THE ABC of INVENTIONS

GUIDE TO RESEARCHERS FOR COMMERCIALISATION OF RESEARCH RESULTS

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1. Summary

Universities and the research done in them is the foremost source of new international business. This guide tells the researchers how the result of a research (an invention, a computer software, a material, a business idea) is developed into a starting point of a new business.

The commercialisation of research results promotes the research work of the university i.a. through new funding possibilities. Further, the scientific publications also promote the success of commercialisation.

The Innovation Services of the universities aid researchers with the measures relating to the commercialisation of research.

2. The aim of the guide

Universities are strongholds of high quality research and teaching. They do not exist separately from the rest of the society, for universities strive to transfer results gained in research into use and thus fulfill their social interaction role. The transfer of the results takes place in the form of scientific publications, inventions as well as business ideas.

Therefore the researchers need to know the basics of inventions. In order to transfer them to the corporate world or create new business, the protection of inventions is often in a very important role. It is imperative to know when the invention can be published. The invention can be both protected and published providing the protection measures are started prior to publication.

It is good to remember that patent publications contain information that cannot be found in scientific articles. Thus patent databases are important sources of information also when planning new research projects. It is worthwhile to direct the resources at producing new information.

The aim of this guide is to give the basics of inventions, of their protection as well as commercial utilisation. These points are good to keep in mind already when planning a new research project, but above all during the research project and when reaching the homestretch.
3. Utilisation of research results

The results of research are generally measured with the help of publications generated during the research. High-grade international scientific publications play a key role as well as posters and presentations at international conferences.

Previous to publishing your research results it is good to contemplate whether the results could be utilised in other ways as well. What could be gained? Are there in fact some compelling reasons for the utilisation of the results that are mentioned in the research agreement consummated with the investor and/or collaborators?

Utilisation of research results is
- Scientific publishing
- Popularisation of science
- Commercial utilisation of research results

This guide is concentrated in dealing with utilisation of research results from a commercial standpoint.

4. From idea to innovation

The journey from an idea to an innovation is often long and it includes many different stages. An idea is just a starting point for the development of an innovation.

An example: You have found that it is problematic that often in the dark you would need a flash light, but you do not happen to have one with you. You get an idea that there could be a flash light integrated in a cell phone.

The idea is refined into an invention when you develop a solution with which the flash light can be integrated into the phone. When the invention has been commercialised it is referred to as an innovation.

5. An invention as a result of research

An invention, which is a novel and surprising solution to the research question, may be discovered as a result of research. The invention can be for example a method for producing a material or a solution, on the basis of which it is possible to produce a new product.
An invention can be discovered during research projects also by accident, thus results should be monitored and analysed continuously. Record your results in a notebook.

An example: The best known inventions discovered at the University of Oulu are heart rate monitors (Polar Electro Oy) and UniQTM bone/tissue markers (Orion Diagnostica Oy).

5.1. What counts as an invention?

An invention presents a novel and inventive solution to a problem, which can be applied into practice. The invention is a new device or method or an improvement to an existing one. The invention can also be based on a novel application of known technique.

Examples:
- two known devices combined
  radio + cell phone
- novel application
  before: medicinal substance functions as an
  pain killer
  now: it prevents blockages of blood vessels

The essential in inventions is inventiveness, i.e. that the solution is not obvious to a person skilled in the art. By this is meant that a person having similar academic background and experience as the inventor would not arrive at the same solution by reading literature of the field.

5.2. Protect your invention before making it public

The invention cannot be patented if it has already been made public. It is not wise to discuss the invention widely with others without non-disclosure agreements. Making something public means giving scientific presentations, conference abstracts, posters, web pages and articles. File an invention disclosure and consult the innovation manager of your university.

It is your duty to disclose the invention to the innovation unit of your university as soon as you feel that you have made an invention. The duty of disclosure comes from the University Inventions Act that is applied to all individuals working in the university and it applies to inventions that are patentable in Finland.
5.3. First, file an invention disclosure

If you have made an invention, first you must fill out an invention disclosure form that can be found on the web page of the innovation unit of your university. Attach drawings, figures, formulas or other further information that are necessary for understanding and exemplifying the invention.

Filing the invention disclosure to the innovation manager of the university starts a process in which the commercialisation and protection of your invention is analysed. The innovation manager of your university will help you in the commercialisation process, the services of which innovation manager are confidential.

The innovation manager checks the received invention disclosure and asks for further information if needed. When all necessary information has been received, the innovation manager contacts you and arranges a joint meeting in which ways to proceed with the matter are considered. It takes time to survey the need for protection and the commercial prospects of an invention. Thus it is advisable to contact the innovation manager six months in advance of the intended publication of the invention.

5.3.1. Who is the inventor?

You are asked in the invention disclosure to clarify who is/are the inventor/s of the invention. In a scientific article, persons that have played a minor or dependent (working under the instructions of another) part can be named as the authors.

In inventions only those persons that have had an independent role in the creation of the invention are named as inventors. They have independently been planning or making experiments with which the functionality of the invention has been tested.

The correct inventors (including all necessary, excluding unnecessary) are important for example on the point of view of the strength of the granted patent.

5.3.2. Who owns the invention?

The offset always is that the invention is owned by its maker. However, it is good to remember that inventions created during employment are governed by the Act of University Inventions and the Act on the Right in Employee Inventions. The first of these two is implemented to employees working in the field of higher education (for example universities and polytechnics), whereas the latter of these two is implemented to all other cases (e.g. researchers at the VTT). In case the employer decides to exploit the invention, an adequate remuneration must be paid to the inventor.

In the University Inventions Act, the circumstances in which the invention was made influence the ownership of the invention. Thus inventors are asked to classify the invention in the invention disclosure into classes A, B or C (Table 1).
If the university decides to claim the invention belonging to the class B, its rights are transferred from the inventor to the university with a separate agreement (The Assigning of Rights). It is also possible that the inventor surrenders voluntarily the rights to his invention to the university (inventions belonging to the classes A and C).

The Assigning of the Rights sets the joint ground rules i.e. specifies what are the rights and the duties of both the inventors as well as the university. When the rights of the invention have been transferred to the university, it takes care of commercialisation and protection of the invention. If patenting is chosen, the university is responsible for the patenting costs.

Patenting an invention is not enough on its own for the invention to be utilised commercially. It is important to analyse the markets, look for utilisers for the invention and develop the invention further. The university is not able to do this work without the help of the inventor. Thus, when the rights are transferred, not only the transfer of rights of the invention to the university is agreed upon, but also of making an utilisation plan in cooperation with the inventor.

Table 1. Classification of inventions

<table>
<thead>
<tr>
<th>Class</th>
<th>Grounds</th>
<th>Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>The invention is a result of <strong>Free Academic Research</strong> (= regular professional duties or a foundation grant)</td>
<td>The inventor</td>
</tr>
<tr>
<td>B</td>
<td>The invention is a Result of <strong>Contract Research</strong> (= invention made in a project funded by Academy of Finland, TEKES, EU or a company)</td>
<td>The university has the right to claim the rights to the invention during 6 months after the receipt of the invention disclosure. The claim must be made in writing.</td>
</tr>
<tr>
<td>C</td>
<td>The invention is made in <strong>Other connection</strong> than above (e.g. an invention made by a person assisting the researchers)</td>
<td>The inventor</td>
</tr>
</tbody>
</table>
5.4. Protecting the invention

Successful commercialisation of an invention often requires that the invention is protected by a patent. For example, the development of biotechnological inventions into a product takes such a long time and costs so much that it is not worthwhile to undertake if the developer does not gain an advantage. This advantage can be gained if the invention is protected by a patent, which is one form of industrial property rights.

Industrial property rights mean exclusive rights with which inventions, marks and appearance used as symbols of goods and services, are protected. These are i.a. patent, utility model, design right, and trademark, which in Finland can be applied from National Board of Patents and Registration of Finland (Patentti- ja rekisterihallitus, PRH). In inventions that are research based, the most important mode of protection is patent.

5.4.1. Patent

A patent means an exclusive right granted by application to the inventor to prohibit others from professional utilisation of the invention. This exclusive right is effective max. 20 years from the effective date of the patent application in that country in which the patent is applied for and granted. Further, it must be remembered that the granted patent is not effective automatically, but the annuities required must be paid in time.

The patent proprietor has to monitor by themselves that no one infringes their exclusive right. An advantage over the competitors can be gained with the help of a patent, because they have to spend resources to develop substitutive solutions.
A patent is also a commodity, because it can be sold or licenced, which means that a permit of use for the patented invention is granted in exchange for payment.

In order for the invention to be patented, it must
• be novel
• differ substantially from the prior art i.e. involve an inventive step
• be industrially applicable i.e. the invention must be a solution to a technical problem

A mere discovery (e.g. an element, a DNA sequence), a mathematical method, an aesthetic creation, rules of a game, a business plan or presentation of information cannot be patented. Furthermore, surgical and therapeutic methods as well as plant varieties and breeds of animals are not patentable.

Patent facts

• Patent is an exclusive right granted by application to prohibit other from professional utilisation of the invention.
• The granted patent is effective for max. 20 years from the effective date of the application, providing that the annuities are paid.
• Patent is effective only in that country in which it is applied for and granted.
• The patented invention must be novel, inventive and industrially applicable.
• The patenting costs can run up to tens of thousands of euros. Even though the patent application may be drafted by yourself, it is advisable to consult a professional of the trade i.e. a patent attorney.
• It takes 2–7 years to obtain a patent.
• The patent application becomes public 18 months after the filing.
• The patent application may first be filed at the Finnish Patent Office (National Board of Patents and Registration of Finland, PRH) and then continued abroad within the 12 months of the so called priority year.
5.4.1.2. When is it worthwhile to patent an invention?

Patenting is a long and expensive process, so patenting is worthwhile only then when it is necessary.

Patenting is worthwhile if
- the invention can be utilised commercially (as a part of a new or existing business)
- the invention is novel
- the patent is strong (the protective effect matters to companies operating in the field)
- the patent can be monitored (it is possible to determine e.g. if there is a component protected by the patent in a product in the market)
- the patent is difficult to circumvent
- the invention cannot be considered a trade secret (the invention will become public e.g. in a scientific article or it is evident from the product what it consists of)

A patent application can be drafted by yourself, but it is always best to seek the help of patent attorneys in order for the patent to be “more airtight”.

Example: You give a presentation in an international conference on the 15th of September, whereupon the invention becomes public. Thus the protection of the invention must be commenced the same day at the latest. But because drafting a patent application and the commercialisation analysis take time, it would be good to contact an innovation manager six months in advance.
5.4.1.3. Why is it worthwhile to keep eye on patent publications?

For a researcher, it is natural to follow the literature of the field from international science publication and to follow development trends by visiting conferences. However, if there is no time to follow the patent publications, a huge amount of existing information is often thrown aside.

It is estimated that over 80 per cent of technical information is contained only in patent publications. Many companies do a lot of research and product development, the results of which they publish only in the form of patents. The surest way to get the newest information is to go through both patents and scientific publications. The information contained by patents is worthwhile to utilise always when planning a new research project, for it is not worth it to research anew something that is already known.

Patent databases can be browsed electronically through e.g. the free of charge Esp@cenet (http://fi.espacenet.com/).

Already over 80 million documents can be found in the database. A patent application becomes public 18 months after it has been filed with the patent office. After publication it can be found in the patent databases.

Example: A mobile phone flash light invention was presented in section 4. With the help of patent databases it is found that the invention is not novel anymore, for there are several patent publications relating to it. See for example GB2361378, DE19942575 and JP57160233.

5.5. The evaluation of the commercial potential of an invention

Before the patenting of an invention is started, the commercial potential of the invention must be evaluated. This means uncovering

1. is there a need in the market for a product and/or service based on the invention (client need)? and

2. in what ways the invention is better than the existing solutions? In other words what are the benefits of the invention compared to existing solutions (the superiority of the technology).

The product and/or service created on the basis of the invention may be directed at either (A) an existing market or (B) it can create a whole new market (for example the heart rate monitor of Polar Electro created a new consumer market).

(A) When a product/service is directed at an existing market, it is easy to evaluate the potential of the markets. The size and the development (growing or diminishing) of the markets can be assessed for example by buying market information.
When the market potential is significant (a big-gish or growing market) the potential of the invention is based on the afore mentioned point 2, or in other words what are the benefits of the invention so that the customer changes the existing product/service into a solution according to the invention. For example, changing the production process of a drug can be too expensive to the company, even though the new production method would be more cost effective.

(B) If the product/service creates a whole new market, the evaluation of potential is difficult if not impossible. Conflicting messages are received from customers, so it is not possible to get unequivocal information. In that case, the evaluation of the commercial potential of the invention is based on analysing fragmented information and the decision of starting the commercialising activities made on the basis of that information.

When analysing the market it is essential that through interviews with the clients one is able to create an impression that the potential is considerable and the starting of the commercialising activities (for example patenting) is justifiable.

5.6. Commercialisation of an invention

Commercialisation means **commercial utilisation** of inventions. An invention can be commercialised either via a new business (start up company), by licensing or by selling. When contemplating on a suitable commercialisation route it is good to keep in mind the topicality, readiness, purpose and product development costs of the invention as well as corresponding products of the competitors.

The commercialisation of the invention usually does not happen overnight. Often further investments are needed so that the invention can be refined closer to the market. At this stage the ball is placed away from the researcher’s court to for example a new company to be established or to an already existing company. Still the research done around the invention is vital to the success of the commercialisation of the invention. Thus universities invest especially in those inventions that have the background of years or decades of research with a foreseeable future.

5.6.1. Establishing a new business

Developing research results (inventions) into a product/service often requires further development investments and this development work is justifiable to perform in a company. Establishing a new business is a valid commercialisation route when

- there are researchers that have the will and the motivation to found a business team and
- the product/service according to the invention is aimed at a growing market or creates a completely new market.

In the following entrepreneurship is discussed from the point of view of researcher of higher education institutes and the roles which a researcher may adopt in a new business are presented.
1. The researcher becomes an entrepreneur in a new company and leaves his/her day job at the research institute

- At some research institutes it is possible to apply for a release from work for a period of time in order to found a new company.
- The researchers duties as an entrepreneur are broader and very often especially in the early stages one has to take responsibility for gaining the first clients for the business.
- The entrepreneur team needs to be increased right away at the early stages of the business and at the same time improve know-how needed in entrepreneurship (i.a. sales/marketing, finances).
- A start-up company is an interesting investment opportunity from the point of view of an investor when it has a committed business team. The investor invests in most cases in an already founded company.

2. The researcher continues his/her work at the research institute and he/she has the role of an expert and a co-owner in the company.

- The researcher gives a secondary occupation notice to the research institute (the primary employer).
- The primary employment of the researcher supports indirectly the operation of the company for the first few years.
- This is a worthwhile option from the point of view of the research institute when accomplished researchers continue their research further.
- This option is functional when the company is founded together with an early-stage investor and the business team is resourced via the investor.

3. The researcher continues his/her work at the research institute and works as an entrepreneur in the established company.

- The researcher files a secondary occupation application to the primary employer.
- Conflict of interest situations between the primary employment and the entrepreneurship and their anticipation.
- After the early stage the resource deficit is encountered and the operation of the company develops slowly or not at all.
- Acquiring outside investments is reasonably difficult because the company and the team lack credibility.
- The financing is secured with cash flow and in order to get it services are often sold. The development of the product business is often left aside.

5.6.2. Licensing

Licensing means that the owner of the invention grants a buyer the right to use the invention in a commercial or other purpose, for example in research. The ownership of the invention is not transferred to the recipient of the license.

The owner (seller of the license) and the buyer (recipient of the license) sign an agreement, in which i.a. following matters are agreed upon:

- Nature of the license (exclusive, non-exclusive)
- Term of the license, extension of the agreement
- Geographical area covered by the license and the implementation field
- Grounds for the compensation paid by the buyer
- The role of the researcher (for example assisting in patenting and/or commercialisation)
- Reconciliation of possible disputes (where, how)
Licensing is justifiable when
- The invention is a method that improves the production of an existing product.
- The license can be sold to different implementation fields or geographical areas.
- There are several buyers for the license.
- It is beneficial for the researcher (for the research institute) that the ownership of the invention remains with the inventor/research institute for example for the future funding of the research.

5.6.3. Selling

Selling means that the owner of the invention sells the proprietary rights of the invention to the buyer.

The owner (seller) of the invention and the buyer sign an agreement in which i.a. following matters are agreed upon:

- Grounds for the compensation paid by the buyer
- The role of the researcher (for example assisting in patenting and/or commercialisation)

Selling is justifiable when

- The invention is created in a corporate coordination project and one of the corporate partners is interested in the commercialisation of the invention.
- The invention complements the patent portfolio of an existing business.
6. Innovation services of the universities

The innovation services of the universities employ persons under the titles of e.g. innovation manager, business development manager, and technology transfer manager. Their duty is to answer for the research commercialisation measures presented in this guide.
7. Dictionary

The Act on the Right in Employee Inventions
An act that regulates the rights and responsibilities of the employees and the employers relating to inventions. Universities are excluded from this act as their inventions are governed by the University Inventions Act.

The Act on University Inventions
An act that regulates what are the rights and responsibilities of both the employees and the employers of the universities relating to invention matters.

Confidentiality Disclosure Agreement (CDA)
A contract that aims to secure that confidential information and material remain secret. The contract may also be called a Non-Disclosure Agreement (NDA).

Contract for Exploitation of the Invention and the Assigning of Rights
A contract with which the owner of the research results/immaterial right transfers his/her rights to his/her employer. Thus the employer is entitled to seek patent for the invention in its own name.

Idea
An insight, thought, inspiration

Industrial Applicability
One of the conditions for granting a patent in addition to novelty and inventive step. The invention must be a solution to some technical problem or the invention is expected to have a technical effect.

Industrial Property Rights
Exclusive rights that protect i.a. inventions (patent, utility model), marks used as the symbols for goods and services (trademark), and the appearance of goods (protection of patterns and designs). Industrial rights must always be applied for from the authority.

Intellectual Property Rights (IPR)
Intellectual Property Rights are divided into two categories: copyright and industrial property rights (for example a patent, protection of design).

Innovation
Commercialised invention or service idea

Innovation Manager
A person employed by the university of the polytechnic that helps and offers advice for the staff and students in invention and business idea related matters.

Invention
A new and surprising solution to a technical problem

Invention Disclosure
A form with which an employee discloses an invention made by him/her to his/her employer.

Inventive Step
The invention to be patented must differ substantially from previously known solutions.

License
Agreement giving right to use property protected by an intellectual property right.

Licensing
The owner of an intellectual property right (for example a patent) grants certain rights (for example the right to produce an invention protected by a patent) to a user in exchange for compensation. The proprietary rights remain with the licensor.
**Novelty**
One of the conditions for granting a patent, meaning that the invention has not become public in any way before the filing of the patent application.

**Patent**
An exclusive right granted to the inventor by the society, in exchange of which the inventor must allow the publication of the invention.

**Patent Attorney**
A person employed by a patent agency to handle matters relating to industrial property rights authorised by the applicant.

**Patent Databases**
Data archives maintained by patent offices or commercial players that contain information about patent applications and granted patents.

**Person Skilled in the Art**
A term that is used when assessing the inventive step of an invention presented in a patent application.

**PRH (Patentti- ja rekisterihallitus)**
National Board of Patents and Registration of Finland. An office that handles industrial property rights, the Register for Associations and the Trade Register in Finland.

**Priority**
The 12 month priority term begins when a first patent application relating to an invention is filed with a patent office. During this term the applicant can file patent applications relating to the same invention to other countries and they will be examined as if they all had been filed together with the first application. All publications that have become public before the filing date of the first application are taken into account.

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**8. Further information**

- Industrial rights:  PRH
- Patent databases:  Espacenet
- Patent Inspiration
- Evaluation and development of an invention / business idea:  Product Track
- The University Inventions Act
- The Act on the Rights in Employee Inventions