Finally, some views to improve Finnish Universities' technology transfer practices are presented.

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LIST OF ABBREVIATIONS

| | |
|---|---|
| CEO | Chief Executive Officer |
| EVA | Economic Value Added |
| IP | Intellectual Property |
| IPR | Intellectual Property Rights |
| NDA | Non-Disclosure Agreement |
| NPV | Net Present Value |
| PCT | Patent Cooperation Treaty |
| R&D | Research and Development |
| ROI | Return On Investment |
| SME | Small and Medium Enterprises |
| TEKES | The Finnish Funding Agency for Technology and Innovation |
| TLO | Technology Licensing Office |
| TTO | Technology Transfer Office |
| TULI | Tutkimuksesta liiketoimintaa – Creating Business from Innovation |
| VC | Venture Capitalist |

# 1. Introduction

The developing connections between Universities and industry as well as the commercialization of academic research have been the subjects of intense policy and debate since the mid 1980s. Universities have become more active in trying to commercialize their research and in establishing linkages within industry. The growth of entrepreneurial activity and the University-industry relationship have entitled to consider entrepreneurial activities as the universities ”*third function*” which contains the economic development in addition to education and research functions. This ”third function” was introduced in the University Act in 2004, including commercialization of research results. After that the Universities have been quite free to formulate their own policies and practices.

Therefore, it is consistent that the academic technology transfer has been under intensive development and changes in Finland, where the Universities have appreciated long-term co-operation and interaction with companies both in education and research. It is important to protect effectively the technologies that arise from the research carried out at the University, as well as to provide high-quality innovation services to the researchers (Opetusministeriö, 2007). Today knowledge transfer from the University to the rest of the society can take place in many ways. These include university graduates, collaborative research, student projects, continuing education, technology transfer by licensing, and new company creation.

## 2. New University Inventions Legislation

In Finland, the main principle of invention ownership is provided by the Act on the Right in Employee Inventions, which states that an employee shall have the same rights to his or her inventions as other inventors, unless otherwise provided by legislation. This means that, primarily, the employee owns all rights to the invention; a specific procedure and assignment of these rights is required to provide the invention the property of the employer.

Similarly, the Finnish University tradition has supported the private nature of the academic's research. According to the national legislation - teachers and researchers of Universities - owned the intellectual property related to their research. Thus they could themselves define what to do - if anything - with the inventions that originated in their research.

The new law prepared by the Ministry of Trade and Industry; the Act on the Right in Inventions made at Higher Education Institutions (19.5.2006/369), entered into force on the 1st of January 2007. Its purpose is to promote the recognition, protection and exploitation of inventions made at Finnish Universities (Finlex, 2006). The Act aims at clarifying the legal status of the inventions made in Universities, as an increasing number of research activities performed at Universities involve extensive co-operation with external parties. This "Finnish version of the Bayh-Dole Act" defines clearly that with respect to contract research, the rights to patentable inventions belong to the academic institution.

The new Act covers the whole staff of the University as well those researchers that are employed by the Academy of Finland. All personnel in both Universities and polytechnics will be treated identically. According to the law, a person who has made a potentially patentable invention, must disclose the invention to the University. The law also makes it possible for the University to claim rights to its employees' inventions with certain conditions, and the University will have six months time to decide whether it will start the patenting process.

In the new Act, the research is divided into main categories depending on the involvement of an external party. Similarly, the ownership rights for Intellectual Property created by members of the University and others participating in University programs are defined by the new Act which regulates the *invention categories* as follows:

- Inventions made as a result of *Collaborative Research* conducted at the University.
- Inventions made as a result of *Open Research* conducted at the University

- Inventions made during operations other than the research referred above

*Collaborative Research* refers to research involving at least one party external to the higher education institution, such as a financier or other participant of the research, and including liabilities related to results or research output that extend to other areas other than just publication of the results. In such a case, the University has the right to acquire the right to the invention. In Collaborative Research, the rights are claimed in cases where a commercial partner is willing to acquire the rights from the University, or, alternatively, if the researchers want to start up a company that exploits the results of the research project.

If the research does not involve any external parties, it is referred to as *Open Research*, as a result of which the inventor may retain the rights to the invention. The University is entitled to the rights in the invention made in Open Research if the inventors have not published the invention or notified in writing, within six months of the submission of the invention disclosure notification, of their willingness to exploit the invention. The researchers of the University also have the possibility offer the rights of Open Research to the University. In such cases, the University carries the expenses of protection, finding suitable companies for exploitation, contract issues and regulating the actions of the exploiting company and invoicing.

Based on the Act, the University may take a priority in negotiating with the inventor on the rights in the invention if the invention has been made under circumstances other than in Collaborative or Open Research. Similarly, the University has a contractual right to acquire rights in inventions in cases where a separate agreement between the University and persons in an employment relationship with it has been entered into. However, the University shall not have rights in inventions made by researchers, teachers or other persons who are not covered by the scope of the Act on the Right in Inventions Made at Higher Education Institutions (HEI), unless otherwise provided in a separate agreement made in writing.

In all cases where the University claims rights to the results, the commercial potential and patentability of the invention are considered. The Act secures for the inventor the right to a reasonable compensation if the University has acquired the rights to the invention. The amount of the compensation is usually determined in each separate case and depends on the returns on the invention to the University. All profit from the inventions is shared between the University, inventor(s), and the department where the research work was done (Aalto, 2011a).

# 3. Special Features of the University-Based Intellectual Property to Commercialize

In general, the University should exploit the innovations it owns in a way that brings added value to society, economic life and the University itself and its staff. Therefore the University has to underline modern high-quality innovation services, know-how and extensive networking that meets the needs of its strategic focus areas (Opetusministeriö, 2007). However, the University's primary tasks are to *educate* and to produce *scientific publications* and theses. Therefore, the protection of exploitable knowledge has to be planned so that it does not delay publishing, or that publishing does not prevent patenting. The first aim is that all research results are always brought into the academic world by publishing them in high-level scientific forums.

On the other hand, the University's aim should be to optimally take advantage of its innovations by licensing, selling and catalyzing new start-up companies. The University should also encourage its employees and students to take part in business and utilise their know-how outside the academic world. In general, technology transfer from the University may be argued as (Saksa, 2006):

- Benefit the public through new products and economic development
- Meet expectations of research sponsors
- Validate innovative applications
- Generate revenue
- Research funding
- Raise visibility of innovators' lab
- Create professional networking opportunities

*Strategic intent*

Usually the University's principles for innovations are stated in the University's *Knowledge Transfer and Innovation Strategy*, which is usually one part of University's comprehensive research and education strategy. The main goals of the University may include following tasks (University of Oulu, 2009):

- To work in close collaboration and interaction with the rest of society to promote the exploitation of knowledge, innovation activity in general, and to strengthen the vitality of the know-how-based environment
- To promote the practices of exploiting knowledge and expertise of researcher for the benefit of the society at large in collaboration with other actors in the field of innovation

- To promote the interaction of basic and applied research
- To correspond to the demands of the new Act on the Right in Inventions Made at HEI's
- To ensure adequate IPR protection
- To include exploitation and vast use of innovations in society in funding agreements made for R&D projects
- To acknowledge inventors (researchers) in all circumstances and to take care of benefits the inventors are entitled to
- To promote the start–up of know-how-based spin-offs
- To put effort into establishing long-term research collaboration with the industry and research institutions
- To recognize future needs for know-how and technological advancement
- To create a motivating research environment for starting spin-off companies together with the technology community
- To develop and provide innovation services and implement innovation strategies together with other research institutes of higher learning and companies

*Innovation policy*

Typically the University's Technology Transfer and Innovation Strategy are formulated as an *Innovation Policy* which facilitates the effective utilization of University's intellectual property for the benefit of society. In practice Universities have channeled their innovation dissemination activities through a centralized organization e.g. Technology Licensing Office (TLO). Next the Innovation Policy of Massachusetts Institute of Technology (MIT) is presented as an example to show what the practice may be. MIT's Policy is acknowledged to be one of the strictest policies on managing e.g. conflict of interest arising from University's licenses and collaboration with industry (O'Shea et al., 2007)

- Technology transfer and entrepreneurial activities are by-products (not the purpose) of the academic mission of education, basic research, and dissemination of knowledge.
- Technology transfer activities must not deflect or distort this core mission. When conflicts of mission arise, the academic activity always takes precedence.
- There must be no incubation of the company within MIT once it has been formed. Faculty members may consult and are board members, but may not be line officers of the company.
- MIT sometimes shares risks in start-up companies in partial lieu of royalties (most times they do both)
- Faculty is required to report all outside consulting activities with start-ups.

- Faculty members may not negotiate terms of the license with MIT. No sponsored research will be accepted from the company if the faculty founder holds equity in the start-up.
- No confidentiality of MIT research results is permitted; everything should be published. Only patents and copyrights can be licensed (no exclusive licenses to "knowhow" or trade secrets).
- Before starting up a company, the faculty founders must sign a "conflict avoidance statement" promising not to accept research support from the company, not to suppress for the company's benefit the dissemination of research results developed at MIT, and not to use students on any company projects (that is, current students may not be employed by the start-up company).
- All financial dealing between the new company and MIT are kept at arm's length. MIT will not invest in early funding rounds and takes no board seat. The MIT treasurer, not the TLO, manages any equity received by the Institute from start-up at its inception. Importantly, the company received no rights in future research in the field of license.
- MIT provides exclusive licenses to academic entrepreneurs (and companies) willing to step forward and start a company – knowing that if it succeeds in the development, the exclusive license will protect it from having its product copied by those who 'weren't willing to take that risk'.
- In terms of royalty distribution formulas for inventor founders of technology once patent cost are paid, and 15% of royalties are paid to the TLO, the one-third of the remaining will go to inventors, and rest will be divided between departments, interdisciplinary centers, and the MIT General Fund.

In practice the Innovation Policy is clearly seen e.g. in the Collaborative Research thus that the ownership of the project results and especially the ownership of IPR and User Rights are well defined by the project agreement. In some cases, the University may not utilize new innovations without negotiating with the project parties. However, usually the University shall always have a royalty-free non-exclusive User Rights to research project results, which may be used in the scientific research and teaching. Similarly the Background material - material generated outside the project - its ownership and use in the project are typically well classified. Confidentiality of project results and information are also issues that have to be taken into the consideration, even years after termination of co-operation project. On the other hand, results generated in publicly funded projects must become public and University shall have the right to publish project results for academic purposes. This principle is especially valid for theses and dissertations.

# 4. University's Intellectual Property Practices

The Act on the Right in Inventions made at Higher Education Institutions places an obligation on research institutions in Finland to identify, protect and commercialize Intellectual Property (IP) arising from publicly funded research for the benefit of country. It also requires that researchers receiving public funds disclose any new IP in a timely manner to the University.

## 4.1 Role of Technology Transfer Office

Usually Universities have developed an *Intellectual Property Policy* or *Code of Practice* for the purposes of defining IP ownership and commercialization. It guarantees that the IP resulting from University research is claimed, protected and transferred into technologies and usable products and services in order to benefit the University and society in general, see Fig. 1. In practice, the University's Technology Transfer Office (TTO) or Technology Licensing Office (TLO) is responsible for performing these functions. The TTO provides the vital link between research and industry, and assists researchers in developing and commercializing technologies for application to fulfill the needs of society.

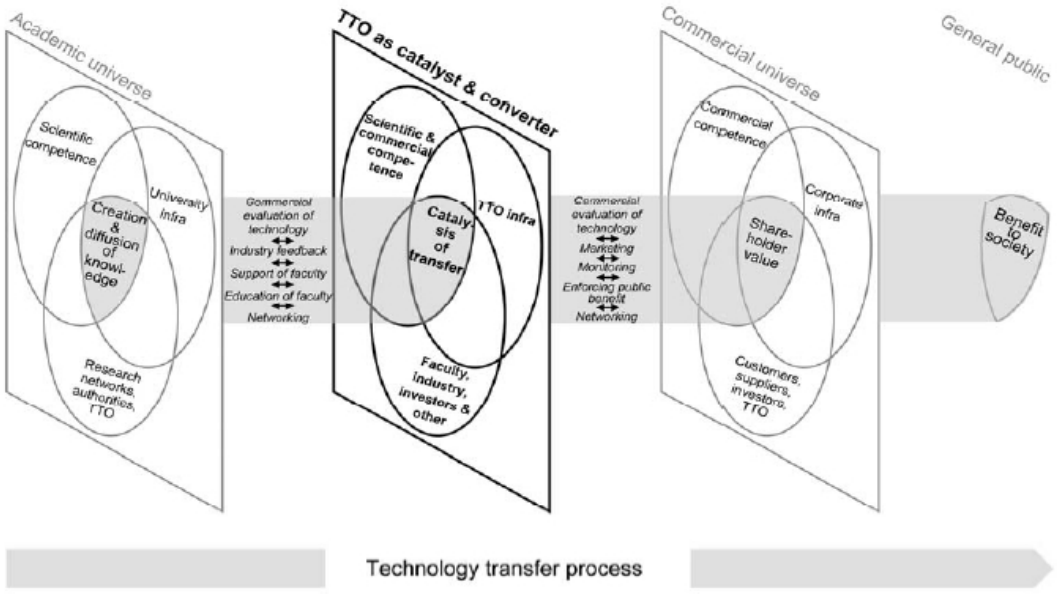



Figure 1. University's technology transfer process (Tahvanainen et al., 2008)

The TTO is responsible for University's IP process, innovations in the University, and in particular the protection of IP and the development, startup, incubation and commercialization of new sustainable technologies. In general, functions of the TTO may include:

- Providing assistance and advice to University researchers on various IP related issues

- Working with University researchers to identify research with commercial potential
- Evaluating, protecting and commercializing IP generated with University support
- Ensuring that the University and inventors, benefit from such commercialization
- Identifying sources of funding for the development and commercialization of IP
- Marketing and licensing IP to domestic or international industry
- Facilitating the transfer in/out of materials and information from/to other institutions and industry through the relevant agreements
- Providing assistance with the formation of spin-out companies based on University technologies
- Developing and implementing policies, procedures and processes for effective IP management and technology transfer
- Education of University re searchers in IP management and technology transfer

The TTO works closely with other departments of the University and researchers in order to fulfill these obligations. An important TTO's function is how to monitor concluded license and sale agreements, and administration of any income generated from the IP. This income may include:

- License fees
- Annual milestone payments
- Royalties
- Direct sale of IP
- Sale of commercial ventures based on the University IP
- Sale of shares in commercial ventures
- Dividends generated from commercial ventures
- Commissions

The University wishes to share with IP inventors whatever economic benefits that may arise from the utilization of University's IP policy. The distribution of income derived from IP is in accordance with the University's IP Strategy scheme. According to this scheme, the income, after deduction of direct costs, is shared between the inventors, laboratories and the University. The net income resulting from the sale or licensing of the invention, i.e., gross income from which direct costs incurred by the University after the submission of the invention disclosure notification have been deducted, is distributed in accordance with the deed of transfer. Direct costs include usually patenting, legal, promotion, negotiation, administrative and other costs directly associated with the

patenting and commercialization process. Unless otherwise agreed, the inventors and their laboratories will receive e.g. 80% of the net income (usually distributed 40% + 40%). The distribution of income depends on the relative share of inventors and the laboratory (background materials, equipment) in the making of the invention. Typically the University shall have a fixed share of 20% of the net income. Unless otherwise agreed, the inventors' share shall be distributed equally among them (Aalto, 2011a).

## 4.2 Innovation Process - Invention Disclosure

In terms of the Intellectual Property Policy and the Act on the Right in Inventions made at Higher Education Institutions, the University researchers are obliged to disclose all newly created or discovered IP to the University, and to co-operate with the University's TTO in all matters, including technical, marketing, patenting and licensing. The general innovation process or procedure for invention disclosure and commercialization of IP is shown in the Fig. 2, and discussed in more detail below. It is essential to observe that the University recognizes the right of inventors to participate in decisions regarding the commercialization and use of IP generated by them.

The Invention Disclosure Form is used to disclose any new IP to the University's TTO. The form provides the information needed to start evaluation of the patentability and commercial opportunity for the invention. The Invention Disclosure Form must be submitted to the TTO and the content of the Invention Disclosure Form all future discussions with researchers will be kept strictly confidential by the TTO.

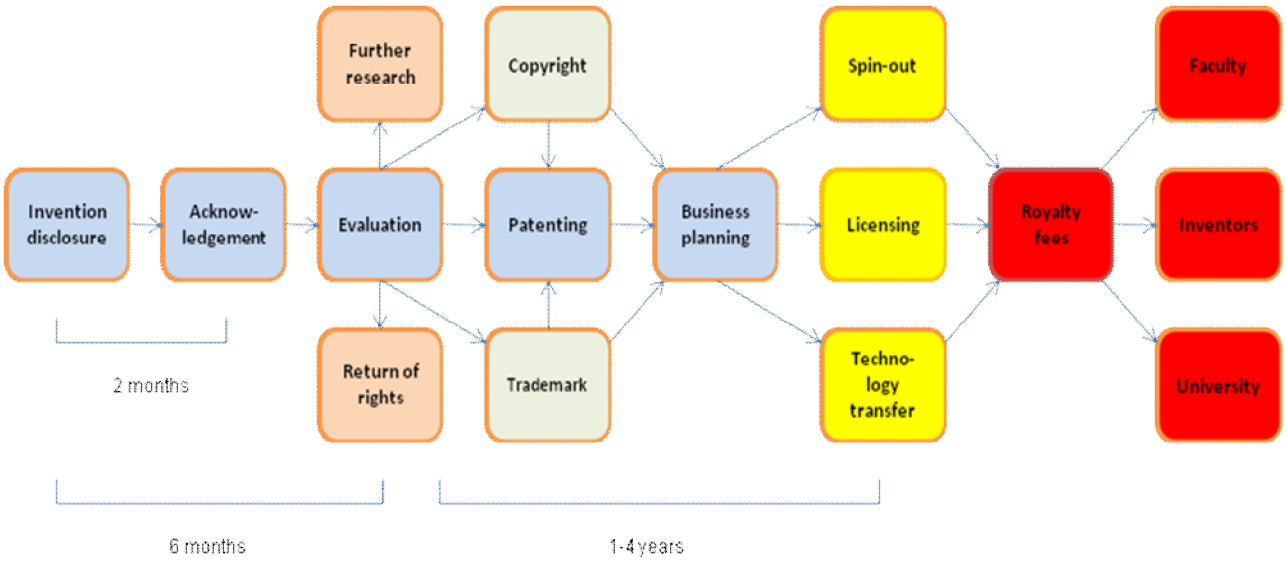



Figure 2. University's innovation process

However, the pro-active University's TTO should actively seek potential IP by carrying out thorough audits of the research activities of University units. The objective should be to identify IP that has not been recognized by researchers as involving commercial potential and to identify potential IP in the early stages of development to ensure that the research and development is fast-tracked and protected before public disclosure.

## 4.3 Innovation Process - Acknowledgement of Receipt by the TTO

Within 2 months of receiving a completed Invention Disclosure form, the University's TTO will send information to the inventors acknowledging receipt of the Invention Disclosure. The TTO will similarly notify the inventors in writing of the invention category they consider the invention to belong to – Collaborative or Open research - and of the possible lines of action the University may take regarding it, and advising them on the next steps in the process. The TTO also contacts the inventors directly to discuss the matters in the disclosure and to obtain more details where required.

In addition, the University's TTO will inform the inventors in writing within 6 months of the receipt of an accepted notification whether they will acquire rights in the invention and to what extent. Similarly, the inventors will be informed within an agreed period, if the University wishes to negotiate on the acquisition of rights of a contractual nature. Usually this decision is made by the University's TTO on the basis of preparatory work done e.g. by the TTO's IPR team.

If the University decides not to acquire the rights in the invention or does not notify the inventors of its decision within 6 months or within an agreed notification period, the inventors will have the right to freely exploit the invention.

It is important to notice, that once an invention has been disclosed to the public, it can no longer be patented. Therefore, researchers need to be aware of and take the necessary precautions against disclosing any information on their research, including publication, presentation at conferences etc.

## 4.4 Innovation Process - Evaluation of the Invention

Due to the high costs of commercializing research, it is essential to carry out an evaluation of the invention to determine the commercial potential before move to the expensive patenting and commercialization processes. Measuring the value of invention and new technology is quite difficult: value is based on different dynamic elements that must be analyzed and understood. Unknown dynamics and dependency of future are highly unpredictable elements in this value

creation process. However, certain generic attributes may be used as indicators in the evaluation process, see Table 1 (Sohlman, 2002).

Table 1: Influence of drivers to the value of invention and new technology

| Attribute | | Attribute | |
|---|---|---|---|
| Age – absolute (establishment, obsolescence) | ↓ | Profitability – absolute (industry average) | ↑ |
| Age – relative to competing technology | ↓ | Profitability – relative to competition | ↑ |
| Use – consistency | ↑ | Expense of continued development (cost to maintain as state of the art) | ↓ |
| Use – specificity (breadth of applications) | ↓ | Expense of commercialization | ↓ |
| Use – industry (width of industry range) | ↑ | Means of commercialization (number) | ↑ |
| Potential for expansion on new products | ↑ | Market share – absolute | ↑ |
| Potential for exploitation (ability to license) | ↑ | Market share – relative | ↑ |
| Proven use | ↑ | Market potential – absolute | ↑ |
| Proven exploitation | ↑ | Market potential – relative | ↑ |
| Competition | ↓ | Perceived demand | ↑ |

In practice, the University's TTO will evaluate the invention using experts in the different technology and business areas - if necessary. Evaluation may also be done based on different kind of off-the-shelf evaluation tools (Gerald, 2010). Evaluation will include studies for prior art to determine whether the invention is novel and inventive. In addition, the industrial status and commercial potential of the invention are taken into the consideration. Usually the evaluation is done based on the following criteria:

- The ownership status of the IP
- The options for protection of the IP
- The commitment of the inventors
- The maturity of development of the invention
- The size and features of the potential market
- The economic benefits
- The commercialization feasibility and potential returns

If the technology is observed to have commercial potential, a decision will be made as to whether technology transfer will be realized by applying for a patent or other protection. Information for the evaluation will be obtained from the Invention Disclosure Form, meeting with the inventors, advice from specialists, and market and IP studies done by the University's TTO staff.

However, if the University decides not to proceed with the invention, a decision will be provided to the inventors, together with the reasons for not proceeding further and recommendations on how to continue in the future. Possible reasons for deciding not to proceed with the invention are likely the following:

- The invention has insufficient industrial relevance or commercial potential to proceed, i.e. there would be no return on investment in the commercialization of the research outputs.
- Further research is required before the invention will result in a commercially usable product. This may include altering the focus of the research to focus into a different market than originally planned.
- The research output has commercial potential but the University has insufficient resources to proceed with the IP protection and commercialization. Due to limited staff and funding, the TTO may need to prioritize projects for commercialization.
- In the case of Collaborative research – no one of the research consortium members is interested in to utilize the University based innovation in their business

If the University takes the decision not to proceed with the invention then it may provide to the inventors an option to pursue the patenting or commercialization themselves. Usually Universities use general cost-effective models for technology transfer that involves balancing the investment in protecting intellectual property with the potential market for the product. Typically this requires careful consideration of the commercial potential of IP before investing in patenting costs, and ensures that the University does not end up with a large portfolio of expensive patents that no one wants to license. One way to avoid unnecessary expenses is to file provisional patents - wherever possible - to give up on expensive filings, except where a potential licensee has been found.

On the other hand, another way to avoid patenting cost is to publish the results of the research. Members of the University are normally expected and encouraged to publish and present the results of their research work. University's IP Strategy does not wish to restrict this freedom. However, in cases involving research material with commercial potential, appropriate action should be taken to evaluate and protect the information before publication. Some research contracts may also restrict this open academic communication.

## 4.5 Innovation Process - Protection of the Intellectual Property

When the University acquires all the rights in an invention or several inventions and decides to apply for a patent for them, it seeks patent protection in Finland or outside Finland separately for

each invention at its discretion. It is important that all contributors to the development and beneficiation of the IP are identified, in order to avoid disputes on the distribution of income derived from it. The inventor shall always have the right to be recognised as the inventor and designated as the inventor in the patent application. Where the invention has been made as a result of a project or group work, each inventor whose inventive contribution has furthered the making of the invention shall be designated as an inventor. By signing the invention disclosure notification, the inventors and the researcher in charge or the head of unit certify that each of the inventors has been designated.

Together with the inventors, the University will find out exploiters for the invention and be responsible for the possible subsequent sale and licensing thereof. At the request of the University, the inventors are obligated to assist in filing the patent application or applications and finding the exploiters, as well as in licensing and in other matters deemed necessary for the exploitation of the invention. The inventors are obligated to sign the deed of transfer and other documents relating to the patent applications.

The University's TTO works closely with external patent experts and agents to determine the most appropriate method for protecting the IP. The most common form of protection is to file a patent and this is the first considered option. Technical assistance on the invention is usually required from the inventors for the drafting of patents. The inventors will be listed on the patent and the University will be regarded as the assignee or applicant. Due to the costs of the patenting process, it is important to carry out full searches on IP before proceeding to patenting. Patenting may also be seen as a value creation process, which consist of writing the patent, obtaining and maintain it, and enforcing and exploiting it when it is granted, as shown in Fig. 3.

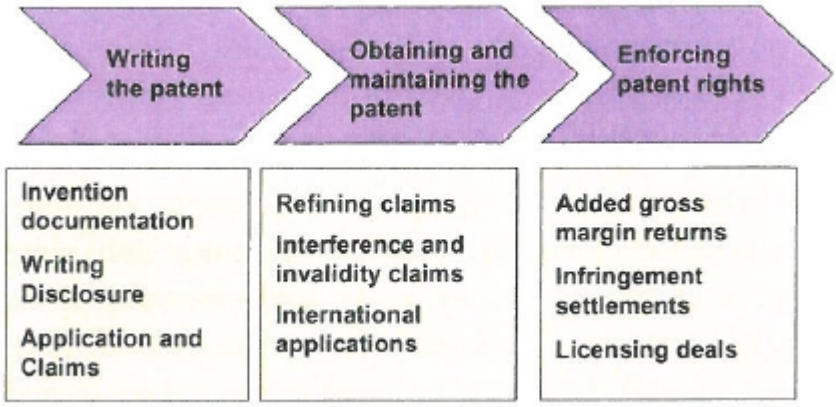



Figure 3. Patent value chain (Sohlman, 2002)

Because the Act on the Right in Inventions made at Higher Education Institutions focus on the patentable inventions, other forms of protection of IP, such as Trademarks, Copyright and Trade Secrets are handled in each case separately. However, University TTO will assist in protecting and registering other forms of IP, where appropriate.

## 4.6 Agreements

Typical agreements in the University related to the IPR are the assignment of rights in a research project, collaboration agreements and different kind of confidentiality agreements (Aalto, 2011b). Sales and licensing agreements of IPR are also customary agreements. These are discussed briefly in next chapter.

### *4.6.1 Agreement on the Assignment of Rights in a Research Project*

The Act on the Right in Inventions made at Higher Education Institutions (19.5.2006/369) defines clearly, that with respect to contract research, the rights to patentable inventions belong to the University and thus it has the right to acquire the right to the invention. In practice this is ensured by an *Agreement on the Assignment of Rights in a Research Project,* which defines the parties of the agreement to be the University and its employees - working for a specified contract research project.

Typically the agreement covers the project and all project results, such as reports, accounts, computer programs, inventions and other results. The employees transfer to University the ownership and intellectual property rights to all results, including right to modify, as well as to license and transfer the rights to third parties. The employee has to sign necessary transfer documents and powers of attorney, as well as support the patenting or other protection process as necessary. Similarly, employees have to keep in confidence and not disclose to any third party any information regarding the invention or other confidential information of the University or University's contracting parties. Right of publication is agreed on separately between the University and its contracting parties in each project. On the other hand, if the University later receives royalties or other income for exploitation of the invention, the net income is distributed to the inventors according to the University's established practice.

### *4.6.2 Consortium, Collaboration and Research Agreements*

These agreements cover typically University's Contract Research Projects and Services for external partners, Collaboration Research Projects funded by Tekes (The Finnish Funding Agency

for Technology and Innovation) and Consortium Research Projects Funded by European Union - at this moment so-called EU FP7 -projects. These agreements are very wide and extensive - they contain typically a detailed Project Plan, Consortium Agreement, Consortium Agreement Terms, Funding decisions and General terms and conditions provided by sponsor for research funding and applicable special terms and conditions. Usually University's Research Support Services with their legal counsels co-ordinate these agreements. In terms of intellectual property rights the scope of the agreement, the ownership and right to use results and background material, confidentiality, publication of results and transfer of results are well defined in the agreements.

### *4.6.3 Confidentiality Agreements - Non-Disclosure Agreements*

Confidentiality is a legal principle that ensures secrecy between two or more parties. The parties may typically be the University or University's researchers and a consulting company or consultant or other external party which provides specific services for the University. Confidentiality is important when one would like to be sure that the information, particularly intellectual property and trade secret, which has been delivered to another party is kept in confidence and not used improperly. The most important reasons for confidentiality are to control your information or knowhow and to protect the novelty of inventions before to patenting. After public disclosure information is not considered confidential.

Confidentiality agreement, also called as non-disclosure agreement (NDA), provides a written evidence of the agreement between the parties, thus protecting the transfer of confidential information and controlling the use of that information. An NDA should describe the field of the confidential information and in what form it is transferred, as well as the purpose of the transfer. The agreement defines how the information is handled, in what circumstances the receiving party can use the information and for how long the obligations are valid. If only one party is disclosing information the agreement is unilateral. On the other hand, if two parties are disclosing confidential information the agreement is bilateral.

## 5. Commercialization of Intellectual Property

The commercial exploitation of intellectual property owned by the University may take place in many ways. A technology may be sold or licensed to a company on the basis of its contribution to an externally funded research project (Hjelt et al., 2006). On the other hand, the technology may also be developed in the University without any connection to companies and the buyer of a license must be found through different expert networks. Thus, the commercialization process is generally long and expensive. It involves a number of different stages, which will differ according to the product or process under development. The commercialization process is outlined in Fig. 4.

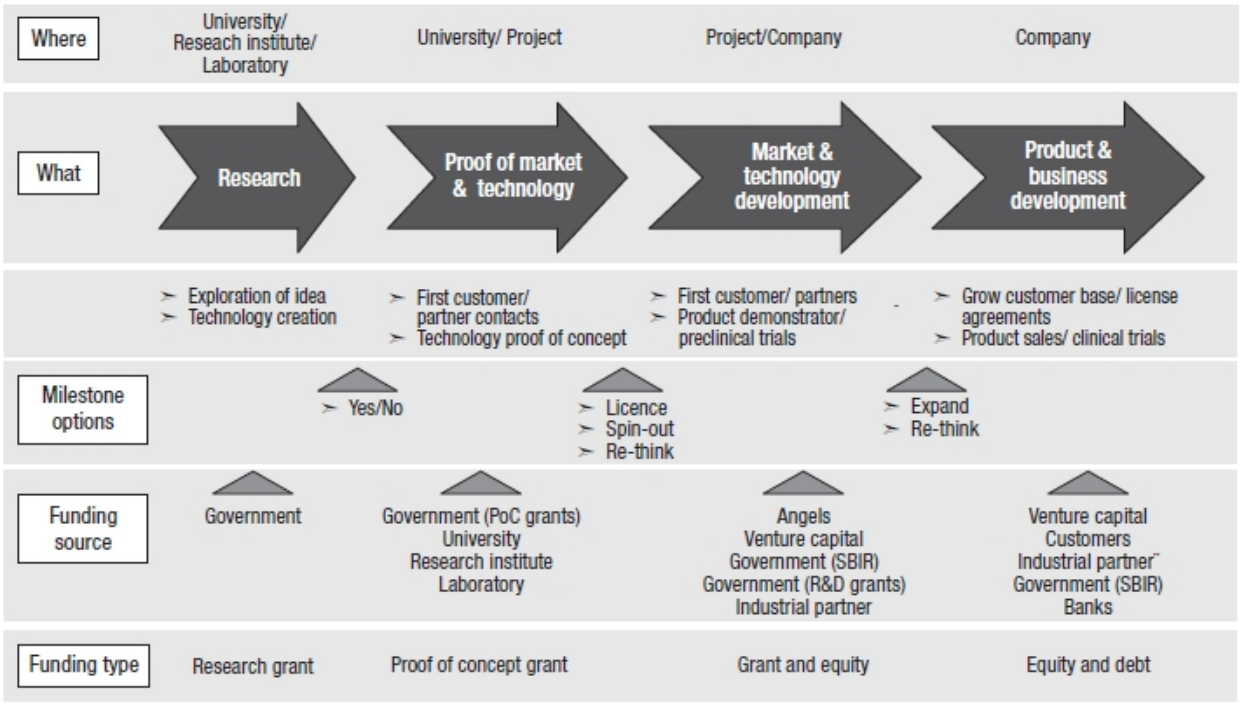



Figure 4. Commercialization process (Hjelt et al., 2006)

There are various alternatives available for commercializing University research and Intellectual Property – in general these may include:

- Licensing
- Spin-out companies and subsidiary companies of the University
- Management buy-outs
- New ventures
- Technology transfer agencies
- Direct sale
- Combination of the above

Regardless of the specific commercialization path to be used – following general facts have to be considered:

- Financial investment required for each commercialization path
- Potential return on investment for each commercialization path
- The nature of the technology or product itself
- The target market and how it can be achieved

Each of these facts has to be studied before deciding on how to commercialize the invention. The University's TTO uses external technology and business consults to obtain services and advice on the commercialization of IP – if required. Following general matters are important:

*Development of business plan*

In many cases, the University's TTO carries out or will support the inventor in developing the initial business plan for the commercialization of the IP. The drafting of the business plan requires an evaluation of the potential market, development of a marketing plan, calculation of a budget required for technology development and commercialization and estimated projected income from the IP, development of a potential business model, evaluation of risks involved in the development and commercialization process. The initial business plan describes the chosen commercialization path and required future steps.

*Market analysis*

An essential part of the business plan development and the evaluation of IP is the market analysis. It includes determining whether there is a market for the invention, what the size of the market is, how the market may change in the future, how the technology or product will reach the market, what products may compete for the market etc. The TTO, with co-operation of the inventors and external consult, will carry out an initial evaluation of the market before investing any extensive funds in IP protection.

*Funding for commercialization*

The commercialization process is usually extremely costly and can require a large investment over a long period of time before income is generated. However, there are various ways of funding for new innovations. The University's TTO will provide advice and assistance with providing funding for the commercialization process. Tekes - The Finnish Funding Agency for Technology and Innovation has a funding instrument for Universities called - Tuli - *Creating Business from Research* (Valovirta et al., 2006). This funding is generally used for proof of concept studies,

product development, pilot scale studies, market research and business plan development (Tekes, 2011a). Drafting of initial business plan and market analysis are mandatory for Tuli funding (Tekes, 2011b). However, researchers are advised to include patenting and commercialization costs of new IP already in the original research applications or consortium agreements.

## 5.1 Licensing

Technologies, products and processes can be licensed out at various stages of development. More development done on a technology before licensing - the higher the income that can be earned from licensing fees and royalties. The major advantage of licensing is that the responsibility for manufacturing, selling, distribution and further development of the technology or product is transferred to the licensee, thus reducing the investment required by the University. The TTO, with the assistance of the inventors, will identify potential licensees or commercial partners to develop and commercialize the IP. Sponsors of research may be granted rights to elect a royalty bearing exclusive or non-exclusive license to the IP. The TTO, together with the legal experts, will draw up and negotiate the license agreements.

*License*

A license is a legal agreement that allows a person or company - *the licensee* - to use the IP or know-how of another person or company - *the licensor* - in return for a fee. This fee is usually royalties, but may also be an up-front one-time payment. Unlike a sale, a license allows the licensor to keep ownership rights of the IP. The advantage of licensing is that the responsibility for manufacturing, selling and development of the technology or product is sifted to the licensee, thus limiting the capital required by the inventor in commercialization.

The license agreement has usually terms defining the length of time the license is valid, the geographic area in which the licensee can use or sell the product, status of sublicenses, the amount of fees and royalties, and whether or not the licensor has rights to any modifications developed by the licensee (Mikkola, 2010). However, license agreements are complex legal documents and they should be as comprehensive as possible in order to secure that the rights of both the licensor and the licensee are ensured for all potential occasions. The negotiating and drafting of the license agreements must be done with the assistance of a legal expert with know-how in the licensing of technologies.

Below are listed some of the items that should be considered when drafting a license agreement (Aalto, 2011b).

- Well-defined determination of the IP related to the license agreement

- Well-defined determination of products the licensee is allowed to develop utilizing the IP
- The exploitation time of the license agreement
- Deadlines on the development of the product onto the market by the licensee
- The payment amounts and conditions
- The geographical dimension of the license
- Guarantees on the used technology
- Rights of the licensor to any modifications developed by the licensee

The clear majority of technology licenses are for patents, copyright - typically for software – or for know-how and trade secrets (Mikkola, 2010). One license may cover several patents or other type of intellectual property. The following types of licenses may be given (LIMA, 2011):

*Patent commercialization licenses* give licensees rights to patented technology or technology defined in filed patent applications. These licenses may be *exclusive, non-exclusive or options.*

*Exclusive licenses* are those in which one licensee receives exclusive rights to develop technology or products utilizing the IP. This means that both the licensor and other potential licensees are disclaimed from exploiting the IP. This gives the licensee a remarkable competitive advantage and a chance for large earnings, thus, the royalty obligations and financial terms in such licenses are often quite significant.

*Non-exclusive licenses* give several licensees as well as the licensor the right to develop products utilizing the IP. Such licenses are often provided when the technology has a potential to significantly benefit wider users, and when providing several licenses may catalyze innovation's penetration faster into the market.

*Options* will give to the potential licensee the option - based on a fee - to negotiate a license within a specific time, while the company evaluates the commercial potential of the new technology. This allows the licensee to estimate the value of the new technology for a limited time before making the final decisions. Options have smaller financial terms and they have of a shorter duration. If the licensee finds that the new technology meets their requirements, then the parties can negotiate a final agreement for an exclusive or non-exclusive patent license.

Because the license is a transfer of value - royalties and up-front fees are the agreed price of that

value. Since licenses are not offered for sale in open markets, where the price is defined based on the supply and demand, each negotiation and selling situation is unique and indicates the commitment of each party. A licensor would like to cover the expenses already invested in the product, and on the other hand generate a solid flow of income in the future. Thus, the up-front fees should be high enough to fulfill the licensor's requirement for short-term income and to guarantee that the licensee is seriously developing the product. However, they should not be so high as to limit the chance of the licensee to invest in the product. Other facts are the life of the product and the life-time of the IP. The shorter the life of a product, the less the licensor can ask for up-front fees and, to a lesser extent, royalty.

Royalty rates differ widely and may depend on the following facts (Herve, 2010):

- The status of development of the licensed product
- The type of product
- The industrial sector in which the product is utilized
- The price level of the developed product
- The maturity of the market area
- The geographical dimensions of the license
- The conditions and exclusivity of the license

Royalties vary typically from 0% for technologies that are licensed out as pure ideas to 8%-12% for products with existing markets, see Fig. 5.

| Royalty Rates for In-Licensing by Industry | | | | | | | |
|---|---|---|---|---|---|---|---|
| Industry | 0-2% | 2-5% | 5-10% | 10-15% | 15-20% | 20-25% | >25% |
| Aerospace | 50.0% | 50.0% | | | | | |
| Automotive | 52.5% | 45.0% | 2.5% | | | | |
| Chemical | 16.5% | 58.1% | 24.3% | 0.8% | 0.4% | | |
| Computer | 62.5% | 31.3% | 6.3% | | | | |
| Electronics | | 50.0% | 25.0% | 25.0% | | | |
| Energy | | 66.7% | | | | | |
| Food/Consumer | | 100.0% | | | | | |
| General Mfg. | 45.0% | 28.6% | 12.1% | 14.3% | | | |
| Governmetn/University | 25.0% | 25.0% | 50.0% | | | | |
| Health Care | 3.3% | 51.7% | 45.0% | | | | |
| Pharmaceuticals | 23.6% | 32.1% | 29.3% | 12.5% | 1.1% | 0.7% | 0.7% |
| Telecommunications | 40.0% | 37.3% | 23.6% | | | | |

Figure 5. Royalty rates for in-licensing by US industry (Herve, 2011)

If the patent is licensed, the level of royalties may diminish, or the license may expire at the end of the patent life-time. The matter of license condition is more difficult when the license is based on the know-how. A reasonable approach toward a know-how license is for the royalty to diminish with time and finally reach zero value when parties observe together that the know-how is valueless. However, if know-how is vital for the successful manufacture and sale of the product throughout its lifetime, there is no reason for the royalty to change. If a licensor makes repeated changes to the know-how and includes those to the licensee, royalties may be gathered for a very long time.

## 5.2 Direct Sale

In many cases, it may be appropriate for the University to sell the IPR directly to the final user. In direct sale the ownership of IPR is transferred to the buyer. Regarding patents - patent provide the patent owner with the right to exclude others from exploiting the invention for the life of the patent. Thus the owner receives exclusive rights to develop technology or products utilizing the IPR.

The buyer may be a company that is already operating in the technology area or one that is about to enter the business. The first step in selling process is to understand the buyer's or final user's basic products and services. This includes not only understanding the current product and service offerings of the business, but also an understanding of future products and services. Similarly, an important matter in an IPR selling process is to understand the buyer's competition position, both from a business perspective and from an IPR perspective. The IP rights of the significant competitors should also be evaluated. This includes evaluation of competitor's patents, trademarks, copyrights and possible trade secret rights. This information should be used to understand the buyer's freedom to operate in the line of business based on the offered IPR. On the other hand, this information is very valuable in the pricing of IPR.

A variety of variables have been defined as indicators of patent value. Reitzig (2004) has defined the 13 best-know indicator variables for business purpose related to patent indicators and value. These indicators are shown in Table 2.

The age and status of IPR defines the starting point for pricing the patent. It may be in question of a priority patent application, granted domestic patent, international PCT application, granted national patent or a whole patent family. As in the case of licensing - similar drivers affect to the pricing of IPR: status of development of the sold product, type of the product, utilized industrial sector, maturity of the technology, dimensions of market area and geographical scope of the IPR. Forward citations, family size and the ownership variable show the degree of more theoretical

validation. Market value is a good indicator for a company's intellectual property assets. However, in the case of University this is not so ruling variable. Similarly, patenting strategy of the University doesn't directly affect to the price of sold IP.

Table 2: Indicators of patent value (Reitzig, 2004)

| |
|---|
| Patent Age |
| Market Value of Corporation |
| Backward Citations |
| Forward Citations |
| Family Size |
| Ownership |
| Scope |
| Number of Claims |
| Patenting Strategy |
| Number of Applicants |
| Number of Trans-Boarder Research Co-operation |
| Key Inventors |
| Legal Disputes |

However, every IPR business transaction has its unique features, whether due to the particular technology, the geographic market, the level of competition, and the litigious nature of the competitors. As in the case of licensing - all terms of transaction have to be well specified in the sales agreement defined by legal experts.

The acquisition price can be a lump sum in cash or it can involve a continuing revenue share based on the performance of IPR. In the latter case, the University will usually retain an interest in the IPR such that if agreed milestones are not met, ownership returns to the University. Typical price level for sold University IPR in Finland varies between 10k€ to 200k€ - however, exceptions exist (Kuosmanen, 2011).

The University's TTO may also decide to use a technology broker for the commercialization of IPR. There are a number of technology transfer agencies available in Finland and abroad that assist with the commercialization of IP. The advantage of using a technology transfer agency is that the

costs involved in the commercialization of IP are borne by the agency, which usually has a good network of potential licensees and extensive experience in the field of technology licensing.

In reality, the income from licensing or selling of patents is fairly small in comparison to University's total budget, or even in comparison to the University's sponsored research budget. Even at famous international Universities with the greatest amount of licensing income this percentage is only around 3-5% and at most Universities only around 0.5-2% (Roine et al., 2010).

## 5.3 Spin-Out and Start-Up Companies

In some cases, when the technology is novel, technology transfer may be best achieved through a spin-out or start-up company. However, this issue is wide and extensive – therefore only main features are discussed here briefly.

A *spin-out* company is a company that is created using the resources of the University or company from which the technology originated. The University or research institution usually may incubate the spin-out company at least until the first round of Venture Capital (VC) investment. Staff members from the University or company are often transferred to the new company either on a permanent or on a part-time basis. University spin-out companies in order to separate their commercial activities from their focused core purpose, i.e. teaching and research.

On the other hand, a *start-up* company is a company created by people outside the University. It is usually built on a license to one or more technologies that may originate from the University, however, its other resources such as management are drawn from elsewhere.

The University TTO will assist with the building up of a new company. The University may take an equity stake in the spin-out company in exchange for granting a license to the IP. Inventors who remain as University researchers may also own shares in the company, or they may sit on the Board of the spin-out company (Oulun yliopisto, 2011). However, this requires a permission for secondary occupation from the University to avoid deep conflict of interests.

The commercialization of research through the creation of new companies is an option in cases where the technology is sufficiently broad based, or so novel that the capital investment required for product development and commercialization is justified by the potential returns. The costs and risks must be evaluated against the potential returns when deciding on whether to form a new company or to license the technology to an existing company that has the necessary infrastructure

such as channels to market, sector knowledge, facilities, commercial management, and an existing customer network. The new company route may be the only option if the technology does not fit into the product offerings and markets of existing companies, or if a market does not already exist for the new product. On the other hand, a license may be the only option if funding for product development and marketing is not available. Forming a new company as a means of commercializing technology presents a higher risk than the traditional licensing route; however, it has the potential to contribute to economic development via creation of new jobs (Hjelt et al., 2006).

There are many challenges facing new companies, particularly those based on technology. A wide variety of skills, expertise and resources is required for them to develop and market their own products. They usually require a large investment over a relatively long period of time before sales and revenues are realized. Spin-outs from existing companies usually have a strong infrastructure and support base, while spin-outs from Universities and research institutions may be at higher risk, since the Universities are normally limited in the staff and financial resources and capabilities which they can devote to the commercialization of technology (Hjelt et al., 2006).

The Department of Science and Technology and Tekes - The Finnish Funding Agency for Technology and Innovation - have initiated a number of interventions to support the successful development of new companies originated from Universities in Finland (Tekes, 2011b). The interventions include the establishment of a number of incubators designed to provide business support and the necessary resources to aid the successful establishment of new companies. Start-ups and spin-outs from research institutions and companies are able to make use of the incubators for support.

# 6. Valuation of Intellectual Property

Intellectual property or intangible assets can be patents, trademarks, copyrights, trade secrets, certain proprietary methods of doing business, and the human capital of the owners and employees. Thus, once an intangible asset has been identified, it needs to be valued. Even thought patents are one of the most concrete types of intangible assets, they are difficult to valuate. There are many uncertainties within the patented invention, which relate to the future predictions. Some patents are based on existing technologies, and they contain less uncertainty than those relating to new technology (Orelma, 2007).

Intellectual property is worth only as much as the buyer or licensee is willing to pay for is. Valuing intellectual property is difficult because there are no easily-understood valuation rules which could be applied in every case. It is impossible to know what benefits owning or using the intellectual property will bring in the future. Thus, there are many uncertainties connected with patent value. Legal uncertainties contain the uncertainties about the scope of the patent and the legal validity in the case of litigation. Technological uncertainties of patent come from the existing technology of the patent. It is not sure whether the filed technology will be the best one – it might be already old and more advanced technologies will replace it. On the other hand, market uncertainties relate with the economic aspects of the patent. All these uncertainties affect to the value and revenue of the patent. A patentable invention in the early stage of development will be worth less than a strong, patented invention which is close to market or which is on the market and generates revenue.

However, many factors define whether IPR is useful, and how much the buyer might pay for it. For buyer or licensees, the value of intellectual property is dependent of factors such as whether the IPR enables them to:

- Increase sales
- Price their products at a high premium
- Reduce production costs
- Increase the speed of production
- Improve the quality
- Reduce product development costs
- Achieve notable competitive edge

On the other hand, the value of intellectual property may be more if the seller is willing to provide other benefits, such as technical assistance, help with quality control or providing focused know-how.

Unless intellectual property help to create, maintain or increase revenue, it may have no real value. However, the value of IPR may change over time. The fact that there is no commercial use at this moment for a patent does not always mean that the patent is valueless. Its value will depend on its ability to turn a profit in future, or it may help the owner or licensee to increase or maintain market share by using patent as a block to competition. Thus, the value of intellectual property to the seller and to the buyer will depend on circumstances at that time and in that place. In valuation it is important to focus on following aspects (Orelma, 2007):

- The nature of the IPRs
- The purpose for which they will be used
- The potential market for them
- The business of the seller and buyer
- Does the patent provide added value to customers
- Is the patent competitive with competitors' patents
- How much potential does the patent have creation of new products
- How difficult is to imitate or circulate the patent
- How big is the risk that the patent expires too early

Despite intangible assets' lack of physical substance and relationship to other assets, which makes them difficult to isolate and measure, there are many different techniques that have been developed for valuation of intellectual property. They all have their limitations and no method is appropriate in every case. The stage of development of the IPR, the availability of information, and the commitment of parties have influence to the method to be used. It may be useful to start with one approach and then use others as verification. Valuation theory provides several theoretical approaches like real option based methods including decision tree analysis, econometric methods, EVA, Tobin Q and different scoring frameworks (Karjalainen, 1999), (Orelma, 2007). However, these methods are out of the scope of this study. Thus, we will focus on most practical methods.

Common practical patent valuation methods are divided in *cost based*, *market value based* and *income or economic value based* methods. These methods are discussed in the following sections. The method used in valuation is often chosen after the purpose and interests of parties and the competences required in the process are understood. In a perfect scenario, several professions should be combined; in practice this is costly and requires clear definitions to avoid common communication problems between research and business oriented people. Experts must be consulted in estimating and verifying the assumptions and inputs of each model to maintain any credibility in evaluation.

## 6.1 Cost Based Methods

Costs may be based on either a historical data or a current estimate (Sohlman, 2002). However, cost never indicates a marketplace or transaction. Cost based method involves looking at the costs incurred in developing or creating the IPR or what it might cost to create the IPR or to develop a similar product. Thus the cost of labor, material and equipment, R&D, creating of a prototype, testing and trials, registering the IPR and associated fees are included. Method assumes that a potential buyer can avoid these costs by buying the IPR. Thus the buyer will avoid spending at least as much to develop similar IPRs. Similarly the buyer avoids the risk that it might not be successful in developing similar IPRs and that it might not be protected. Sometimes this method appeals to sellers because it seems fair to them that they would receive at least as much as they have spent. In addition, it is much easier that other methods which require finding comparative information on which to base a market valuation of the IPRs.

Table 3: Cost structure of 10 years old patent family (Sohlman, 2002)

| Accounting cost (kEUR) | Finland | EPO | |
|---|---|---|---|
| Inventor remuneration | 0.5 | | |
| Filing & Application | 5.5 | 22 | |
| Annual fees | 2 | 9 | |
| Oppositions | 2 | | |
| Personnel | 1 | | Total |
| Total | 11 | 31 | **42 kEUR** |

However, historical costs indicate only the old market situation, but very little about the expected present or future price. If recorded costs of patenting are used in valuation, the resulting value is not usable for actual decisions because for patents the future values are usually larger than cumulated development costs. Thus, this method is primarily suitable for financial reporting and benchmarking. Historical cost is typically a basis for accounting patents and other IP assets in the company balance sheets. Therefore, this method may be used to apportion the purchase price of business among its assets where the IPRs a minor part of its total assets. On the other hand, it may be appropriate when valuing IPRs which are in the early stages of development or when equivalent IPRs may be developed. In Table 3 the cost structure of 10 years old patent family is presented. Achieved value indicates very little about future opportunities or commercial utilization. Cost approach does not directly consider either the amount of economic benefits or the time period

over which they are expected to continue. Cost approach assumes that the asset can be replaced, while patents are unique in nature.

## 6.2 Market Based Methods

Market approach for valuation describes the value obtained as a result of how the market has observed it to be. Market conditions are the expected sale or license price of an asset. The market approach derives an estimate of asset value by analyzing similar assets recently sold or licensed; selling prices, volumes, net sales and cash flows are gathered. This information may be based on actual *sales transactions*, royalty incomes generated by the assets or some kind of rules of thumb used inside the industry.

Market based methods take the value of assets that are recently traded. This means that there should be quite reliable information on the value of similar patents available from the market. The use of market prices of comparable assets as a reference is easy to use, but it contains uncertainties like incomplete information about the assets in question (Valkonen , 2010).

*Royalty based approach*

If patent value is based on company sales or license royalties, one way is to assign a fixed percentage of sales as being made possible through a patent. Thus the value of royalties means using the license revenues actually paid by a licensee from existing contracts. However, the licensor and licensee may structure royalty payments in many ways. Typical forms of royalty payments are (Newman et al., 2008):

- A running royalty based on a percent of the net sales price
- A running royalty based on an euro amount per unit
- Lump sum or paid-up amounts
- Combined agreements that combine lump-sum milestone payments with running rates
- Tiered rates that adjust at different sales levels
- Different rates for different fields-of-use or geographic markets
- Different rates when there are multiple patents that cover a single product or technology
- Minimums and maximums both annually and over the life of the agreement

Royalty rates are often taken as a market average, expanded to include not only the value of licensing agreements but also litigation value of the patent, returns to R&D cost and return to sales. A simple example of royalty based approach is presented in Table 4.

Table 4: Value of patent family based on royalties (Karjalainen, 1999)

| Patent family | |
|---|---|
| Size of market | 5 M€/a |
| Market share | 30 - 35 % |
| Sales | 1.5 – 1.75 M€/a |
| Royalty % | 2.5 % |
| Royalty fee | 0.0375 - 0.045 M€/a |
| Years (10) | 0.375 - 0.45 M€ |
| Value of patents | **0.375 - 0.45 M€** |

*Relief-from-royalty*

Another commonly used market based method is the relief-from-royalty approach. This method is often used e.g. to value trade names and trademarks. In this method, the value of an IP is equal to all future royalties that would have to be paid for the right to use the asset if it were not acquired - i.e. the licensing costs avoided by virtue of owning the property. Conversely, this approach may also quantify the amount of income that the owner would generate by licensing the intellectual property to others. This method requires that the IP have been developed to the point where it can be expected that products containing the technologies could be produced within a reasonable period of time. A royalty rate is selected e.g. based on the importance of the asset, ability of competitors to produce similar assets and market licensing rates for similar assets. The royalty rate is applied to the expected revenues generated with the asset. The hypothetical royalties are then discounted to their present value. Royalty rates may vary widely among industries depending on the nature of the proprietary property, its role in the business, the specific industry and the marketplace. An example of this approach is presented in Table 5 - life time of the patent is expected to be 5 years - and tax savings based on investment allowances are also taken into consideration (Karjalainen, 1999). Market based methods are always very complex analytical processes, because they are based on more market derived data that are difficult to collect and verify. It may be difficult to get information about other transactions – they are often kept confidential. In addition, few transactions are sufficiently similar to allow a valid comparison – no two deals are really the same. However, when comparable data is available the result is often a credible indication of the fair market value and offers an empirical evidence of the potential market value.

Table 5: Value of the patent based on relief-from-royalty approach (Karjalainen, 1999)

| Process stage | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|
| Sales based on the patent (M€) | 300 | 350 | 300 | 250 | 100 |
| Royalty % | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Royalty savings (M€) | 12.0 | 14.0 | 12.0 | 10.0 | 4.0 |
| Tax rate (40 %) | 4.8 | 5.6 | 4.8 | 4.0 | 1.6 |
| Royalty savings after tax (M€) | 7.2 | 8.4 | 7.2 | 6.0 | 2.4 |
| Net present value rate (15%) | 0.9325 | 0.9109 | 0.7051 | 0.6131 | 0.5332 |
| Discounted cash flows (M€) | 6.7 | 6.8 | 5.1 | 3.7 | 1.3 |
| Sum of discounted cash flows (M€) | | | | | 23.6 |
| Tax savings based on investment allowances (M€) | | | | | 9.5 |
| Value of patent (M€) | | | | | **33.1** |

## 6.3 Income Based Methods – Discounted Cash Flows

One of the most popular means to value intangible assets is the discounted cash flow method. This method is typically used to value some of the more widely known intangible assets such as technology, software, customer relationships, strategic agreements, franchises and distribution channels (Sohlman, 2002). This approach focuses on the income producing capability of the patent. The value of patent as an asset is determined by converting the future benefits into present value. Patent's value is basically the difference between positive and negative cash flows over its lifetime. The value of a patent at a point in time is the present value of the net cash flow it generates over its remaining lifetime, see Fig. 6. In principle the discounted cash flow is: The value of euro in hand today is more than the value of euro received tomorrow because of other available alternative investment opportunities.

The discounted cash flow formula is derived from the future value formula for calculating the time value of money and compounding returns. The *Net Present Value* of future cash flows $R_t$, over $N$ periods of time $t$, is:

$$NPV_t = \sum_{t=0}^{N} \frac{R_t}{(1+k)^t}$$

where *k* is the discount factor. Thus multiple cash flows in multiple time periods are discounted - and for each future cash flow at any time period in years from the present time - summed over all time periods. The sum is then used as a Net Present Value - positive or negative - over all time periods. Net present value calculations takes into account facts that expenses are certain and early and the return is actually later and very uncertain. Thus the product may not succeed and markets are really not met.

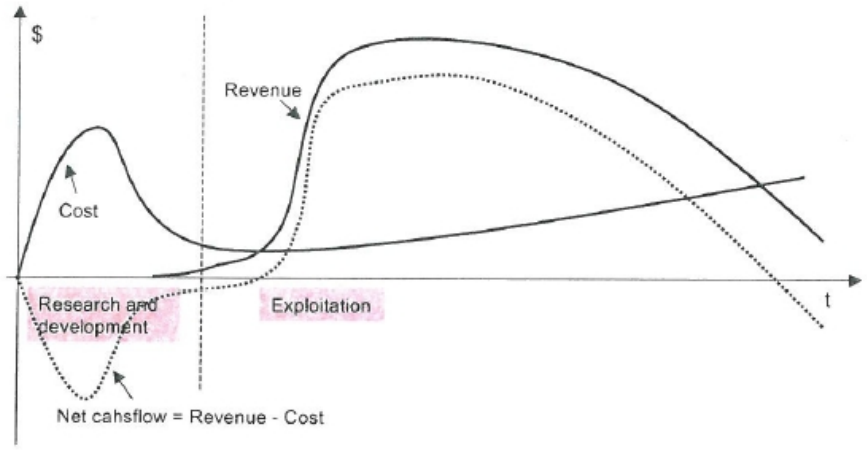



Figure 6. The life time value of a patent (Sohlman, 2002)

Let's look at the simple example of net present value calculation. We would like to know what is the value of 1000 € in 5 years with different discount rates, which could e.g. describe typical inflation rate (3%), long term bill rate (7%), average corporate cost of capital (15%), corporate investment hurdle rate (30%) and Venture Capitalist (VC) investment hurdle rate (50%). See Table 6.

Table 6: Net present value of 1000 € in five years

| Formula is: $1000€/(1+k)^5$ | | |
|---|---|---|
| *k* | Value € | Payback |
| 3 % | 862.61 | 1.15x |
| 7 % | 712.99 | 1.40x |
| 15 % | 497.18 | 2.01x |
| 30 % | 269.33 | 3.71x |
| 50 % | 131.69 | 7.59x |

The effect of discount rate over time may also be presented as shown in Fig.7.

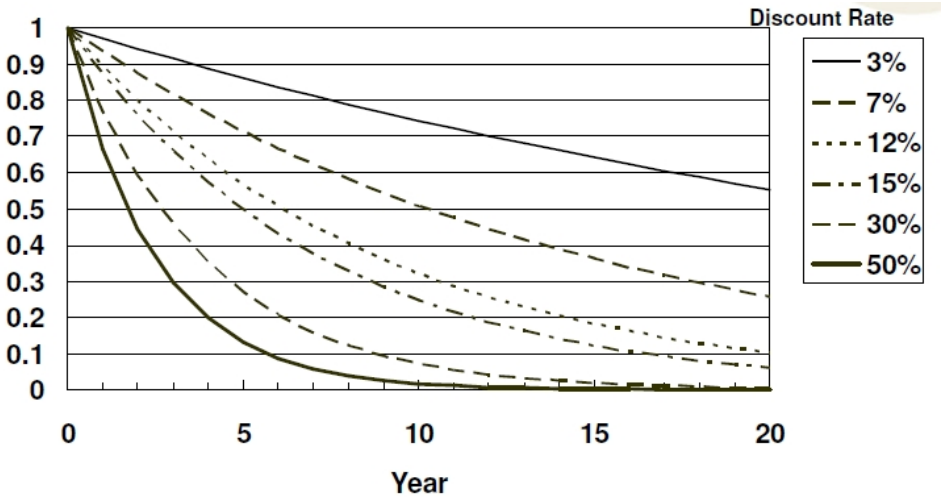



Figure 7. Effect of discount rate over long periods

The discount factor reflects both the time value of money and the uncertainty in achieving the level of future cash flows. Usually an initial investment is required in order to produce the future inflows. Income based methods are assumed to include all elements of value. The investment needed to generate the cash flows is considered, as well as the timing and riskiness of the returns, while taking a longer span. Income based methods are usually more generally applicable than market or cost based methods.

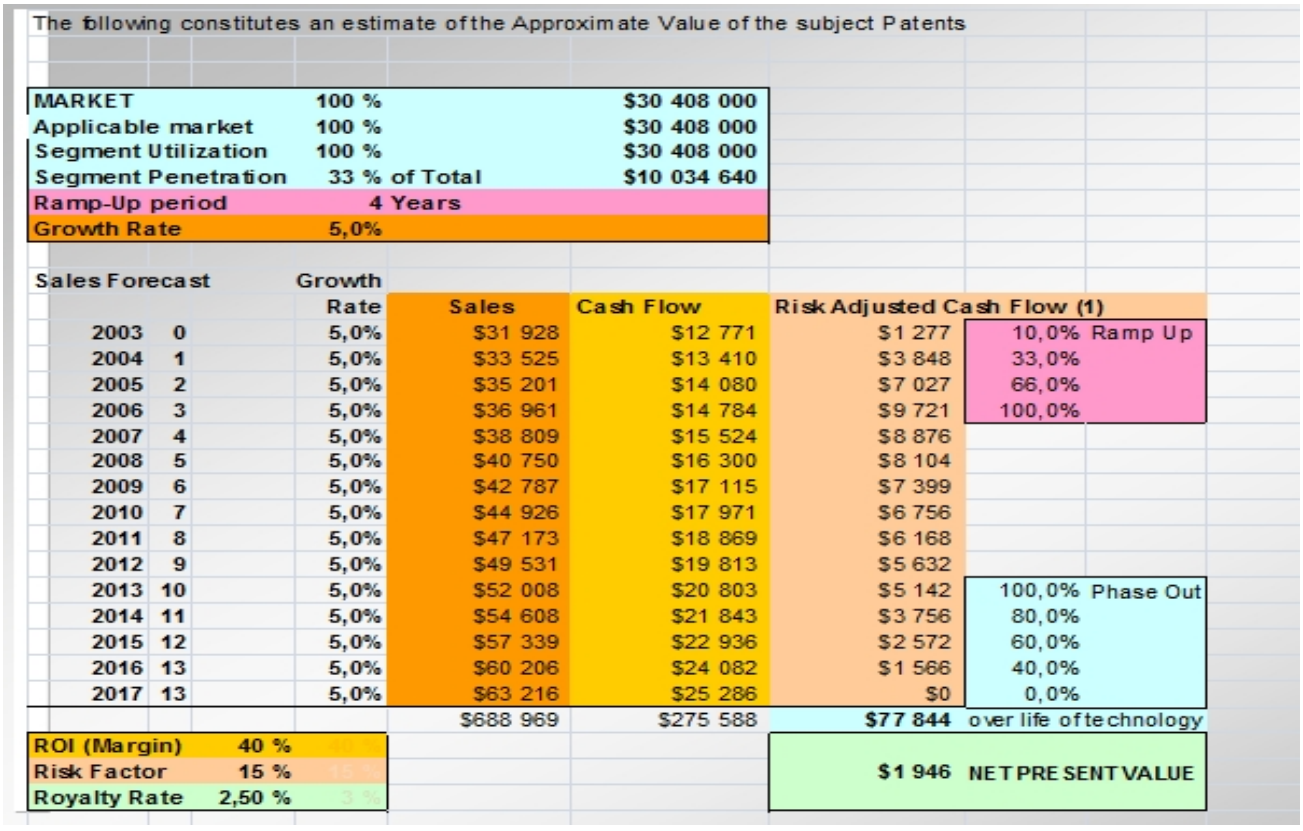
## 6.4 Risk Adjusted Discounted Cash Flows Method

Very early stage projects have usually a very high risk, and so they need a high discount rate: 30 – 50%. However, so high discount rates make it very hard to justify any early stage project. Thus, a better approach is to account for the high risk explicitly and use e.g. concept of risk adjusted net present value (Weeks, 2008). In this approach discounted cash flows are modified by taking into the consideration uncertainty dependent risk factors, which observes novelty of technology and product, and also status of potential markets. Similarly market segments and market segment penetration are evaluated. Thus, an estimate of revenue in each market segment by year and growth rate for future projections are defined. Ramp-up and ramp-down rates may also be defined. Ramp-up is a stage of development of technology and it depends on market uptake characteristics. Ramp-down is an estimate dependent on the life of patent. On the other hand, market segment penetration is based on competitive factors and it is an estimate what percent of market will be won from competitors. Risk factor may be defined, as shown in Table 7.

Table 7: Determination of risk factor (Weeks, 2008)

| | | | | |
|---|---|---|---|---|
| Old Tech | Existing Product | Existing Market | Very Low Risk | 15-20% |
| Old Tech | Existing Demand | Existing Market | Low Risk | 20-30% |
| Old Tech | Replace Demand | Existing Market | Moderate Risk | 25-35% |
| New Tech | Replace Demand | Existing Market | High Risk | 30-40% |
| New Tech | New Product | New Market | Very High Risk | 35-45% |
| New Tech | New Product | Startup | Extra High Risk | 50-70% |

Let's have a look at a case where rather clear and well understood technology - protected by patents - is considered, and it is aimed to the existing business markets. Sales forecast and growth rate of sales is assumed to be known. Similarly, the risk factor is evaluated to be low (15%) - margin of return on investment (ROI) is set 40% - and market segment penetration is estimated to be 33% - ramp-up period is 4 years and required royalty rate is defined to be 2.5%.



The following constitutes an estimate of the Approximate Value of the subject Patents

| | | | |
|---|---|---|---|
| MARKET | 100 % | | $30 408 000 |
| Applicable market | 100 % | | $30 408 000 |
| Segment Utilization | 100 % | | $30 408 000 |
| Segment Penetration | 33 % | of Total | $10 034 640 |
| Ramp-Up period | 4 | Years | |
| Growth Rate | 5,0% | | |

| Sales Forecast | | Growth Rate | Sales | Cash Flow | Risk Adjusted Cash Flow (1) | | |
|---|---|---|---|---|---|---|---|
| 2003 | 0 | 5,0% | $31 928 | $12 771 | $1 277 | 10,0% | Ramp Up |
| 2004 | 1 | 5,0% | $33 525 | $13 410 | $3 848 | 33,0% | |
| 2005 | 2 | 5,0% | $35 201 | $14 080 | $7 027 | 66,0% | |
| 2006 | 3 | 5,0% | $36 961 | $14 784 | $9 721 | 100,0% | |
| 2007 | 4 | 5,0% | $38 809 | $15 524 | $8 876 | | |
| 2008 | 5 | 5,0% | $40 750 | $16 300 | $8 104 | | |
| 2009 | 6 | 5,0% | $42 787 | $17 115 | $7 399 | | |
| 2010 | 7 | 5,0% | $44 926 | $17 971 | $6 756 | | |
| 2011 | 8 | 5,0% | $47 173 | $18 869 | $6 168 | | |
| 2012 | 9 | 5,0% | $49 531 | $19 813 | $5 632 | | |
| 2013 | 10 | 5,0% | $52 008 | $20 803 | $5 142 | 100,0% | Phase Out |
| 2014 | 11 | 5,0% | $54 608 | $21 843 | $3 756 | 80,0% | |
| 2015 | 12 | 5,0% | $57 339 | $22 936 | $2 572 | 60,0% | |
| 2016 | 13 | 5,0% | $60 206 | $24 082 | $1 566 | 40,0% | |
| 2017 | 13 | 5,0% | $63 216 | $25 286 | $0 | 0,0% | |
| | | | $688 969 | $275 588 | $77 844 | over life of technology | |

| | | | |
|---|---|---|---|
| ROI (Margin) | 40 % | | |
| Risk Factor | 15 % | | |
| Royalty Rate | 2,50 % | | |
| | | $1 946 | NET PRESENT VALUE |

Figure 8. Calculation of risk adjusted net present value (Weeks, 2008)

In Fig. 8 the calculated risk adjusted Net Present Value (NPV) is shown. The NPV of future cash flows and NPV of licensing value are both positive. Thus, the project is justified - and worth 77 844

$ today, from which the NPV of royalty would be 1 946 $. Not a goldmine - and result indicates that some kind of combination of upfront, milestone payments and royalty would definitely provide better return.

## 6.5 Other Methods

While discounted cash flows method is the most frequently used approach for evaluating patents and royalties, some experts also use other methods in conjunction with or in place of it. One of the most common is the rule of thumb (Newman et al., 2008).

*The 25% rule*

The rule of thumb or *25 Percent rule* is an example of the profit split or profit-sharing approach and suggests that a licensor and licensee would negotiate a royalty ranging from 25% to 33% of the licensee's expected profits from the patented technology. The rule is typically applied to gross profit (before tax) on sales of the product which use the patent. For a trade mark the royalty rate is likely to be between 10% and 15%. Gross profit calculation usually takes into account manufacturing costs, such as raw materials and labor utilities. However, operating expenses - such as costs of sales and general overheads - are typically ignored.

Most royalties are on net sales, thus the 25% rule is adapted to produce a rate on net sales. In business sectors where profit margins are high – like in software business – the royalty rate will be high, and vice versa.

In many business sectors the average royalty rate based on net sales is in the region of 5%.This is an average and the values which underline it vary widely. All rules of thumb ignore important factors such as the investment needed, the risk involved and the commitment of the parties. Any rule of thumb should be no more than a starting point, and the final evaluation should be done based on more accurate analysis.

Due to data limitations and other issues, in many cases actual profits, or the profits for product line or the company, are analyzed. Usually it is used as a starting point and the final evaluation is done based on the discounted cash flow analysis.

## 7. Practical Checkpoints for Pricing a Patent

Next a list of practical checkpoints or useful to-do list for pricing of a patent is presented. It points out major issues that need to be considered in valuation process. It may also be used in the review of intellectual property portfolio or a background material for developing a negotiating strategy for a licensing case of IPR.

*Check validity of the patent*

Before starting a detailed valuation, validity of the patent should be verified. The first checkpoint is whether the patent's maintenance fees are up to date or not. Some payment delays can be tolerated, but if the annual fees have not been paid the patent might be worthless due to revocation.

*Collect related information*

For valuable patents, following information should be collected:

- A copy of the patent application
- Copies of any available business plans or marketing studies
- Copies of any contract or licensing agreement concerning the patent
- Descriptions of any litigation processes
- Available economic data from the industry in which the invention is utilized
- A list of any domestic or foreign patent applications relating to the patent
- Cost information relating to the patented product

*Build up a valuation group*

Background in the specific technology of the patent, know-how in patent law and business valuation competences are important for relevant patent valuations. In many cases the inventors are the best to advice on technology matters. Valuation group may also include a patent agent and someone with know-how in patent finance - such as TTO's Technology Transfer Manager.

*Get acquainted with the patent*

A patent contains a lot of formal information such as; the title of the invention, a serial number, the name(s) of the inventor(s) and, if applicable, the assignee to whom the inventor(s) have transferred ownership. The *date of the patent* helps in the calculation of the patent's remaining life. For valuation, it should not only be considered the legal life of the patent but also it's economic and technological. Patent's economic life may be substantially shortened by developments that make

the invention rapidly old-fashioned. The *background* part of the patent usually presents the most useful information about the patent's commercial potential. The *detailed description* part expresses the technical aspects of the invention to those working in the relevant discipline. The description usually does not limit the scope of the patent and thus does not affect its value. On the other hand, *claims* of the patent provide the most important information: the scope of the invention. Patent's scope of protection is the most important fundament of value. Thus, a very careful remark should be paid to the claims to understand patent's scope and how the claims join in to the market situation. In addition, the *cited* patents should also be analyzed to understand to which extent owners of these patents have limited the scope of their patents.

*Consider a portfolio of patents.*

Owning a patent does not guarantee the right to utilize the invention if it infringes someone else's present patent. If a new invention infringes a prior patent, the earlier one is said to *block* it, which reduces inventions value. Thus, a portfolio of related patents can be worth more to a single owner than the same patents would be individually to several owners because it can eliminate blocking patents. With such portfolios it may be wise to value the patents as a family rather than individually. In addition, a valid patent registered in multiple countries will have a larger market scope and it will be worth more.

*Check up the litigation status of the patent*

Legal factors that affect the patent's value are whether there has been litigation and, if so, what the final result has been. If the patent has been litigated, it is an indication that its owners believe it to be valuable, and indicates competitors to be aware. Usually this increases patents value. The opposite is also valid - a failed attempt to enforce a patent can harmfully affect its value. If required, consult a patent attorney in litigation issues.

*Analyze competing technologies*

Evaluating alternative technologies may help to predict the cost savings and potential earnings or royalty rates that are related to the patent. Analyzing competing technologies helps indicate the invention's potential to capture a new market share and potential revenues.

*Estimate the potential demand for patented technology*

The valuation group should estimate the potential demand of product by evaluating the industry area in which the patent would be valid. A consultation with marketing professionals or other experts is recommended and up to date market survey would give a good base for the patent

valuation analysis. The remaining risks and costs of prototype development should be taken into the consideration to see whether the licensee or the licensor should take care of them.

*Carry out a valuation analysis*

Valuation could be done on cost, market or income bases and actually all methods should be considered. However, the cost based method is rarely efficient for patents, and the market based method may not be suitable. Thus, the income based method is often preferred for valuing patents. In the income based method the sales estimates are usually based on a profit analysis or on a historical data if it is available and prediction of future returns. However, in practice penetration rates to the market for a novel patent might be based on the actual product characteristics rather than IP rights (Weeks, 2008). Used discount rate should indicate the risks of an investment in the predicted profit flow as accurately as possible. To evaluate the potential income based on the patent, it is useful to consider the benefit related to the sale of the patented technology or savings related to the patent's use (Sohlman, 2002). Thus, the valuation on a discounted cash-flow analysis could be based on the two clear options - with a patent or without it. The analysis would take into the consideration expected costs, capital expenditures, working hours etc. and the chosen discount rate would quantify the costs of capital and the risks of the investment in the forecasted cash flow. The difference of the output between these two alternatives could be used for valuing the patent. However, in reality, the final royalty rate will always be lower than the estimated economic profit based on the patent.

*Compose a valuation resume*

The valuation resume should include; valued patents, used assumptions, obvious limitations of the analysis, applied evaluation processes, achieved conclusions, and the competence of the evaluation group members and their input to the valuation.

# 8. Best Practices – Case Massachusetts Institute of Technology

All best performing Universities in the world have a strong emphasis on applied research and close co-operation with industry. Several successful Universities could be pointed out: Standford University, Massachusetts Institute of Technology (MIT), Harvard University, University of California, The Hebrew University of Jerusalem and National University of Singapore are few well-known examples. We have selected Massachusetts Institute of Technology as an example to represent the best University technology licensing practices. In addition, Boston area - where MIT is located - is one of the leading hubs for high-growth venturing and technology licensing (Roine et al., 2010).

Massachusetts Institute of Technology is a high-class educational institution. Teaching and research are its primary purposes. However, MIT has a long history of partnership with the social and economic development of the state of Massachusetts. The university employs over 900 faculty members and registers approximately 4300 undergraduates and 6000 graduate and professional students. MIT has 5 schools, which contain 34 academic departments, divisions, and degree-granting programs, and numerous interdisciplinary centers and laboratories. Large proportion of MIT students come from outside of the United States.

MIT has been very successful in fostering entrepreneurial approaches to technology transfer. It has one of the oldest and most successful technology transfer functions in the United States. MIT has also developed a long-standing mission of service to its state and national interests, while at the same time creating a very entrepreneurial culture and some novel approaches to technology transfer. Number of factors has been pointed out to underlie this MIT's success (O'Shea et al., 2007):

- Over a long period of time, MIT has developed informal internal and external networks between government, industry, and academia. These networks have increased and leveraged research funding at MIT and has allowed for the sharing of knowledge. This has helped to stimulate high-tech entrepreneurship.
- The quality of academic staff. MIT's excellent research combined with a willingness to aim at interdisciplinary research has been a strong driver in the creation of knowledge that industry and start-up companies have exploited.
- Organizational characteristics such as the Technology Licensing Office (TLO), practices and policies. MIT has a number of dedicated and experienced organizational structures such as its TLO and entrepreneurship programs. These resources are dedicated to

promoting emerging technological opportunities and to training potential academic entrepreneurs to create and build successful start-ups.

- The mission of University. MIT has demonstrated a strong commitment to the exploitation of research. This commitment is supported by clear policies, that are consistently applied, that support and encourage innovations and start-up formation by academics.
- Within the TLO, MIT has a staff of technically trained, industrially experienced licensing officers. The staff in the TLO is highly motivated to accomplish the "deal done".
- MIT's successful tradition and history at commercializing radical technologies has created an innovation and start-up culture among academics and staff.
- The culture that has developed among MIT faculty. Academics within MIT have positive attitudes to commercialize technology and starting companies.
- The flow of industry funds for research. MIT has a long tradition of industrial funding, which has led to commercially oriented innovations.
- The external geographical context in which MIT operates. MIT is located in one of the leading high-tech clusters in the USA. This gives academics access to critical expertise and recourses to spin-out ventures.

We will pick up a couple of these factors for a closer look. As mentioned, some MIT's organizational structures and practices facilitate well commercialization of research. These include the TLO, the Sloan School Entrepreneurship Center, the Desphande Center for Technological Innovation, Entrepreneurship Development Programs, and inter-disciplinary Research Centers.

We will focus on the MIT Technology Licensing Office which has a long history - established already in 1945. Today it has two principal goals: To facilitate the transfer to public use and benefit of technology developed at MIT and to provide an additional source of unrestricted income to support research and education at MIT (MIT 2011e). Thus, the TLO office plays a proactive role in technology transfer activities – it encourages faculty to disclose inventions immediately. MIT's Innovation Policy was presented earlier in Chapter 3. According to its Innovation Policy TLO evaluates carefully the market value of disclosed inventions, and obtains protection of intellectual property – when necessary. It also co-operates closely with Venture Capitalists (VC) to consult new technologies and present research that might be suitable for a start-up venture. In addition, MIT TLO is staffed by qualified engineers - Technology Licensing Officers - with industrial experience from biotechnology, chemistry, energy, biology, software, chemicals, medical devices, cell biology, diagnostics, medicine, consumer products and mechanical devices (MIT 2011c).

Main practical functions of the MIT TLO regarding innovation process, IP management and licenses to the start-up companies include (MIT, 2011e), (MIT, 2011d):

- Coach on patent preparation
- Informal dispute resolution
- Make contacts with companies
- Negotiate license
- Put sponsored research milestones in license
- Monitor compliance
- Informal matchmaking
- Give advice on what idea will fly as a business
- Introduce inventors to investors
- Introduce inventors to potential CEO's
- Give advice on conflict of interest issues

On the other hand, MIT TLO does not do - itself:

- Analyze prior art in great detail
- Prepare patents
- Invest to companies (sometimes take equity in partial lieu of royalties)
- Provide Office Space or Administrative Support
- Do detailed marketing studies
- Prepare business plans (only read and comment on them)
- Calculate return on investment (ROI)

MIT's innovation practices and policies have generated very good results, and MIT has been one of the most successful Universities in the United States in technology transfer and spinoff activity. MIT TLO office statistics from the year 2010 is shown in Table 8. These values represent also a good average value for MIT TLO activity on a decade basis (MIT, 2011a). Total number of invention disclosures reflects the encouraging atmosphere within the University and how well it has been adopted by faculty staff and students. Number of patents filed and issued represents a solid flow of attractive innovations with high potential market value. On the other hand, number of licenses and options indicate how well the innovation work done within the University has matched to the expectations of commercial users. Similarly, cash income and royalties represent financial benefit and it is also an indication of payback from the innovations to the University - and indirectly also to the final users.

Table 8: MIT TLO statistics (MIT, 2011a)

**TLO Statistics for Fiscal Year 2010**

| | |
|---|---|
| Total Number of Invention Disclosures | 530 |
| Number of U.S. Patents Filed (including provisional, ordinary, and priority) | 184 |
| Number of U.S. Patents Issued | 166 |
| Number of Licenses Granted (not including trademarks and end-use software) | 57 |
| Number of Trademark Licenses Granted | TBD |
| Number of Software End-Use Licenses Granted | TBD |
| Number of Options Granted (not including options as part of research agreements) | 34 |
| Number of Companies Started venture capitalized and/or with minimum of $50K of other funding) | 16 |

| | |
|---|---|
| Cash Income | $76.2 M |
| Royalties | $60.1 M |
| Patent Reimbursement | $8.8 M |
| Equity Cash-In | $ 1.1 M |
| Expenditure on Patents | $15.3 M |

O'Shea et al. (2007) have studied the success of MIT in terms of technology transfer and spinoff activity. They have found out four major attributes which are important to this success. These are the science and engineering base of the University; the quality of research by University staff; the commitment to innovation and spinoff activity within management in the University (Leadership and Supporting Policies); and the culture within the University (Entrepreneurial Orientation of the University). They point out that some of these factors may be replicated and copied and some definitely cannot. History is unchangeable; the effect of geography is also mostly static; culture can be changed – but its dynamic is slow. Research portfolio of the University can be changed – but also its dynamic is quite slow. The quality of research can be raised – provided that resources are available. Administrative commitment can be created through allocation of resources and incentives. A strong TLO should be a part of this. Similarly a tempting distribution with faculty and researches of earnings from commercialization of University know-how can be developed. However, the requirement of high level academic output must always be required.

# 9. Conclusions

Finnish Universities have not played a significant role in the commercial utilization of research results or enforced their knowledge into intellectual property. In addition, Finnish academics' interest in entrepreneurship has been at low level - compared to many other countries (Kankaala et al., 2007). Universities primary interests seem to have been related to the supply of educated manpower and to contribute to solve industry's research problems that industry itself has neither the resources nor competence to deal with. However, it is obvious that the co-operation and partnership with universities is of high importance for Finnish industry. Co-operation with Universities has contributed to increase the knowledge and competences of firms and visibility and prestige in many areas. Significant technology transfer has taken place directly from research groups to the companies in every collaborative research project. Especially for SMEs, the co-operation with universities has been valuable in developing important technologies in their core business areas.

Unfortunately, the Finnish firms have too seldom exploited the IP generated by Universities. New ideas and skilled manpower provided by Universities seem to have been much more important for companies than patents and other IPs. On the other hand, in Finnish Universities the number of attractive licenses, patents and spin-offs have been quite modest in comparison with the major well-known international Universities. Thus, the law of supply and demand has not worked at all in this context.

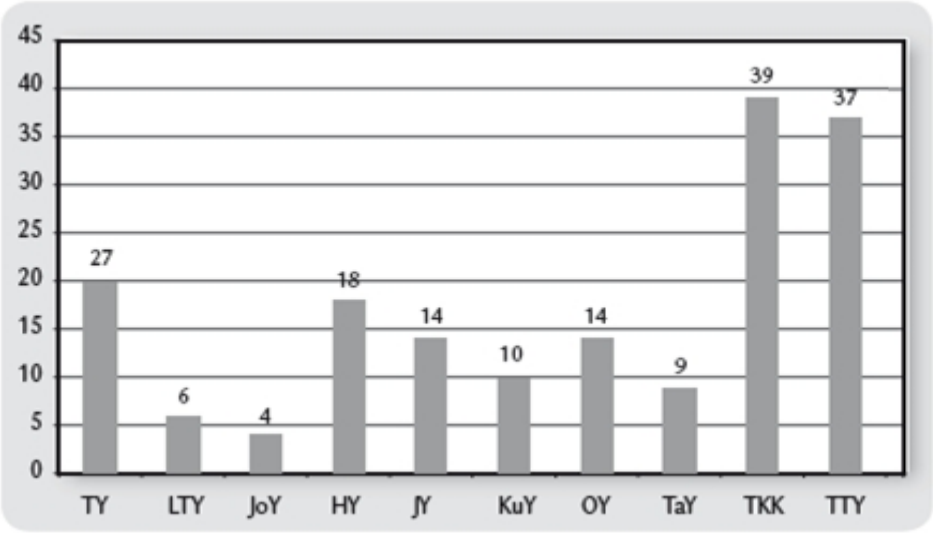
This - and more general issue of value-creation of the University based innovations in Finland - has been considered in several Finnish publications during the last decade (Hjelt, 2006), (Kankaala et al., 2007), Opetusministeriö, 2007), (Opetusministeriö, 2009), (Loikkanen et al., 2009). One of the latest is the Tikari report made by Roine et al. (2010). A background for this criticism may be found from IP, technology transfer and spin-off activity statistics. In Table 9, the invention disclosure, patent application, patent license agreement and license revenue statistics of Finnish Universities regarding year 2005 are shown (Kankaala et al., 2007). Explanations of abbreviations of Universities are shown in Appendix 1. Similarly in Table 10, number of spin-off companies originated from Finnish Universities between years from 2000 to 2006, is presented. Kankaala's et al. (2007) publication provides a very good viewpoint to this subject. Although the statistical data is a couple of years old, it depicts rather well also the present activity level of Finnish Universities. This may be seen from statistics of the new Aalto University regarding year 2010. The number of new spin-off companies in that year from Aalto University was 15. As may be seen from statistics, the size of the mature patent portfolio varies – naturally, and the number of license agreement, in

some Universities, has actually been rather good. Similarly, the annual number of spin-off companies from some Universities has been well comparable to international figures. However, the license revenues have been very low. The only exception has been the Helsinki University. The reason for this has been the co-operation arrangement between the University's technology transfer company - Licentia Oy (Kankaala et al., 2007).

Table 9: Invention disclosure, patent application, patent license agreement and license revenue of Finnish Universities regarding year 2005, and Aalto University's year 2010.

| | **OY** | **KuY** | **JY** | **TaY** | **TTY** | **TKK** | **HY** | **LTY** | **TY** | **ÅA** | **HSE** | **VY** | **Hanken** | **JoY** | **Aalto 2010** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Invention Disclosures | 47 | 11 | 5 | NA | 50 | 150 | NA | 14 | 25 | NA | 0 | 10 | 0 | 6 | 111 |
| Patent Applications | 6 | 3 | 1 | 0 | NA | 7 | 3 | 2 | 8 | NA | 0 | 0 | 0 | 0 | 6 |
| Patents | 12 | 0 | 0 | 1 | 9 | 15 | 0 | 0 | 1 | 58 | 2 | 0 | 0 | NA | 52 |
| License Agreements | 39 | 2 | 0 | 0 | 0 | 31 | 0 | 3 | 5 | NA | 0 | NA | 0 | 0 | 12 |
| License Revenue (1000 €) | 70 | 74 | NA | 90 | 0 | 50 | 1330 | 7 | 33 | NA | 0 | 0 | 0 | 0 | >350 |

Table 10: New companies established between years 2000 to 2006 from Finnish Universities.




However, traditional University activity indicators emphasize the importance of formal technology transfer which is mainly based on agreements and exclude the transfer of open information and

research results – like articles, conference presentations, personal contacts, open-resource research etc. One reason for divergent figures is that the culture of technology transfer is different in Europe than in the United States. In the USA it is natural for companies to pay for intellectual properties. This may partly be a result from the fact, that more Venture Capital is available – even for SME companies – to acquire ownership and user rights to the results of university research (Roine et al., 2010). J. Turner (Turner, 2007) from MIT has argued the success factors of MIT as:

- Quality technology
- Enthusiastic and co-operative inventors
- Experienced, technically trained, business-oriented TTO staff with industrial experience
- Clear University policy, straightforward procedures – rapid and efficient processes
- Flexible terms
- Willingness to adapt to changing circumstances

However, Finnish statistics indicate only patent applications filed by the University and patents owned by the University. Patent applications filed by the researches are not shown in statistics. In addition, in Finland it is not possible to use flexible provisional patent application system as it is in the USA. In Finland all patent applications are proper applications (Opetusministeriö, 2007).

As pointed out, patenting and licensing of research are not the only means of transferring new knowledge from Universities to the industry. A remarkable part of results of research is transferred directly to the companies e.g. in Tekes funded collaborative research projects. Universities have a range of outputs including information, materials, equipment, prototypes, instruments, human capital, and extensive international networks which are transferred to industry in different ways. J. Turner (Turner, 2007) put this – MIT Approach – action in practice - as follows:

- Primary objective is technology transfer, not to maximize income
- Leverage intellectual property
- License exclusively
- Don’t let greed obstruct license agreement
- Modest royalties geared to product success

Thus, the most common mechanism for technology transfer is still publications, conferences and informal exchanges at personal level. Measuring University success in innovation purely by licensing or patenting activities certainly covers the importance of these other means of knowledge transfer. Non-patented innovations, spin-off companies started by the University, and consulting

assignments between industry and University are technology transfer examples that also have to be taken into consideration.

In the future, it is important to consider University culture in fostering or supporting entrepreneurial activity among staff and students (Roine et al., 2010). Most Universities have had little experience negotiating with industry and considering commercialization activities. With time and experience, however, Finnish Universities have gained experience in the invention and innovation processes. However, the majority of University based innovations relate to technologies that are many years away from being commercialized and Universities cannot take on burden of forecasting uncertain commercial returns. This function is best done by a private sector. However, the real incentives for the companies for a co-operation with Universities should be emphasized (Turner, 2007):

- Source of new technology
- Lower cost product development
- Patent position – exclusivity
- Easier to raise investment capital
- Shorter time-to-market
- Low-cost access to technical expert

Likely, the Finnish society will be best served by a knowledge transfer system that encourages interactions between Universities and industry, and also inspires each party to concentrate on its relative advantage – with universities focusing on research and entrepreneurs devoting their efforts to commercialization.

This discussion of how innovations are transferred from Universities to industry is also an important part of debate about Finnish economic competitiveness. Finnish Universities today are not only competing with other national institutions for collaborative co-operation with industry, they are both collaborating and competing within a global economy. Universities must continue to invest in high class research, the advancement of innovations, and the commercialization of new ideas in order to remain competitive. The government - as the funding source for university-based research - is in an ideal position to encourage Universities regarding the importance of providing a more flexible environment than will allow for more rapid commercialization of new ideas developed by University students and staff.

**APPENDIX 1.**

| | |
|---|---|
| OY | Oulun yliopisto - University of Oulu<br>http://www.oulu.fi/yliopisto/ |
| KuY | Kuopion yliopsto – University of Kuopio<br>http://www.uef.fi/ |
| JY | Jyväskylän yliopisto – University of Jyväskylä<br>http://www.jyu.fi/ |
| TaY | Tampereen yliopisto – University of Tampere<br>http://www.uta.fi/ |
| TTY | Tampereen teknillinen yliopisto – Tampere University of Technology<br>http://www.tut.fi/ |
| TKK | Teknillinen korkeakoulu – Helsinki University of Technology<br>http://www.tkk.fi/ |
| HY | Helsingin yliopisto – Universtity of Helsinki<br>http://www.helsinki.fi/yliopisto/ |
| LTY | Lappeenrannan teknillinen yliopisto – Lappeenranta University of Technology<br>http://www.lut.fi/ |
| TY | Turun yliopisto – University of Turku<br>http://www.utu.fi/ |
| ÅA | Åbo Akademi – Åbo Akademi University<br>http://www.abo.fi/ |
| HSE | Helsingin kauppakorkeakoulu – Helsinki School of Economics<br>www.hse.fi/ |
| VY | Vaasan yliopisto – University of Vaasa<br>www.uwasa.fi/ |
| Hanken | Hanken Svenska handelshögskolan - Hanken School of Economics<br>www.hanken.fi/ |
| JoY | Joensuun yliopisto – University of Joensuu<br>http://www.uef.fi/ |
| Aalto | Aalto yliopisto – University of Aalto<br>http://www.aalto.fi/ |

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