**UNIVERSITY OF SZEGED**
**FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION**

# INNOVATION IN PRACTICE

**Handout**

**Prepared by**
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**2019.**

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## PREFACE

The aim of this handout is to point out the latest achievements of innovation management and to reveal the most relevant practical questions on the level of firms related to innovation. The paper provides insight into the fields of economics and management of innovation, introduces the basic notions of innovation, the concept of innovative company and reveals the composition of the innovative corporate knowledge base. It shows the purposes, tasks and toolbox of innovation management and innovation strategies and describes the relevance of intellectual property rights along with the role of strategic alliances.

A recent study provides a starting point for students and future entrepreneurs interested in innovation research and innovation management. By learning the curriculum, students will be able to understand and use the basic concepts of innovation and innovation management without any prior knowledge and will be ready to use the given concepts and tools in practice. The topic is widely researched – for this reason it is recommended to read further international text books and articles.

Lecturer: Zsofia Vas, PhD

25 January 2019.



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# COURSE INFORMATION

## BASIC INFORMATION:

Course title: **INNOVATION IN PRACTICE**

Course code: 60C206

Type: lecture

Credit: 3

Contact hours a week: 2

Evaluation: exam mark (five grade)

Semester: 5th

Prerequisites: Management



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**LEARNING OUTCOMES:**

***a)* regarding knowledge, the student**

- has thorough knowledge on the essential theories and concepts of economics on the field of innovation
- is familiar with the elements and the process of innovation on the level of firms
- knows the basic innovation management tools
- understands factors influencing innovation performance on the level of firms

***b)* regarding competencies, the student**

- is capable of revealing factors facilitating or hindering innovation activities
- can apply innovation management tools in practice
- is able to create an innovation strategy
- understands the need to protect innovation by intellectual property rights

***c)* regarding attitude, the student**

- behaves in a proactive, problem oriented way by taking apart a group work
- is open to new fields of innovation, to cooperation for invention
- is capable of critical evaluation of factors influencing firm innovation performance
- is accepting of the opinions of others poviding resources for innovation activities

***d)* regarding autonomy and responsibility, the student**

- prepares and presents cases and strategies of innovation
- completes his/her tasks indepentently as a part of a team



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**REQUIREMENTS:**

A presentation given during the study period and a written exam in the examination period is required to complete the course. 30% of the points can be obtained by the presentation and 70% by the written exam. In order to pass, 51% of the points have to be collected and at least 90% for the excellent grade.

**Presentation**: At the beginning of each lecture one group of students gives a presentation about a chosen innovation case. The aim of the presentations is to demonstrate an innovation in practice, answering questions about the nature of the innovation (what it actually is); who introduced the innovation, when and why did it happen; how was the innovation developed; what are the effects of the innovation on the organization and/or the economy and society; what kind of factors facilitated or hindered the introduction and distribution of the innovation on the market.

**Written exam**: The written exam is during the examination period. Precondition of taking the exam is to give the in-class presentation.

**Attendance**: Class attendance is not compulsory but recommended as well as continuous (weekly) learning during the semester.

**Grading**

| |
|---|
| 0-50%: fail |
| 51-65%: pass |
| 66-75%: satisfactory |
| 76-85%: good |
| 86-100%: excellent |



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## 1. THE RELEVANCE AND NOTION OF INNOVATION

**Learning outcome of the topic:** The chapter provides an overview of the key definitions of invention, innovation, describes the importance and the concept of innovation and reveals the main types of innovation. By learning the lesson, students will understand the importance of innovation, will be able to explain the notion of invention and innovation and will be capable of differentiating the types of innovation in practice.

*Innovation* transforms life in a way that is unpredictable. Innovation is about creating, diffusing and adapting new knowledge which is essential for the economic actors to be competitive. As Freeman wrote in his famous work in 1982 "not to innovate is to die". The term innovation refers both to the process of generating, distributing and adapting economically useful knowledge and the outcome of this process.

The importance of innovation is unquestionable on the level of firms, the economy and society as a whole. Economic actors need to have the ability to change and adapt. Innovation is relevant due to the increased competition on the market. Economic actors, primarily firms need new solutions to remain on the market or to increase their market share. Innovation helps to improve quality and to reduce costs, thus increasing competitiveness and maximizing profit. Innovation is essential since product and service life cycles are shortened (computers or mobile phones for example) and the market increasingly requires new solutions. Traditional, low-tech products are still on the market and these also require more efficient solutions for production or distribution.

Innovation is the key not only for the firms to be competitive but it is also the engine of economic growth. In the 19th century economic historians already observed that economic growth is the result of technological progress, however they did not explore how changes in technology contributed to this growth. It was *Joseph Schumpeter* (Austrian economist, 1883-1950, in his work of 1934, 1939, 1942) who – among the first economists to do so – emphasized that new products favour economic growth. He argued that in competition new products are much more important than the changes in the prices of existing products. He called the



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process of innovation *"creative destruction"* (in the book Capitalism, Socialism and Democracy 1942). This refers to the process of development which continuously alters the economic structures by destroying the old solutions and creating new ones. The key actor of the process is the *entrepreneur*.

Innovation has both positive and negative effects on a micro (firm) and macro (country) level as well, it influences the economy, society as a whole and the environment. Innovation not only directs the future of businesses but also the root of business development (White – Bruton 2011). A good example for that is the change in telecommunication: before telecommunication, it was difficult to get information about pricing. There were widely different prices for the same product. Today, using telecommunication (e.g. internet) pricing is more transparent and efficient. This shows that technology leads to better prices and new technologies have made more information available for the customers. For this reason, buyers have become more aware of opportunities. This leads to greater demand and more information leads to better prices and to informed enterprises.

Due to new technologies companies not only develop but they can disappear too. The Polaroid Company went bankrupt after the development of digital cameras. Even though Polaroid has reinvented itself recently and has the new innovative line of Polaroid PoGo its market share is smaller than it was at the time of Polaroid photo machines. Whole industries can also disappear. It is enough to think of the recorded music industry and technologies to play music (records, eight-track tapes, cassette tapes, compact discs, MP3 and today's new technologies like 4G phones).

Innovation has an impact not only on individual firms or the economy, but on society as well (both positive and negative effects). On the one hand, with technologies in our lives (e.g. telecommunication) it is easier to communicate, to learn, to transfer information and knowledge even in big geographical distances. Technologies make production, sales etc. more time and cost efficient. On the other hand, technologies cause damages, like social isolation and addiction, lack of social skills, no need for face-to-face contacts, lack of privacy, depression, pollution etc.

There are several definitions for innovation. One is from Paul Trott (2017, p. 16), who describes that *"innovation is*



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*the management of all the activities involved in the process of idea generation, technology development, manufacturing and marketing of a new (or improved) product or manufacturing process or equipment"*. But among many others, the most well-known is from Oslo Manual (third edition from OECD in 2005). According to OECD (2005) innovation is the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.

Schumpeter defined innovation as the process of putting together new combinations from existing elements. According to him, there are five cases of combination: new product, new production processes, new materials or resources (new source of supply), opening and exploiting new markets and new form of organizations (new ways to organize business).

Today – as the definition of innovation describes – In harmony with the world market conditions there are four basic types of innovation: product, process, marketing and organizational innovation (OECD 2005):

- *Product innovation*: A good or service that is new or significantly improved. This includes significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics. (Product is used to cover both goods and services.)
- *Process innovation:* A new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. (The term „technological innovation" means product and/or process innovation.)
- *Marketing innovation:* A new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.
- *Organizational innovation:* A new organizational method in business practices, workplace organization or external relations.

To clearly separate the different types of innovation in practice, the aim of innovation or the nature of the firm's business activity must be analysed more thoroughly. Product innovation refers to both innovation of goods and services.



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Distinguishing goods and process innovation is easy, however, the difference between service and process innovation is not always evident. If innovation involves new or significantly improved characteristics of the service provided to the customer, it is product innovation (OECD 2005). If the innovation involves new or significantly improved methods, equipment and/or skills used to perform the service, it is process innovation. If the innovation involves significant improvements in both the characteristics of the service offered and in the methods, equipment and/or skills used to perform the service, it is both a product and a process innovation.

What if product and marketing innovation are compared? Goods or services which have significantly improved functional or user characteristics compared to existing products are product innovations (e.g. clothes produced using new breathable, waterproof fabrics with improved performance). A significant change in the design of an existing product is marketing innovation. But even the first introduction of a new shape for clothes for a new group of customers or giving the product a higher degree of exclusivity is marketing innovation.

The distinction of service and marketing innovation depends on the nature of the firm's business. Let's see the example of internet sales. Firms that are in the business of e-commerce (e.g. website providers) are offering sales services. For these reason if the firm makes a significant change in the characteristics or capabilities of their website is a product (service) innovation. But for a firm that produces and sells goods, the introduction of e-commerce for the first time is marketing innovation in product placement.

Related to process and marketing innovation it can be stated that both process and marketing innovations can involve new methods of moving information or goods but their purposes are different. Process innovation involves production and delivery methods and other support activities aimed at decreasing unit costs or increasing product quality. While marketing innovation aims at increasing sales volumes or market share, the latter through changes in product positioning or reputation. The introduction of a new sales channel (i.e. a new way of selling goods and services to customers) may also include the implementation of new logistics methods (i.e. the transport,



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storage and handling of products), in this case both process and marketing innovation is realized.

A good starting point for distinguishing process and organizational innovations is the type of the activity. Process innovations deal mainly with the implementation of new equipment, software and specific techniques or procedures, while organizational innovations deal primarily with people and the organization of work. If the innovation involves new or significantly improved production or supply methods that are intended to decrease unit costs or increase product quality, it is a process innovation. If the innovation involves the first use of new organizational methods in the firm's business practices, workplace organization or external relations, it is an organizational innovation.

Among innovations surrounding us, there is a specific group of innovation, the so-called *basic innovations*. Basic (technological) innovation is an innovation launching technological revolution. It appears in leading industrial sectors and results in long-run macroeconomic cycles and defines the base of economic growth for potentially even 40-60 years (e.g. the steam engine at the time of the 1st industrial revolution or internet and mobile phone in the 1980s). This phenomenon was drawn up by Kondratiev who concluded that (technological) innovations cause super cycles (waves) in the modern world of economy, and these cycles have an impact on all sectors of the economy. The process of "creative destruction" occurs in case of basic innovations as well. This means that cycles consist of intervals of high sectoral growth and intervals with relatively slow growth, and a basic innovation goes through the phases of expansion, stagnation and recession.

According to another perspective, there are two further types of innovation: radical and incremental innovation[1]. *Radical innovation* (disruptive innovation) is innovation that has a significant impact on the market and on the economic activity of firms. Radical innovation may change the structure of the market, create new markets or render existing products outdated or unnecessary.

*Incremental innovation* is the dominant, most frequent form of innovation. It is related to an existing product, service, process, organization or

[1] www.innovationpolicyplatform.org



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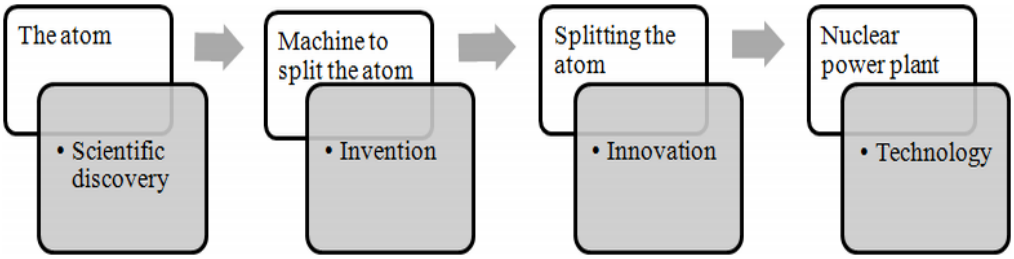
method whose performance has been significantly enhanced or upgraded.

How to imagine the process of innovation? Joseph Schumpeter in his famous works drew up the stages of the process of innovation, however in a very simplistic way. He concluded that the process of innovation starts with an idea or a scientific discovery (Figure 1).

More and more nowadays a significant part of innovations is the result of scientific breakthroughs (e.g. X-rays, lasers), however, innovation may arise without any scientific work; just think of the types of marketing and organizational innovation. The sub-process of bringing ideas to life or making scientific discoveries is followed by the invention (inventing and creating the prototype), then by the innovation itself and the first adaption of the new solution on the market. All these are followed by the further adaptation and diffusion of innovation.

*Figure 1*. Process of innovation




*Source*: own construction based on White – Bruton (2011, p. 14)

The simplified model reveals that the process of *invention* must be differentiated from the process of innovation. Myres and Maquis in thier work from 1969 (Trott 2017, p. 15) explain that *"innovation is not a single action but a total process of interrelated sub processes. It is not just the conception of a new idea, nor the invention of a new device, nor the development of a new market. The process is all these things acting in an integrated fashion"*. Innovation is a concept and its commercial exploitation, meanwhile invention is the conception of an idea, the creation of a prototype. In other words: innovation is the subsequent translation of the invention into the economy.



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**Keywords**:

- invention
- innovation
- product, process, marketing, organizational innovation

**Discussion questions:**

1) What is innovation?
2) Why innovation is relevant for the firms, economy and the society?
3) What are the effects of innovation?
4) What does it mean to be innovative?
5) What is the difference between invention and innovation?
6) How to imagine the process of innovation?
7) What are the types and sources of innovation?



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## 2. THEORETICAL MODELS OF INNOVATION

**Learning outcome of the topic:** The chapter describes the complex nature of innovation and presents the theoretical models of innovation such as linear, simultaneous coupling and interactive innovation models. After reading the chapter, students will be able to describe the changing views of innovation over time and will be capable of recognizing the role of actors, interactions in the process of innovation.

It is misleading to imagine that innovation is only inspired by scientific discoveries and the process consists of only a few sub-processes like invention or distribution. Innovation is a complex, interactive process which includes several sub-processes, influenced by many actors and determined by different infrastructural and institutional factors.

In the past, there were only simple concepts to demonstrate the process of innovation. The very first theoretical models of innovation were the *linear models* (Trott 2017). According to linear models the process of innovation is a sequence of separate stages and activities. There are two types of linear models: the technology driven model and the customer-driven model.

The process of innovation according to the *technology-driven model*, in other words the *technology push model*, starts with unexpected scientific discoveries made by scientists (Figure 2). Then, technologists apply these discoveries to develop product ideas, engineers and designers turn them into prototypes for testing and the production starts. Finally, marketing and sales promote the product to the potential consumers.

According to this concept the market is a passive recipient and the focus is on research and development (R&D) activities. This view dominated industrial policies after WW2 but its core concept is still valid in industries like pharmaceuticals or chemical industry.



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*Figure 2.* Technology push linear model of innovation


*Source*: Trott (2017, p. 23)

The other well-known linear model of innovation is the *customer-driven or market pull model* (Figure 3) (Trott 2017). According to this model, the market plays an active role in the process of innovation. New ideas often often originate as a result of close interactions with customers. If there is a particular customer need, the process of innovation continues with the research and development activity for design and engineering, then manufacturing.

*Figure 3.* Market-pull linear model of innovation


*Source*: Trott (2017, p. 23)

The linear models were the first to draw up the main elements of the innovation process. Even though the core idea of the models are still valid, the concepts are very simplified. Linear models suppose that the process of innovation has a starting point, that innovation is a finite process and that the process of innovation is a series of sub-processes following each other (when one ends, the other begins). However, in reality, innovation does not happen this way.

The second theoretical concept for innovation is the *simultaneous coupling model* (Figure 4) (Trott 2017). Due to the fact that linear models focus on what is driving the innovation, but do not explore how innovations occur, furthermore, linear models only describe that where the initial stimulus for innovation was born, the concept of simultaneous coupling



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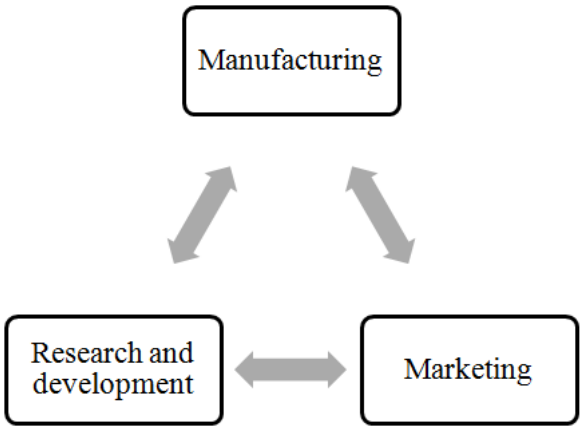
model appeared. It suggests that innovation is the result of three parallel functions/processes. These are research and development, manufacturing and marketing.

The simultaneous coupling model is more sophisticated compared to the linear models, but still very simple. It emphasizes the role of both R&D and the market, not only the role of R&D or the role of the market, but still does not take factors like interactions, feedbacks, variety of actors etc. into account.

*Figure 4.* Simultaneous coupling model




*Source*: Trott (2017, p. 23)

The *interactive model of innovation* further develop the idea of innovation process (Trott 2017). The interactive model links together technology-push and market-pull models and highlights that innovation is the result of the marketplace, scientific base and organisational capabilities (Figure 5). The sources of innovation are not only the scientific discoveries and the marketplace.



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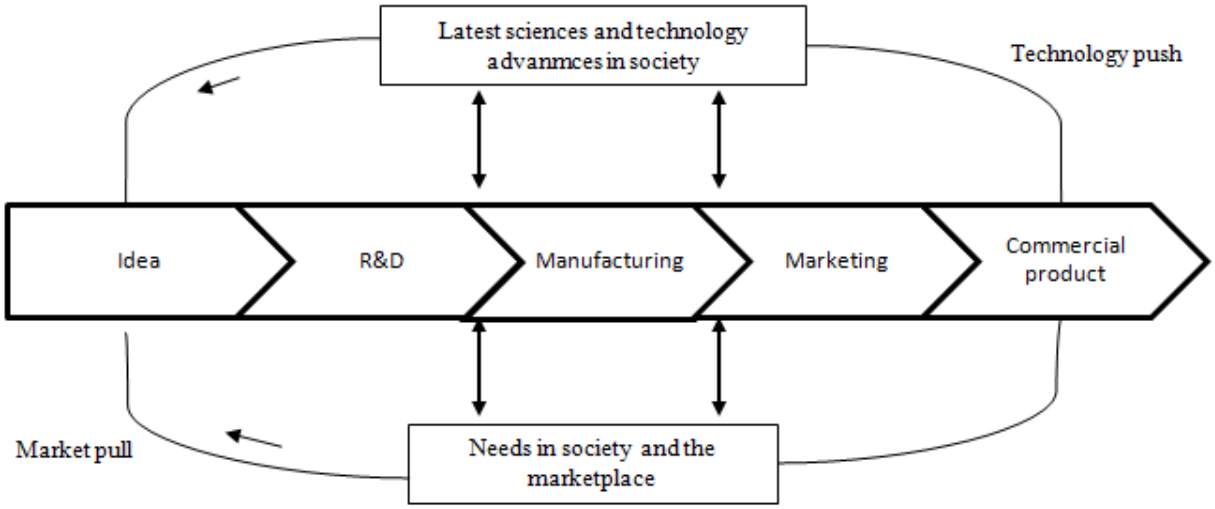
*Figure 5.* Interactive model of innovation




*Source*: Trott (2017, p. 25)

The model reveals that there is no explicit starting point in the process of innovation. Innovation can arise from a wide variety of points. It is a more comprehensive model of innovation compared to the previous models. It says that innovation is a logically sequential but not necessarily continuous process. It can be divided into a series of functionally distinct but interacting and interdependent processes. Innovation is a set of communication paths with the aim to transfer knowledge among actors. The interactive model reveals that when firm innovate, they do it in line with the current social and cultural needs and influenced by the latest technological solutions.

The fourth group of theoretical concepts is the *network model* (Trott 2017). The network model of innovation places the emphasis on interactions, both formal and informal in the process of innovation. Even if the firm, the entrepreneur is the core actor of the innovation process, the innovation arises out of social interactions. Interactions with others, like customers, suppliers, competitors, universities, government, friends, colleagues etc. provide an opportunity for new thoughts, ideas, views and knowledge. The reason why innovators develop networks is that the probability for a firm to have all the necessary resources for innovation is very low. For this reason, firms interact with each other and form networks. The need

for interactions can occur at any phase during the process of innovation: at the phase of creating the idea, or developing the prototypes (R&D), doing the manufacturing or marketing, or distributing the product on the market.

Since the 1980s and 1990s, several other theoretical concepts have emerged to reveal the characteristics of the process of innovation. To mention a few: the concept of *open innovation* from Henry Chesbrough (2003) emphasize that during innovation firms consciously strive to jointly implement external and internal ideas with the goal of creating the most advantageous solution. The concept of *innovation systems* (Lundvall 1992) provides understanding on the interactive and collective nature of innovation and describes the role of the variety of actors, information, knowledge, interactions and complementarities among agents involved in the process of innovation. The concept reveals that there are four main elements for innovation: actors, relations, institutions and infrastructure.

To sum up, the latest theoretical concepts (network model, open innovation, innovation system concept) emphasize that innovation is a complex process including several sub-processes. It is a continuous and circular process in which a new innovation may appear at any point. It is based on social interactions (internal and external linkages) and involves a range of actors (competitors, customers, suppliers, research institutions, university development and financial agencies etc.) who cooperate with each other. Innovation is not deterministic and the success of the process is unpredictable.

Furthermore, serendipity, luck has a big role in the process of innovation. Unexpected discoveries may occur and even if it is rare, they may lead to big scientific breakthroughs. Most discoveries are the results of work done by people who possess deep knowledge about the particular area of science and technology and even if serendipity has a role, to have it, there is a need for prior knowledge in the area. As Louis Pasteur said *"chance favors the prepared mind"* (Trott 2017, p. 22).

**Keywords**:

- technology push and market pull linear innovation model
- interactive innovation model
- network model, open innovation, innovation systems



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**Discussion questions:**

1) How innovation happens according to the linear innovation models?
2) What is the criticism of the linear innovation models?
3) How the interactive innovation model describes innovation?
4) What further models have appeared in the last decades to explain innovation?
5) What are the most important features of innovation in today's modern interpretation?



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## 3. KNOWLEDGE AS THE BASE OF INNOVATION

**Learning outcome of the topic:** This chapter defines innovation in terms of knowledge. It reveals that knowledge is the most important resource of all and describes the notion and types of knowledge, the corporate knowledge base and the knowledge-based processes for innovation. By understanding the content of the chapter, students will recognize the relevance of knowledge for innovation, will be capable of describing the meaning of knowledge, highlighting the core elements of corporate knowledge base, and will be able to distinguish knowledge-based processes leading to innovation.

Our most important resource is *knowledge*. As Albert Einstein said knowledge is experience, everything else is information. If a firm aims at bringing about innovation, it needs experiences and has to build on knowledge. Knowledge is an accumulation of everything that a firms knows and uses to carry out its business activity. Without knowledge, not a single company would be competitive and able to innovate for survival. As Davenport and Prusak (1998, p. 5) defined, *"knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information"*. Knowledge includes several elements, it is dynamically changing and its development leads to more knowledge.

In order to attain knowledge, data and information are needed. *Data* is a set of objective facts related to events. After collecting, organizing, summarizing and analyzing data with a specific aim, information is created (Figure 6). Information means to give shape (Davenport − Prusak 1998). Information is interpreted data, but its interpretation is context-dependent. Knowledge is more than data and information. Knowledge is based on synthesized information, which helps the firm to make decisions.



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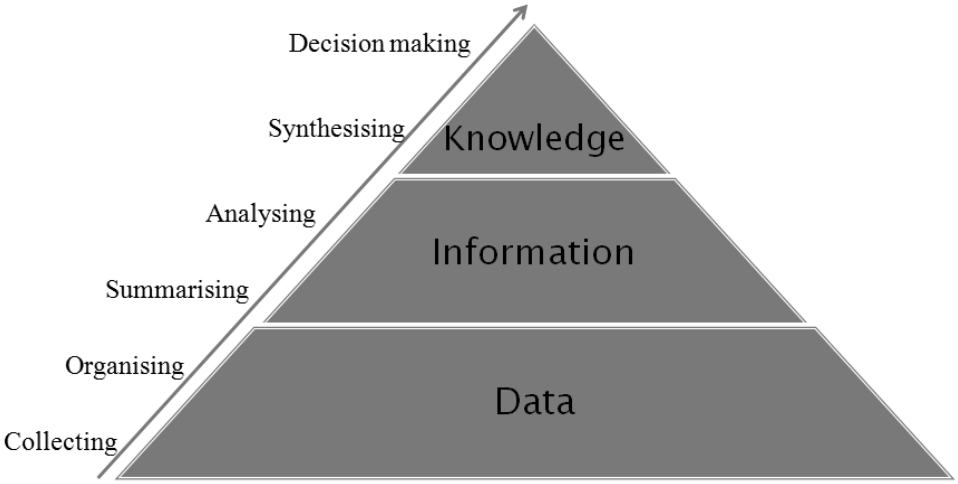
*Figure 6.* Relation of data, information and knowledge




*Source*: own construction based on Davenport − Prusak (1998)

There are two main types of knowledge: tacit or implicit knowledge and explicit or codified knowledge. *Tacit knowledge* is not easily understood, it cannot be articulated, it's harder to communicate, more difficult to write down, visualize or transfer from one person to another (e.g. cooking, riding a bike, being a good manager or leader). It is highly personal and rooted in the individuals' actions and experiences. In contrast, the characteristics of *explicit knowledge*: it's easy to communicate, store and distribute (e.g. books, contracts, manuals, notes). It can be expressed in letters, words and numbers. The human mind is built up of tacit and codified knowledge as well, however, the proportion of tacit knowledge is much higher.

Not only humans but firms too build on the combination of tacit and explicit knowledge, as the *knowledge pyramid of a competitive company* shows (Figure 7) (Boutellier et al. 2000). All firms have a knowledge base, which consists of different types of knowledge and competences which are indispensable for innovation.

The major part of the knowledge base of a firm builds up from tacit types of knowledge, which appear in the form of socialized knowledge (organizational culture, routines, values) and practical knowledge (knowledge related to manage functions). The minor part of the knowledge base of a firm builds up from explicit knowledge, which appears in the form of documented knowledge (contracts, manuals) and



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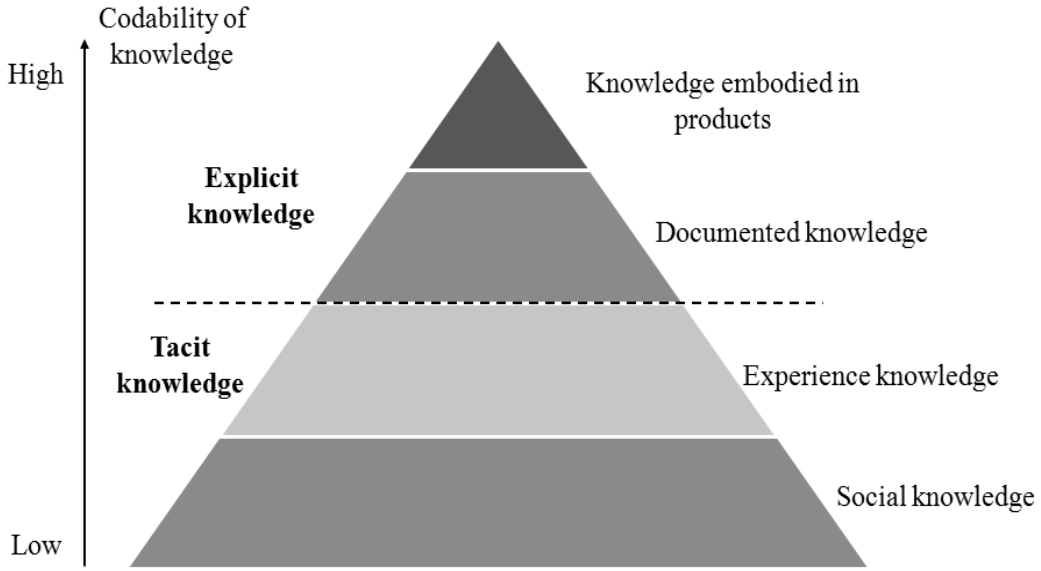
knowledge incorporated in products. Generating explicit knowledge takes less time.

*Figure 7.* Knowledge pyramid of a competitive company




*Source*: own construction based on Boutellier et al. (2000, p. 278)

Innovation can be interpreted as a function of knowledge. Innovation as an output is economically useful knowledge. Innovation as a process consists of different knowledge-based processes. Most of the studies analyse the process of innovation as three knowledge-based sub-processes: knowledge generation, knowledge diffusion and knowledge utilization. Probst (1998) developed the most sophisticated model to demonstrate all knowledge processes in the company (Figure 8) (Probst 1998) and distinguished eight phases.



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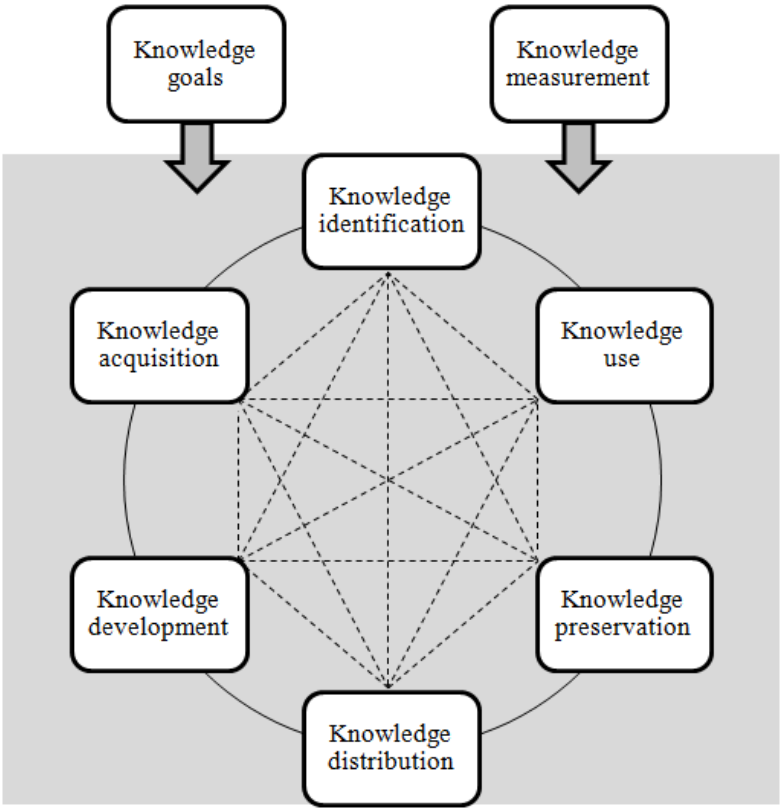
*Figure 8.* Knowledge-based processes in the company




*Source*: Probst (1998, p 19)

The building blocks of knowledge management, as Probst called, consist of an outer and inner cycle, which altogether involves eight components. *Knowledge goals* refer to the process of determining the aims, determining which capabilities should be built on which level within the company. If the company defined its goals, we must map the company's knowledge base and *identify* the need for external knowledge. If external knowledge is necessary, by the process of *knowledge acquisition*, the company may acquire the knowledge from outside through relationships with customers, suppliers, competitors and partners in co-operative ventures. However it is not enough to gain knowledge from outside the company, but the knowledge base must be further developed with the help of new knowledge sources. Thus, *knowledge development* is the process of generating new skills, new products, better ideas and more efficient processes based on the



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acquired knowledge. To be able to innovate, every employee of the company must be able to access the necessary knowledge. This is provided through the process of *knowledge distribution*, which is the process of sharing and spreading knowledge already present in the company. *Knowledge preservation* is the process where the selective retention of information, documents and experiences required by management for the future takes place. If all the knowledge process in the inner cycle is managed, the company can start to *use* the knowledge present in the company productively to reach its goals. Finally, *knowledge measurement* should complete the cycle. It is the process of measuring the performance and providing feedbacks to the management of the company.

**Keywords**:

- data, information and knowlegde
- tacit and codified knowledge
- knowledge pyramid
- knowledge-based processes

**Discussion questions:**

1) What is the base of innovation as an output and as a process?
2) What are the characteristics and types of knowledge?
3) How is knowledge created?
4) What are the elements of the knowledge base of an innovative firm?
5) What are the basic corporate knowledge-based processes aiming at innovation?



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## 4. INNOVATION AS A MANAGEMENT PROCESS

**Learning outcome of the topic:** The chapter reveals to need for innovation management**.** It explains the role of uncertainty in innovation and describes tools influencing innovation process and the types of innovation strategy. Throughout the chapter, students will recognize the need to view innovation as a management process, will be able to explain the role of innovation management and strategy, to reveal the impact of uncertainty on innovation and to discuss and build different types of innovation strategies.

Firms working to bring about innovation face a great dilemma, the *dilemma of innovation management* (Trott 2017). On the one hand firms need stability, routines to manage business activities efficiently and quickly every day. To stay competitive, firms try to reduce their costs in logistics, R&D, production and marketing. On the other hand firms need to develop new solutions to maintain and even increase their market share. In this case, the emphasis is on creativity, unique competencies and innovation. The dilemma is about how firms can reduce costs on the one hand and try to innovate on the other? The answer is difficult.

Innovation is an extremely complex process and must be handled as a management process. It involves a variety of different activities and actors. Innovation management is the process of managing innovation sub-processes with the use of different tools to be able to react to external and internal opportunities and to use the firm's knowledge base to introduce innovation (White – Bruton 2011). It involves all processes and workers at all levels, however findings have identified three functions as the most influential in the innovation process (Trott 2017): business planning, research & manufacturing and marketing.

Innovation is a complex network process and consists of endless interconnected circles (Figure 9). To bring about innovation, firms collect data and information over time, they get in contact with actors who have the necessary resources, monitor newer and newer technological solutions, analyse social needs and this way



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develops attractive solutions for the customers.

The process of innovation has a cyclic nature and should be handled as a continuous process (not as a process that occurs only once and brings the firm success). Successful business activities and innovation can develop in the combination of change and entrepreneurship, and as Trott (2017) describes it four functions (scientific exploration, technological research, product creation and market transition) are necessary to have opportunities for successful business and innovation activity.

White and Bruton (2011) emphasize that managing innovation is more than *"encouraging individuals to think outside the box"*. There are several characteristics of firms, which help manage innovation process well (White − Bruton 2011 from Delbecq and Mills 1985). Firms should:

- have separate financial resources, funds for innovation,
- make reviews and report periodically on informal proposals for innovation,
- define clearly the directions and make follow-ups,
- map and analyse external activities to learn from others and to gain best practices,
- set realistic expectations,
- create a supportive atmosphere for troubleshoots and detect changes as well as provide necessary resources for maintenance and services.

If firms have a suitable working environment, then further behaviours enable innovation (White − Bruton 2011): innovators should have and ask questions for identifying problems and finding opportunities; innovators should be open to learning new skills; innovators should dare to take risks and to be proactive; innovators should have strong personal beliefs and values in line with the values and goals of the firm.

What is the most challenging thing during innovation? It is *uncertainty*. Managing uncertainty is crucial during the management of innovation. Due to the fact that innovation is complex and depends on several internal and external events, uncertainty may hinder the process at any phase. To define and classify uncertainty, *Pearson's* classification can be followed (Trott



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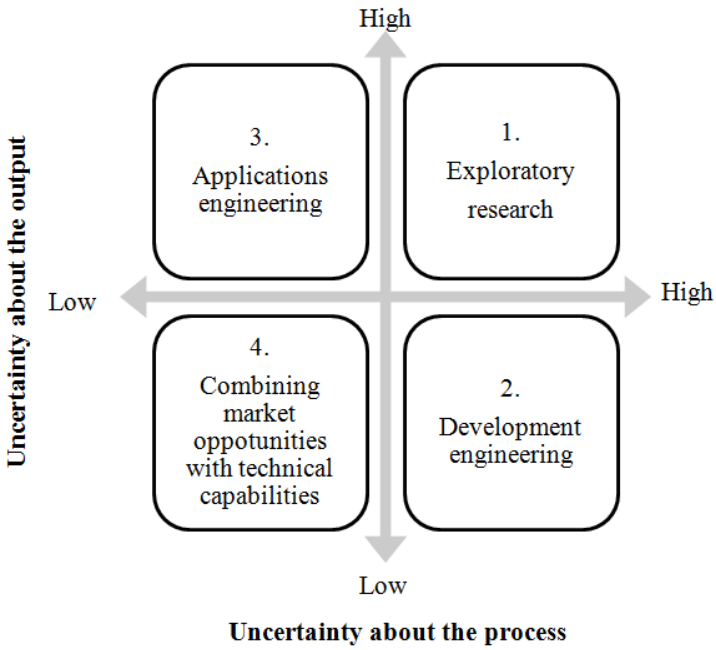
2017). Pearson (in 1991) separates two extremes in his *uncertainty map*:

- uncertainty about ends (what is the eventual target of the activity or project); and
- uncertainty about means (how to achieve this target).

It is worth classifying the firm's innovation activities according to the uncertainty map. The map helps consider how ideas are transformed into innovation and provides a way of identifying the different management skills required (e.g. need for engineers or market research). There are four possible scenarios (Figure 10).

*Figure 10.* Pearson's uncertainty map




*Source*: Trott (2017, p.121)

The first is the scenario of "exploratory research" when there is a high degree of uncertainty about means and ends. The target itself and how to achieve the target is not clearly defined (e.g.: university research laboratories). The second is the scenario of "development engineering" when commercial opportunity of the product has been identified, however, the means of fulfilling it is yet to be established



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(e.g.: Guinness in-can system). The third is the scenario of "application engineering" when there is uncertainty regarding the ends, and there's a need to discover how the technology could be effectively used (e.g.: material kevlar). The fourth is the scenario of "combining market opportunities with technical capabilities". This one is about improving existing products or creating new products through the combination of a market opportunity and technical capability.

Due to the above mentioned facts about innovation being a complex process influenced by several internal and external factors, it is worth to have a conscious strategy for managing innovation. The *innovation strategy* is a key element of the firm's general business strategy. It is the most important task of innovation management and a solution to the problem of remaining competitive and of increasing competitiveness. Firms can be very good at different activities but that only counts for little if it is not supported by a well-grounded innovation strategy (Dodgson et al. 2018). Innovation strategy *"guides decisions on how resources are to be used to meet a firm's objectives for innovation and thereby deliver value and build competitive advantage"* (Dodgson et al. 2018, p. 95).

The innovation strategy must be in harmony with the generic competitive strategy of the firm. To classify *generic competitive strategies*, Michael Porter's logic can be adapted (Figure 11) (Porter 1980).

*Figure 11.* Generic competitive strategies

| | Segmentation strategy | |
|---|---|---|
| **Narrow market scope** | Differentiation strategy | Cost leadership |
| **Broad market scope** | **Uniqueness competency** | **Low cost competency** |

*Source*: own construction based on Porter (1980)

There are three general strategies (Porter 1980): 1.) *Differentiation strategy*: The firm tries to be competitive by differentiating its product from the products of its competitors. The firm is unique by a high quality product and can keep or increase its market share (e.g. Apple). The product has a broad market scope. 2.) *Cost*



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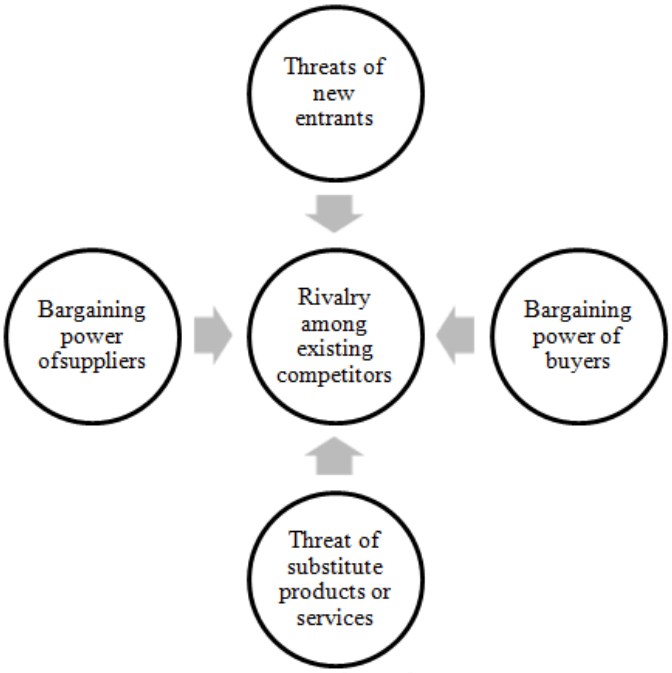
*leadership*: The firm tries to be competitive by being cost efficient. Usually a firm using this strategy has a product with relatively low quality. The product has a broad market scope. 3.) *Segmentation strategy*: The firm produces a product by being cost efficient and providing the product for a narrow market.

Even if the chosen innovation strategy must be in harmony with the general business strategy, it is different from the business strategy. It needs to comprehensively handle forces and factors both internal and external to the firm. One of the most relevant internal factors is the life-cycle of the product. If the firm is willing to make innovation strategy, it is most necessary in the phase of product development and maturity (and decline). The most influencing external factors are related to the market. One of the most well-known tools to map these factors is *Porter's five forces model* (Figure 12) (Porter 2008).

*Figure 12.* Porter's five forces model




*Source*: own construction based on Porter (2008)



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According to Porter, there are five forces shaping the competition: competitors, customers, suppliers, potential entrants and substitute products. To understand industry competition and profitability in case of any kind of industry and its firms (automotive, health care etc.) we must analyse the five forces. However, the configuration of the five forces differs by industry.

What are the main characteristics of innovation strategy? Innovation strategy is portfolio-like. It depends on the sector, firm's size, profile, technological and market circumstances, complexity of products and services, effects of innovation on the society and environment (Dodgson et al. 2008). In some firms there is no explicit innovation strategy. Innovation strategy is implicit and it is in the mind of senior managers. In contrast, many firms have written down, well documented, communicated and explicit innovation strategies. Well-established sectors and firms in stable business environments employ specific innovation strategies. However, innovation strategy is less specific in emerging and changing sectors and markets, in case of radical innovation or at an early stage of the product's life-cycle.

An innovation strategy consists of *four interrelated elements* (Figure 13) (Dodgson et al. 2008). Innovation strategy involves evaluation about which innovation processes (e.g. R&D, product development, and commercialization) are most appropriate for the firm's goals and circumstances. Innovation strategy identifies technologies and markets for the firm which are the most profitable to develop and to exploit.



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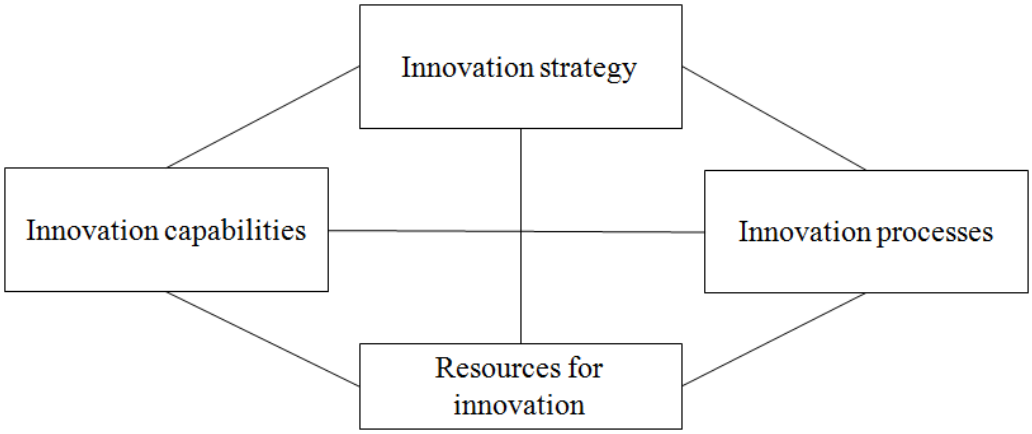
*Figure 13.* Elements of innovation strategy




*Source*: Dodgson et al. (2008, p. 96.)

But this all depends on the resources for innovation available to the firm (e.g. financial, human, technological, marketing, organizational and networking resources) and is also influenced by the firm's innovation capabilities to guide and enable resources (like learning, searching market and technology opportunities, selecting among options, configuring innovation efforts, deploying value from innovation).

The type of innovation strategy depends on several factors like the nature of innovation, the size of the firm, technological readiness, partnerships, attitude to accept risk, financial sources etc. Even if each firm's strategy is different in some way, there are four ideal types of innovation strategy (Table 1).

Firms following *proactive strategies* are generally market and technology leaders. These firms are prepared to take big gambles, capable to bring about and finance radical innovation and accept risk. Companies using *active strategy* build their innovation activities on existing technologies and markets. They do mainly incremental innovation, in many cases cooperating with technological leaders. Firms with *reactive strategy* are technology followers, developing entirely incremental innovation with low risk. Finally, there are firms with *passive strategy*. These companies do innovation occasionally only if it is demanded by the customers. They try to avoid any risk and imitate technologies.

The more complex the strategy, the more energy it needs. Proactive



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innovation strategy requires a wide range of resources and capabilities. The innovation project is complex and complicated. In contrast, in case of passive strategy, there is no need for specialized resources, there is no unique competence, thus the innovation process is not complex and complicated and the company does not need to develop innovative capabilities.

*Table 1.* Ideal types of innovation strategy

| | Proactive | Active | Reactive | Passive |
|---|---|---|---|---|
| **Objectives** | Technological and market leadership | Not being first to innovate, but being prepared to follow quickly | Wait and see, follow a long way behind | Do what is demanded by customers or dominant firms |
| **Types of technological innovation** | Radical and incremental | Mainly incremental | Entirely incremental | Occasionally incremental |
| **Knowledge sources** | Science, in-house R&D, collaboration with technology leaders, demanding lead customers | In-house R&D, collaboration with technology leaders, customers and suppliers | Competitors, customers, purchase of licenses | Customers |
| **Innovation expenditure** | Basic and applied R&D, products and services new to the world, operations, education and training | Applied R&D, products and services new to the firm, operations, marketing, education and training | Focus on operations | No formal activities |
| **Risk acceptance** | High-risk projects included in portfolio, take big bets | Medium-low risk projects, hedge bets | Projects all low risk, wait and see | No risk taken, no bets |
| **Main forms of appropriability** | IPSs, complementary assets, secrecy, speed | Complementary assets, speed | None | None |
| **Typical firms** | DuPont, Apple, Qantas, Singapore Airlines | Microsoft, Dell, BA | European and Asian budget Airlines, like Ryanair and Air Asia | Third- and fourth tier automotive suppliers |

*Source*: Dodgson et al. (2008, p. 105)

Regardless of the strategy, there are several *organizational characteristics, which facilitate the innovation process* (Trott 2017). Firstly if a firm is growth-oriented, the probability of it being



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innovative is higher. Vigilance is also necessary for continual external scanning (e.g.: market research and competitor analysis) by all the members of the firm. Commitment to technology (resources like intellectual input from science, technology and engineering) is advantageous and will require further investment on the long-run. Accepting risks means the willingness to consider risky opportunities carefully. Cross-functional cooperation leads to new ideas and better innovation processes. It is very important to harmonize relationship e.g. between the marketing and R&D functions to avoid one of the biggest barriers of innovation. Receptivity is related to the capability of the firm to be aware of, identify and take effective advantage of externally developed technology. Most innovations involve a combination of several different technologies. ‚Slack' refers to the fact that there is also a need for a certain amount of flexibility to allow individuals room to think, experiment, discuss ideas and be creative. Adaptability is necessary for the firm to be ready to accept changes, which influence internal activities (e.g.: in case of radical innovation). All firms need a diverse range of skills: They must have a good combination of specialized skills and knowledge in the form of experts.

**Keywords**:

- innovation management
- uncertainty map
- five forces model
- innovation strategy
- proactive, active, reactive, passive innovation strategy

**Discussion questions:**

1) Why is innovation management necessary?
2) What is the most challenging during innovation?
3) How does uncertainty influence the process of innovation?
4) What kind of innovation strategies lead to success?



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## 5. NOTION AND MANAGEMENT OF RESEARCH AND DEVELOPMENT (R&D)

**Learning outcome of the topic:** This chapter describes the role, the notion and the types of research and development. It reveals how the process of research and development forms. After learning the content of the chapter, students will understand the difference between R&D and innovation, will be able to describe the notion of R&D, to discuss the types of R&D, and to recognize the complexity of R&D.

Research and development is a key to generating scientific breakthroughs and major innovations with a relevant economic and social impact. *Research and development* (R&D) is one form of generating knowledge. In common speech the concepts of R&D and innovation are often confused, however, they shall always be differentiated. Simply put, R&D is the expansion of the knowledge base, while innovation is the economic utilization of new knowledge. The two phenomena are not the same but are related to each other. If the R&D activity is successful, it may lead to innovation. However, if R&D is not successful, it does not lead to innovation. In addition, innovation can be generated without R&D, so there is no need for R&D in every case to have innovation.

The definition of research and development is given by the *Frascati Manual* published by the OECD. According to the Frascati Manual (OECD 2015, p. 44) *"research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications."*

In practice, there are three different types of research and development: basic research, applied research and experimental development. According to Frascati Manual (OECD 2015, p. 45) *basic research "is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view"*. In other words, it is research carried out in order to acquire a more complete understanding of nature. It is not aimed at a specific product or process, though may be applied to a broad range of uses (e.g.:



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antibiotics) (Trott 2017). It is typically conducted in laboratories of universities and large organizations. The output results are published in scientific papers.

*Applied research* (OECD 2015, p. 45) ”*is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective"*. In case of applied research, the research involves the use of existing scientific principles for the solution of a particular problem (Trott 2017). It leads to new technological solutions and patents (e.g.: Dyson vacuum cleaner applying the science of centrifugal forces, firstly explained by Newton.)

The third type of research and development is *experimental development*. It ”*is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed. R&D covers both formal R&D in R&D units and informal or occasional R&D in other units"* (OECD 2015, p. 45). It aims at development, which involves the use of known scientific principles but differs in that the activities focus on products (e.g. Dyson vacuum cleaner example - the prototype product underwent many modifications and enhancements before a commercial product was finally developed).

The question is that is it necessary to go through all the types and processes to generate innovation. The answer is complex. First of all, basic research has a high relevancy. Researches leading to significant results generally start with basic researches, then consciously or spontaneously continue as applied research. Does this mean that basic research is the only way to significant results? Definitely not! It’s enough to think of the example of MRA (magnetic resonance angiography), which was the result of an applied research. It may also happen that economic actors only do experimental development, thus giving rise to smaller innovations. But the three types of research and development are closely related to each other and build on each other forming a continuum (Figure 14) (Trott 2017).



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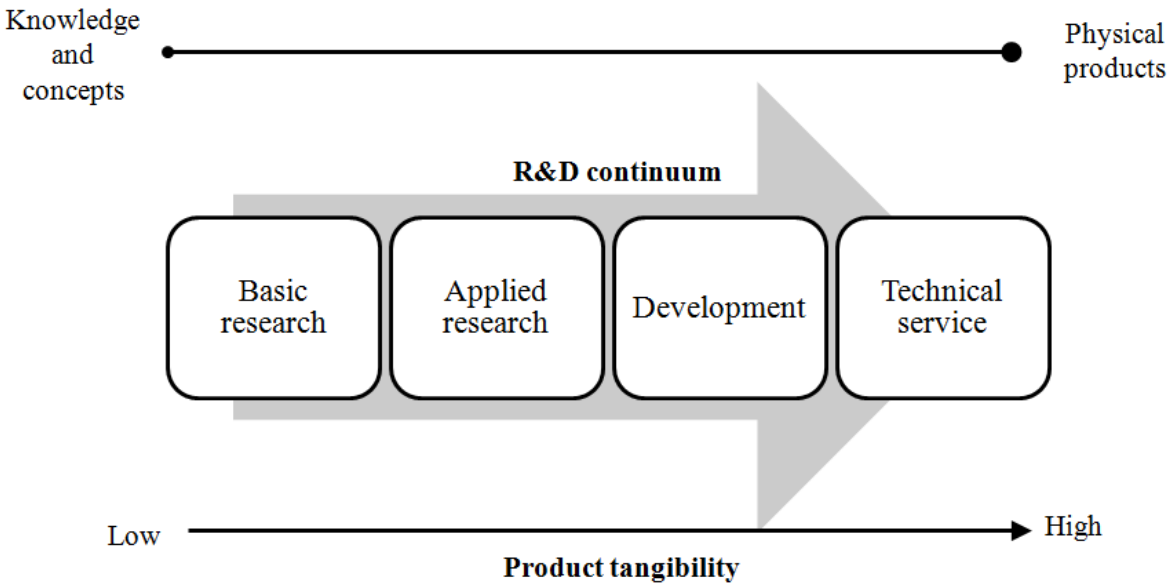
*Figure 14.* Research and development continuum




*Source*: own construction based on Trott (2017, p. 306)

Basic research may lead to applied research and then to experimental development and innovation (e.g. antibiotics). However, innovation may be generated from applied research and/or experimental development (when the innovator does not do basic research) (e.g. MRA magnetic resonance angiography).

Usually there are two different kinds of actors who are interested in conducting research and development activities. These are the universities, research institutions and the industrial actors, firms (Figure 15). These two kinds of actors are usually involved in different areas of R&D. Universities mostly focus on basic research, industrial firms mostly focus on applied R&D and product development (on having knowledge that may possess market applicability).

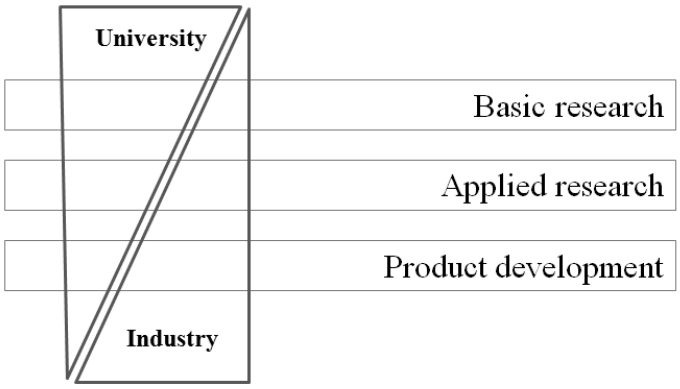
Not only the process of innovation, but the process of R&D itself must be handled as a management process. *R&D management* is part of the business strategy and includes several processes like (Trott 2017):

- Environmental forecasts: concerned with changes in technology that will occur in the future; factors such as economic, social and political

factors also have to be considered.

- Comparative technological cost-effectiveness: new technologies, and new materials appear – life-cycle effect (e.g. electric cars).
- Risk: may have high-risk projects and some developmental low-risk ones. Planning cannot remove risk but it can help to ensure that decisions are reached using a process of rational analysis.
- Capability analysis: weaknesses and strengths of the firm, analysis of competences and necessary capabilities for the future.

*Figure 15.* Actors and areas of research and development




*Source*: Trott (2017, p. 314)

European Industrial Management Association (1985) names three different areas, where R&D plays a central role (Figure 16) (Trott 2017). 1.) *R&D for existing business*: R&D done to provide new solutions for existing business activities and products (e.g. new machines in newspaper industry). 2.) *R&D that drives new business*: R&D done to increase the product portfolio, to have newer business opportunities (e.g. 3M company and the Post-It). 3.) *Exploratory research*: R&D done to develop new technologies, and increase the business portfolio (e.g. Microsoft - computer programming technologies, telecommunication, media, music, film, TV, sound technology).



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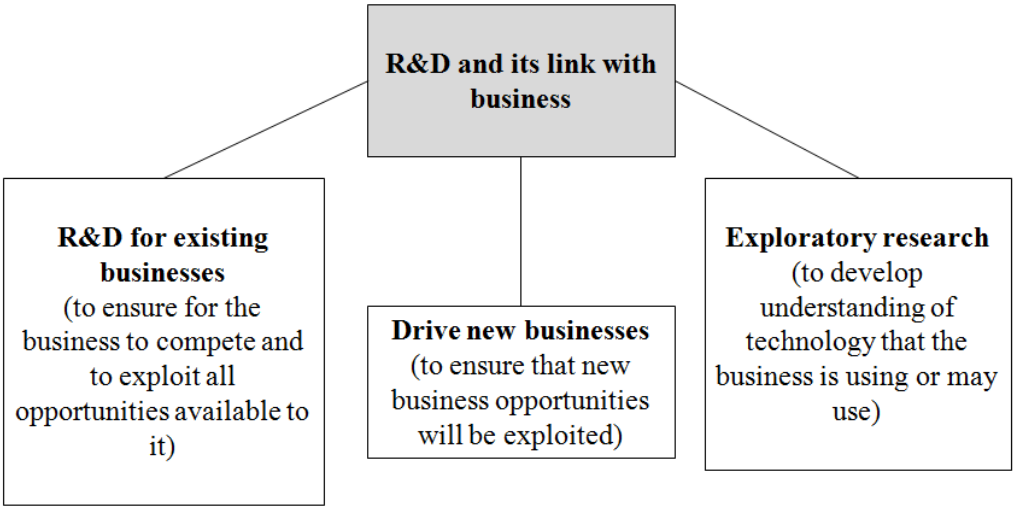
*Figure 16.* Strategic role of R&D




*Source*: own construction based on Trott (2017, p. 318)

In general, there is no recipe for handling and managing R&D activity. The success of it cannot be foreseen because it may depend on several internal (firm) and external (business environment) factors (e.g. lack of human source or price of the raw materials). Firstly, the corporate and R&D strategy must be in harmony. To achieve this, a variety of factors influencing the firm should be analysed. It is essential to answer such questions as what might the company do; what can the company do and what should the company do (Trott 2017). After answering these questions, the business strategy can be formulated (Figure 17).

Do decide which R&D project idea should be selected for funding, the firm must evaluate the existing projects, and should answer what the firm can afford and how that may contribute to the firm's success. It is not a bottom-up nor top-down decision making process. All actors such as owners, senior and R&D management, engineers, salespeople should have a continuous discussion.



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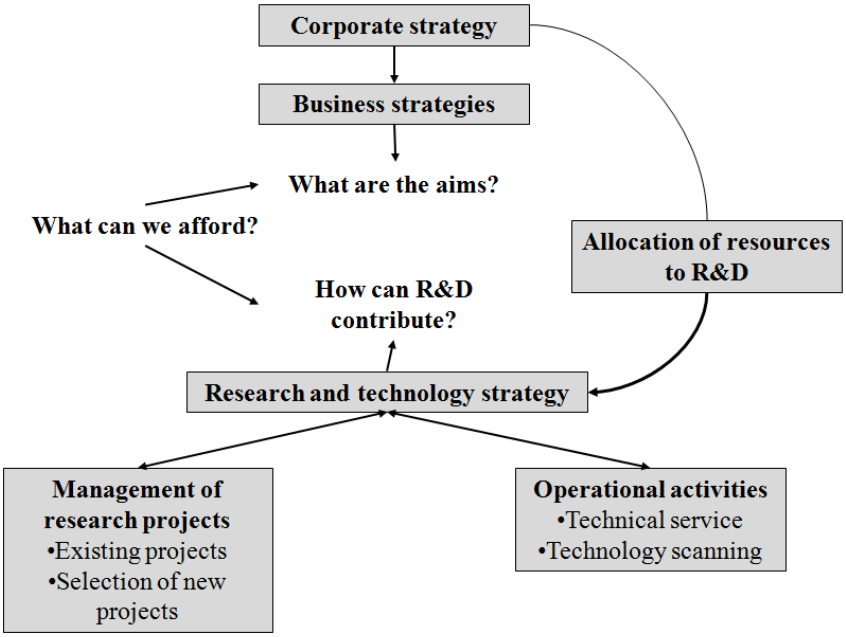
*Figure 17.* R&D decision-making process




*Source*: Trott (2017, p. 323)

By the end of a successful R&D activity, different kinds of technologies are developed. Firms have a technology portfolio, which consists of four different types of technologies (Trott 2017). The *core technology* is usually central to all or most of the company's products (e.g. in the photocopying industry photographic technologies are core). *Complementary technologies* are additional technologies that are essential in product development.(e.g. photocopying industry – microprocessor technology and paper-handling technology). *Peripheral technology* is defined as technology that is not necessarily incorporated into the product but whose application contributes to the business. (e.g. software, PhotoShop). *Emerging technologies*: new to the company but may have a long-term significance for its products. (e.g. telecommunication technologies)

**Keywords**:

- research and development
- basic, applied research and development



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**Discussion questions:**

1) What does research and development (R&D) mean?
2) What is the relation between R&D and innovation?
3) What is the aim of R&D?
4) How to select a successful R&D project?
5) What different technologies are used by firms?



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## 6. PROTECTION OF CREATION: INTELLECTUAL PROPERTY RIGHTS

**Learning outcome of the topic:** The chapter aims at revealing how to deliver value from innovation. It describes the solutions to protect an innovative creation from being stolen in the form of intellectual property rights (IPRs). By learning the chapter, students will be able to protect their innovative ideas and will be capable of gaining inclusive rights for their innovations.

If a firm comes up with a new idea, it has to be aware of the options it has to protect that idea. The aim of protection is to foster innovation, to increase competitiveness, to have full benefits out of inventions and creations, to protect an idea against infringement by others (stop others from using, making, selling or importing the novelty without the firm's permission), to protect the product and the idea behind it, preserve the corporate reputation and brand (e.g. colour, packaging etc.), to protect a know-how. On the one hand, a firm may protect its idea and innovation by keeping it secret but there may be a risk of a competitor appearing with the same or similar idea and starting its commercial exploitation, this way reducing the market share of the firm. On the other hand, a firm may apply for a legal protection and by intellectual property rights (IPRs) the firm may receive exclusive rights for the idea's commercial exploitation.

Intellectual property is protected by law. This enables people to earn financial benefit from what they invent or create. According to the World Intellectual Property Organization (WIPO) „*intellectual property (IP) refers to creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce"*[2]. There are two main branches of IPRs: industrial properties and copyrights. The reason for distinguishing the two branches is that in case of *industrial properties* the owner of the intellectual property must file an application for receiving the protection. In case of *copyright*, the protection is obtained automatically, there is no need to apply for it separately.

There are several fields of protection within the two main branches (Table 2) (WIPO 2008). (Here only the most common ones are listed, not all

[2] www. wipo.int



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types!). Among industrial properties, there are types protecting technical knowledge (a product) like a patent, utility and industrial design, and types that are related to the indication of the product, like trademark or geographical indication.

*Table 2* Main types of IPRs

| **Intellectual property rights (IPRs)** | | |
|---|---|---|
| **Industrial properties** | | **Copyrights** |
| Protection of technical knowledge<br>−Patent<br>−Utility<br>−Industrial design | Indications<br>− Trademark<br>− Geographical indication | − Classic copyrights<br>− Related rights |

*Source*: own construction based on www.sztnh.gov.hu, www.wipo.int

One of the most relevant types of IPRs is a *patent*. A patent is an exclusive right granted for an invention which is a product or a process that provides, in general, a new way of doing something or offers a new technical solution to a problem. To get a patent, technical information about the invention must be disclosed to the public in a patent application. Patent is a territorial right, meaning that the exclusive rights are only applicable in the country or region in which a patent has been filed and granted in accordance with the law of that country or region. There is no such thing as a "world patent". The time of protection is generally 20 years which cannot be renewed. The protection period starts from the date of the application, but the invention can be commercially used only after receiving the final patent protection (which may take several years from the date of application). However, approvals have been known to take very long to get, sometimes even longer than the patent's 20-year life. This may happen especially in case of products from pharmaceuticals and agrochemicals. For this reason in case of these products, a so called *supplementary protection certificate* is provided, and the time of protection can be extended by a maximum of 5 years.

An invention must meet several criteria to be eligible for patent protection (WIPO 2008). The invention:

1) *must be patentable*: discoveries, scientific theories, mathematical methods; aesthetic



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creations; programs for computers; methods for medical treatments; biological processes for production of plants and animals are not patentable

2) *must be novel*: an invention is not novel if details of the it have made publicly available before the filing date of the patent application, also call the "priority date"
3) *must include an inventive step*: The solution provided by the invention for a specific problem is not obvious to a person with average knowledge of the technical field
4) *must have an industrial application*: the invention cannot be purely theoretical, it must be possible to apply for practical purposes (but the invention does not have to be meaningful)

If the owner of an invention wants the grant of a patent for an invention, they must adapt to the legal concept of the patent systems. Today, all countries build on the concept of *"first to file"*. This means that the first person who files the patent application has the right to get the legal protection for the invention, regardless of the date of the actual invention.

But it was not the only rule in the past. There were several countries (like Canada, Philippines and the USA), which adapted the rule of "first to invent". This means that if there are more inventors for the same invention, the one who had the first thought of the idea and was the first to put it in practice had to get the legal protection, even if the first inventor wasn't the first to file the application. Earlier, the harmonization between this two systems was provided by the Paris Convention (signed in 1883). By today, all countries have switched to the first-to-file rule the USA being the last one in 2013 by the America Invents Act.

*Utility* is a type of industrial property, which is not available in all countries. Utility is a patent-like IPR, an exclusive right to protect inventions, which derives from incremental innovation (e.g. Swiss army knife). It provides similar rights as patents and requires the same conditions as patents, but not strictly related to "the inventive step". In case of utility the registration is simpler, faster (6-12 months) and it is granted usually for 10 years (but this may change from



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country to country) and cannot be renewed.

*Industrial design* is related to the ornamental or aesthetic aspect of an article. It may consist of three dimensional features, such as the shape of an article, or two dimensional features, such as patterns, lines or colour. The aim of having this IPR is to prevent third parties from making, selling or importing articles bearing or embodying a design which is a copy, or substantially a copy, of the protected design, when such acts are undertaken for commercial purposes. E.g. packages, containers to furnishing and household goods, lighting equipment, jewellery, textiles etc. The duration of the protection varies from country to country from 5 to 25 years (and cannot be renewed).

*Trademark* is a sign capable of distinguishing the goods or services of one enterprise from those of another. Trademarks date back to ancient times when craftsmen used to put their signature or "mark" on their products. The trademark can be exclusively used by its owner (e.g. colour letters of Google, Apple logo) or licensed to another party for use in return for payment (e.g. McDonald's logo). The time of protection is 10 years and can be renewed.

*Geographical indication* is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are related to that specific region. Since the qualities depend on the geographical place of production, there is a clear link between the product and its original place of production. It does not enable the holder to prevent someone from making a product using the same techniques. It is typically used for agricultural products, foodstuffs, wine and spirit drinks, handcrafts and industrial products. Protection lasts until the product is in commercial use (e.g. Darjeeling tea, Camembert cheese, Tokaji wine).

An odd-one-out protection types is the *trade secret*. Information, knowledge can be protected as trade secret as well. However it is not a legal protection (not one type of IPRs), but can provide advantages similar to IPRs. Generally the subjects of the trade secret are facts, information, solutions or data, which is published (e.g.: data of customers, technology, engineering or organizational skills, experiences, know-how). The aim of using a trade secret is to protect information, knowledge which has financial, economic and market value for the firm. In case of trade secrets that



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knowledge is protected immediately and automatically. The protection lasts until its subject is a secret.

As it was mentioned at the beginning of the chapter, an inventor may protect the invention either as a patent or a trade secret. There are several advantageous of the trade secret (e.g. no need to register it, obtained automatically, the protection may take longer than in case of patent), but there is one danger of using it. If a firm applies for the legal protection for its invention, and another firm protects the same idea as a secret, the firm applying the option of trade secret usurps the idea of firm having the patent.

*Copyright* (or author's right) is a legal term used to describe the rights that creators have over their literary and artistic works (classic copyrights) (WIPO 2008). Works covered by copyright range from books, music, paintings, sculptures and films to computer programs, databases, advertisements, maps and technical drawings. Copyright protection extends only to expressions and not to ideas, procedures and methods of operation or mathematical concepts as such. Copyright protection is obtained automatically without the need for registration or other formalities. Copyrights are provided during the creator's life and 70 years after the death of the creator (exploited by the inheritor). Copyright protection is related to those as well who assist the creator to communicate and disseminate their works to the public (e.g. by broadcasting in radio, TV). These are the related rights.

**Keywords**:

- intellectual property rights
- industrial properties
- copyrights
- patent, utility, industrial design, trademark, geographical indication

**Discussion questions:**

1) Why is it relevant to protect firms' intellectual property?
2) What does intellectual property (IPR) mean?
3) What are the different forms of intellectual property rights?



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## 7. MANAGING INTELLECTUAL PROPERTY RIGHTS: PATENTING

**Learning outcome of the topic:** The chapter shows the different routes to obtain protection for an innovation. It describes the national, European and international (PCT) routes to file a patent application and get the grant of a patent for an invention. By learning the steps to get ptotection for an invention, students will be capable of identifying the most suitable route to get their inventions patented and will be able to understand the limitations of patenting.

Patent – as it has been described in chapter 5 − is an exclusive right granted for an invention. The invention is a product (a good) or a process that provides a new technical solution for doing something and solving a problem. A patent is one of the most complex forms of intellectual property rights and an invention must fulfill several requirements to qualify for it: it must be patentable, must be novel, must include an inventive step and must have an industrial application. A patent is an intellectual property, which gives the right to the owner to exclude others from making, using, selling and importing the invention for the limited time of the protection (generally 20 years).

A patent for an invention may be obtained by three possible routes of application. The owner of the invention may submit a national patent application, a regional patent application under the European Patent Convention or an international application under the Patent Cooperation Treaty (Table 3).

*Table 3.* Possible routes to file a patent application

| Route | National | European | International (PCT) |
|---|---|---|---|
| via | National offices | European Patent Office or national offices | International Bureau or European Patent Office or national offices |
| Valid in | One country | Up to 38 countries | Up to 152 countries |
| Process | Applications are filed at the national office and valid for the state only | One single application at EPO and for all EPC contracting states. Has same legal effects as national patents. | It is an international patent procedure, but it is not an international patent. After international phase, applicants choose to enter the national/regional phase in various member states |

*Source*: own construction based on www.sztnh.gov.hu/en, www.epo.org and www.wipo.int

If the owner of the invention intends to apply for a patent only in one or in a few countries, it may be better to choose the national route[3]. In this case the applicant files a *national patent application* at the national patent office in the country's native language. Each country has its own national intellectual property office, which provides the grant of the patent for the invention described and claimed in the application in the given country. Even though patent laws are internationally harmonized, the national route may differ from country to country due to the different national rights, which provide different degrees of protection.

Despite the differences, the basic steps of national patent procedure are the same everywhere (Figure 18). The procedure starts with the filing of a patent application. The applicant submits the patent application and specification at the national office (via post, e-mail). Following this the national office analyses prior date and sets the priority date. The time of protection is counted from this day. *Prior art* refers to any evidence that the invention was already published, publicly known and available in whole or in part, before the filing date, the priority date of the application. Prior art can include, e.g.: product available for sale; commercial use of the invention; publication (printed, electronic), presentation, demonstration of the invention; previously-filed patent application (which probably would be granted).

*Figure 18.* Basic steps of national patent procedure


*Source*: own construction based on www.sztnh.gov.hu/en

After obtaining the filing date, the national office publishes certain content of the application 18 months after (not earlier) the priority date, thus informing other economic actors who might be develop a similar invention. At the next phase of the procedure, the national office carries out a patentability analysis and examines the requirements of the patent laws. If the

[3] http://www.sztnh.gov.hu/en



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invention fulfills all the requirements a patent is granted for the invention and the national office publishes the whole patent specification. This means that the applicant receives the exclusive right to realize the economic benefits of the invention, even though all the technical information becomes public (not like in case of trade secret).

The *European patent application* procedure is similar to the national one. The European patent application is possible only if a country has joined the *European Patent Convention* (EPC, signed in 5th October, 1973). The Convention was set up at the Munich Diplomatic Conference, for this reason the EPC is also called as Munich Convention. It was founded by 16 countries and today it has 38 member states and further validation states (Figure 19). The Convention sets the rules of receiving a *European patent* grant and provides a single procedure for the grant of patents for its member states by filing one single application to its central office, the European Patent Office (EPO). The European Patent Organisation is an intergovernmental organization (financed through the fees, and not taxes), and has its offices in Munich, The Hague, Berlin, Vienna and Brussels.

*Figure 19.* Member states of the European Patent Organization

*Source*:www.epo.org

An applicant may submit the European patent application at any office (national office or at EPO) in one language (English, German or French) or



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may use the online filing software too. This is one of the great advantages of the European route: the applicant does not have to translate the application to each country's native language, it is enough to write it in one language. Similar to the national route, the filing is followed by obtaining the filing date, then a publication, search and examination follow and the process closes with providing the grant. The European Patent Office then publishes the complete patent specification (Figure 20). In the case of the European route all sub-processes are conducted by the European Patent Office.

*Figure 20* Basic steps of national patent procedure


*Source*: own construction based on www.epo.org

The third option to get an invention patented is to file an *international patent application*. It is an international patent procedure that may provide protection in up to 152 countries. If a country signes the *Patent Cooperation Treaty* (PCT, signed in June 1970, Washington), the applicants from the member states can get patent protection internationally. By filing an *international PCT patent application*, applicants can simultaneously get protection for an invention in contracting states (Figure 21). The procedure is administrated by the *WIPO*, World Intellectual Property Organization.

Even though it is an international patent procedure, it is not an international patent (similarly to the European patent). After *the international phase* applicants choose to enter the national or regional phase in various member states (Figure 22). The international route starts with filing the application and the patent specification at the national office or at EPO or at WIPO in one language (it makes the application process easier by filing the application in one language at one office)[4]. Then the process continues with the international search when an International Searching Authority (ISA) examines patent documents, defines priority and analyses

[4] www.wipo.int



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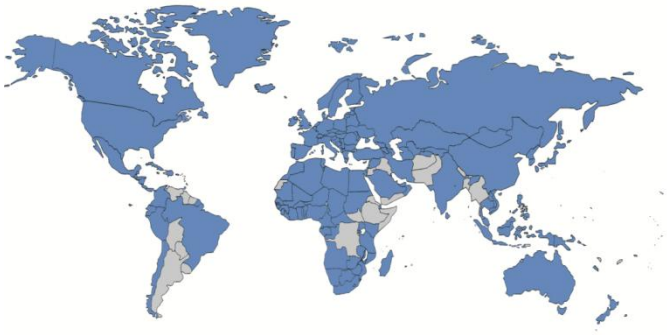
prior art. Even further optional supplementary international searches are possible (by another ISA) if the applicant is not satisfied with the result of the search.

*Figure 21* Member states of the Patent Cooperation Treaty



*Source*: www.wipo.int

The next phase is the international publication when WIPO publishes certain parts of the application 18 month after the priority date. Then the applicant may ask for international preliminary examination (optional) when ISA carries out a patentability analysis, examining the requirements of the patent requirements. It is very advantageous because the ISA provides a strong basis for the patenting decisions. It defines where the invention is marketable and desirable and evaluates the likeliness of the invention being patented.

*Figure 22* Basic steps of national patent procedure


*Source*: own construction based on www.wipo.int

From this point, the procedure turns to the *national phase*: after the PCT procedure administrated by the WIPO, usually 30 months from the filing date, the applicant starts to pursue the grant of the patent directly before the national (or



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regional) patent office in countries where the applicant wants to obtain the protection. After the successful national phase the national offices provide the grant and publish the whole patent specification.

The process in case of an international patent application is more complex than in case of the national or European route, but has many advantageous. The applicant has to file the application in one language in one office. The WIPO may provide an official report on the patentability of the invention before deciding the destination countries where the invention is marketable and has economic benefits. Thus the national phase can be reduced. The PCT process is faster and cheaper than to file an application in each country separately. It helps to prepare the necessary translations and to pay national fees and the applicant even gets extra time to find investors.

**Keywords**:

- patent
- prior art
- national, European and PCT patent

**Discussion questions:**

1) What is a patent as an exclusive right?
2) What are the conditions of patenting?
3) What are the basic steps of the national, European and international patenting process?
4) What are the advantages of the European and international (PCT) patenting?



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## 8. STRATEGIC ALLIANCES

**Learning outcome of the topic***:* The chapter reveals that strategic alliances are highly important during innovation. They have many types with different purposes. By learning aboutr strategic alliances, students will understand the necessity of strategic alliances for successful innovation and are able to compare innovation-related cooperation and to see the advantages of the different forms of these alliances.

Innovation is a very complex process including several sub-processes. It is a continuous and circular phenomenon in which a new innovation may appear at any point. The probability for one single firm to have all the resources to generate innovation is very low. For this reason, firms interact with other firms and form strategic alliances. Innovation is based on linkages with a wide range of actors, like competitors, customers, suppliers, research institutions, universities, development and financial agencies.

In strategic alliances firms cooperate out of mutual needs and share the risk of innovation (Trott 2017). Strategic alliances provide access to resources, increase the probability to have successful innovation in the form of new products, new processes (thus new technologies). They help to penetrate new markets and even gain advantages of economies of scale.

According to Trott (2017, p. 266) *"a strategic alliance is a contractual agreement among organizations to combine their efforts and resources to meet a common goal"*. In other words *"a strategic alliance is an agreement between two or more partners to share knowledge or resources, which could be beneficial to all parties involved"* (Trott 2017, 266). Strategic alliances are mutual agreements that are generally based on contracts, however, alliances may exist without any contractual agreement. Alliances do not harm the organizational, legal or strategic autonomy of the firms involved and usually they are long-term or fixed term cooperations.

In practice, firms may choose out of two general strategies. On the one hand, a firm may compete the "go-it-alone" way. In this case, the firm tries to generate all the resources for innovation to compete against other industrial actors



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and does not share any ideas, information and knowledge with others (Trott 2017). On the other hand, a firm can build on the "octopus strategy" and develop alliances with a wide range of actors. The latest strategy is much more advantageous due to several factors. In cooperation, firms can get access to existing skills, knowledge and technology, thus saving time and money on not having to develop these elements on their own. Firms together with actors from different areas can generate hybrid technologies (e.g. on the field of bio-electronics). Firms with competitors can effectively make both radical and incremental innovation. Beyond these basic reasons for entering alliances, Trott (2017) collected several examples and objectives of cooperation (Table 4).

To generate economically useful knowledge, firms need strategic alliances. Alliances aim at *transferring knowledge* (both tacit and codified). Direct knowledge-transfer contributes to making codified knowledge available through e.g. hard copies and electronic data (Davenport − Prusak 1998). Indirect knowledge-transfer leads to the spreading of tacit knowledge. It is hard to get the transferrable skills and know-how in the first place, but it's not impossible either through e.g. observations.

There are several *generic types of strategic* alliances. On the one hand, there are *intra-industry and inter-industry* alliances. On the other hand, there are alliances like (Trott 2017):

- licensing,
- supplier relations,
- outsourcing,
- joint venture,
- collaboration (non-joint venture),
- clusters,
- innovation networks.



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*Table 4* Reason for entering strategic alliances

| Reasons | Examples |
|---|---|
| Improved access to capital and new business | European Airbus against Boeing and MacDonnel Douglas |
| Greater technical critical mass | Alliance (the LG Philips) between Philips of the Netherlands and LQ Electronics of Korea (access to technology from Philips, lower manufacturing costs of Korea) |
| Shared risk and liability | Sony-Ericsson joint venture |
| Better relationship with strategic partners | European Airbus |
| Technology transfer benefits | Customer-supplier alliances, e.g. WW and Bosch |
| Reduce R&D costs | GEC and Siemens 60/40 share of telecommunications joint venture |
| Use of disrtibutions skills | Pixar and Disney |
| Access to marketing strengths | NMB, Japan access to Intel's marketing |
| Access to technology | Ericsson gained access to Sony's multimedia technology for 3rd generation mobile phones |
| Standardisation | Sony licensed their Blu-ray technology to others to help secure industry standard over Toshiba's HD DVD |
| By-product utilisation | GlaxoSmithKline and Matsushita, Canon, Fuji |
| Management skill | J Sainsbury accessed financial skills from Bank of Scotland |

*Source*: Trott (2017, p. 279)

*Licensing* is a relatively common and well-established method of transferring technology (Trott 2017). It aims at giving and getting official permission to do something[5]. It is advantageous if firms want to acquire different technologies as fast as possible and do not want to develop their own technologies, thus reducing the costs of technology development. Usually, licensing does not involve extended relationships between firms but licensing another firm's technology is often the beginning of another, intensive form of collaboration. In case of licensing, licensor performs the role of teacher and contributes to learn new skills and technologies. A big disadvantage of licensing is neglecting the internal technology development.

*Supplier relations* aim at cost benefits (Trott 2017). For example,

[w]www.dictionary.cambridge.org

having an alliance with a supplier contributes to having lower production costs that might be achieved if a supplier modifies a component, so that it 'fits' more easily into the firm's product. Supplier relations help to reduce R&D expenses if suppliers provide information about the use of the firm's product in the customer's application. Suppliers can provide improved materials and may reduce costs by changing delivery frequency and lot sizes. Simple supplier-customer relations may evolve into closer working relationships aiming at developing new products together.

Outsourcing is the "*delegation of non-core operations from internal provision of production to an external entity specialising in the management of that operation"* (Trott 2017, p. 272). It assists to reducing the firm's costs, to paying more attention to the core activities and competences, more efficient use of the worldwide labour, capital, technology and resources.

A *joint venture* is a business agreement in which the parties agree to develop, for a finite time, a new entity and new assets by contributing equity (e.g. Sony-Ericsson) (Trott 2017). They exercise control over the enterprise and consequently share revenues, expenses and assets. They are usually established for a specific project and will cease on its completion. Compared to this, *collaboration* (non-joint ventures) are more flexible arrangements. They provide opportunity to extend cooperation (like in case of supplier relationships).

A *R&D consortium* describes the situation where a number of firms come together to undertake what is often a large-scale activity (with relevant investment) with the aim of doing R&D and innovation. The reason for joining a research consortium includes sharing the cost and risk of research, pooling scarce expertise and equipment, performing pre-competitive research and setting standards (e.g. GENIVI alliance, a cooperation among automobile manufacturers, component providers and technology developers to streamline In-Vehicle Infotainment (IVI) products and services) (Turiera − Cros 2013).

*Regional clusters* are geographic concentrations of interconnected companies, specialized suppliers, service providers and associated institutions in a particular field that are present in a nation or region (Porter 2000). It is their geographical closeness that distinguishes them from innovation networks (e.g. Californian



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wine cluster, Silicon Valley). *Innovation networks* are more than a series of supplier and customer relationships. They are sets of loosely affiliated firms working relatively autonomously. They are temporary networks in which firms unite around one firm or a business opportunity (like in case of NIKE or Apple) (Trott 2017).

Even if strategic alliances have more advantages for firms than disadvantages, alliances have several risks and limitations (Trott 2017). In case of multinational cooperation, members may fail to understand each other due to cultural differences. Firms may have difficulties to adapt the new management style or alliances can have limited success because of insufficient trust, different strategic goals, unrealistic expectations, or operational and/or geographical overlap.

**Keywords**:

- strategic alliances
- licensing, supplier relations, outsourcing, joint venture, collaboration, cluster, innovation network

**Discussion questions:**

1) What are the reasons for entering strategic alliances?
2) What does strategic alliance mean?
3) What are the types of strategic alliances?
4) What are the advantages and risks of forming strategic alliances?



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