MANAGING ECONOMIC INNOVATIONS

IDEAS AND INSTITUTIONS

edited by

Robert Romanowski

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Introduction

Keywords: innovation management, economic innovations

Innovation has become a buzzword in the 21st century with the idea of creative destruction launched by J.A. Schumpeter being the main base for evolutionary economics. However, new institutional economics helps to understand the necessity of support given to entrepreneurs and innovators from science and administration to reduce the risk of launching innovations. This book is devoted to selected ideas of innovation management as well as institutions supporting innovation processes such as green entrepreneurship, helix models including role of universities in innovation process, quality management, crowdsourcing and financing innovations.

The first chapter is devoted to understanding the nature of innovation management, created on the innovation model. It will identify the evolution of innovation processes leading to new innovation paradigms, based on networking and openness. Desk research was used as a methodology herein to demonstrate the differences between six types of innovation processes and the resulting ten types of innovation.

The second chapter is devoted to understanding the impact which intellectual capital has on innovation management and illustrates it using the example of PuppTech Inc., a technology start-up working on environment-monitoring technology to protect the wellbeing of pets in vehicles. The goal of this chapter is to use PuppTech as a tool in the exploration of the impact intellectual capital and its protection has on innovation management within start-ups.

The third chapter aims to provide a better understanding of "Knowledge Mobilisation" as one of the prerequisites for innovation, and, in some contexts, an enabler of innovation. The chapter presents the essence and specificity of knowledge mobilisation (KMb) for innovation, and elaborates on the process of transferring knowledge (usually from formal research institutions such as universities) into active use by business organisations. It also provides a comprehensive literature review of KMb definitions as well as some institutional solutions for the issue.

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The fourth chapter reviews the role of higher education institutions in developing innovation skills among university students. Through a literature review a list of 18 competences which are a good compromise between the requirements for standardization and the multifariousness of innovation competences was developed. The chapter is then rounded up with some practical recommendations for higher education institutions regarding the development of innovation skills amongst its students.

The fifth chapter presents the issue of quality in customer relationship management and attempts to reformulate the concept of normative quality (quality based on norms and standards) into the concept of relational quality (the perception of quality from a customer's perspective). It also demonstrates the extent to which the implementation of the quality management concept in an enterprise affects the process of continuously improving cooperation with broadly understood stakeholders.

The main objective of the sixth chapter is to present the concept of open innovation in a theoretical aspect as well as practical terms, on the example of the service station sector in Poland. For this, the authors conducted research on a sample of adult poles responsible for the management of petrol station facilities in Poland.

The seventh chapter is devoted to the issue of green entrepreneurship. The purpose of this chapter is to indicate the importance of green entrepreneurs in the quintuple helix model with a supportive role of sustainability-oriented innovation intermediaries. In order to create a detailed review of the critical points of current knowledge on the relationship between both aggregates, a systematic literature review was carried out. Thereby, the arguments based upon broadly accepted facts are presented and systematized.

The eighth chapter of the book is dedicated to a review and examples of use of crowdsourcing in marketing, In it, the authors define the concept, present models, its applications, key success factors and present examples of its use. In order to achieve the objectives, desk research and the case study method were used.

The final chapter helps to understand the issue of financing innovations and the financial constraints that many young fast-growing companies face. The purpose of this chapter is to determine selected sources of capital that is available for innovative startups, at different stages of their development while emphasizing their importance for the economy. Based on the literature review conducted across 73 research papers, reports and statistical documents, this chapter sheds new light on advantages and disadvantages of different financing options.

We end the introduction on this note and hope that this book will prove useful for students studying Innovation Management, those working in R&D departments as well as enthusiasts of innovation.

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Chapter 1

The Nature of Innovation Management

Robert Romanowski

Abstract: The Nature of innovation management is referred in literature as short-term process with immediate cost, and as long-term benefits and other outcomes (Dodgson, Gann, Phillips, 2016, p. 6). The concept of innovation has long been dominated by a technical approach to the innovation process, despite the economic arguments exposed by one of the precursors of the theory of innovation and, at the same time, the school of evolutionary economics – Joseph Alois Schumpeter. Frequently, in the context of innovation, it is pointed out that organizational and marketing aspects play a part in the successful introduction of innovation onto the market. The aim of the study is to identify the evolution of innovation processes leading to new innovation paradigm, based on networking and openness. The method of desk research was used in the study to demonstrate the differences between six types of innovation processes, including science push, demand pull, coupling, interactive, integrated, networking and open innovation ones, and ten types of innovation, treated as a result of the process. In the new paradigm of innovation the risk of a result (type of innovation) is reduced by the way it was achieved (the process of innovation). Reduction of innovation's risk is possible when an innovator uses both own and other entities' resources in the process. The nature of modern innovation management has been changed from technical activity pushing novelties to a market into economic factors helping to define possibilities of positioning a new solution even before production.

Keywords: innovation process, types of innovation, innovation management, economic innovations

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Introduction

Innovation is a concept that has dominated the discussion on the modern economy, referred to as a knowledge-based economy. The Idea of innovation management is referred to as a short-term process with immediate costs and long-term benefits and other outcomes (Dodgson, Gann, Phillips, 2016, p. 6). The nature of innovation management is based on understanding the innovation process, which implicates necessary resources, a structure of an organization and expected outcomes. Innovation management emerged as a discipline in the 1890's with Edison's innovation factory. Edison changed the image of the sole inventor by converting innovation to a process with recognized steps practiced by a team of inventors working together – laying the basic design of the R&D department (Şimşit, Vayvay, Öztürk, 2014, p. 690).

The process of innovation management, called also the innovation process, was based on the assumption of a gradual opening up towards external sources of information necessary for the effective implementation of an invention on the market. Two hypotheses by Schumpeter[1] resulted in the need to support the innovation process in small and medium enterprises. Among the many actors which can support the innovation process, the most often mentioned are academic bodies and administration at all levels. At the same time, division into types of innovation is related to long-term outcomes of the innovation process.

The concept of innovation has long been dominated by a technical approach to the innovation process, despite the economic arguments exposed by one of the precursors of the theory of innovation and, at the same time, the school of evolutionary economics by Joseph Alois Schumpeter. Frequently, in the context of innovation, it is pointed out that organizational and marketing aspects play a part in the successful introduction of innovation onto the market. The aim of the study is to identify the evolution of innovation processes leading to new innovation paradigm, based on networking and openness, typical for economic innovations with a supportive role from technical ones.

Basic types of innovation

The issue of innovation is not easy to interpret. Joan Robinson, recognizing this issue as a real problem, said "it is easier to show what an innovation is than to define it" (Robinson, 1983, p. 7–8). The perception of innovation is varied and vague, due to the short

[1] Schumpeter foresaw the problems of capitalism associated with creative destruction, affecting large companies which in his time were inefficient "bureaucratic monsters", alongside the development of small, flexible companies focused on innovation and managed according to the spirit of entrepreneurship (1st Schumpeter's hypothesis, also known as 1st Schumpeterian model (Kozłowska, 2010). As it turned out, large companies, even monopolies, acting under capitalist conditions, created mechanisms of self-repair, e.g. in the field of innovation, big companies began to cooperate with governments and in this way, nowadays, most of the breakthroughs are created by them, allowing the economy to grow (2nd Schumpeter's hypothesis, also called 2nd Schumpeterian model (Kozłowska, 2010).

tradition of research on innovation and the diversity of theoretical approaches. As such the concept of innovation is not clearly defined[2].

Among many authors dealing with issues of innovation a very interesting approach is represented by J.A. Schumpeter and P. Drucker. The concept of "innovation" was introduced for analysis at the beginning of the last century by J.A. Schumpeter (1960), who defined innovation as follows:

- the introduction of a new product (or a new species of product),
- the introduction of a new method of production,
- the opening of a new market, i.e. a market in which a branch of industry in a given country has not been represented yet, regardless of whether the market previously existed or not,
- gaining new sources of raw materials and semi-finished products, regardless of whether this market existed before or not,
- changes in the organization of some industries, e.g. the creation of a monopolistic situation or breaking it.

Schumpeter's classification is important for several reasons. First of all, it stresses the economic and technical nature of innovation (in terms of subject), making it possible to define four types of innovation i.e. product innovation, process innovation, organizational innovation, and market innovation. Furthermore, in terms of time, Schumpeter treats innovation very narrowly, because he recognizes only the first implementation of an invention (in production, organization or on the market) as innovation, which means that only a few changes and innovations can be termed "innovation" in this sense. Schumpeter understands innovation as the creation of fundamental or radical changes involving the transformation of new ideas or a technological invention into a market product or process.

Another important definition of innovation in the field of economics was formulated by P. Drucker, for whom "innovation is the specific tool of entrepreneurship, the means by which they exploit change as an opportunity for different businesses or a different services. It is capable of being presented as a discipline, capable of being learned, capable of being practiced. Entrepreneurs need to search purposefully for the sources of innovation, the changes and their symptoms that indicate opportunities for successful innovation. And they need to know and to apply the principles of successful innovation" (Drucker, 1992, p. 29). For Drucker, innovation is more an economic or social notion than a technical one[3].

Drucker's and Schumpeter's approaches can be regarded as two poles in the concept of innovation. While Schumpeter specifically defines situations in which absolute

[2] In their analysis of innovation Edison, Ali and Torkar provide more than 40 definitions for innovation (Edison, Ali, Torkar, 2013, p. 1390–1407).

[3] Moreover, P. Drucker lists systematic and spontaneous innovations, defining the former as the goal of an effective entrepreneur as well as defining it as identifying the sources of innovation opportunities (Drucker, 1992). It separates the sources of innovation depending on whether they are within or without the company's environment.

innovations can occur (i.e. inventions which are introduced for the first time in any market worldwide), Drucker defines innovation as a deliberate search for an opportunity to introduce new products. The main type of Drucker's innovations are secondary (i.e. the reproduction or adaptation to new conditions of already existing solutions). An analysis of these definitions reveals that all of them can be located between the narrowly conceived first change on a global scale (Schumpeterian approach), and the introduction of new products at the local level, at the level of the entity, usually the company, positively affecting the entity or its surroundings (Drucker's approach).

Following an innovation, understood as the development and implementation of a first invention or a new solution for the market, the diffusion of this innovation through market and non-market channels, from the place of origin (the first worldwide implementation) to different countries, regions, sectors (markets) and businesses is necessary. The second element is especially important and often under-emphasized.

Schumpeter's and Drucker's approaches were included in the Oslo Manual (2008), which contains a set of concepts applicable in the innovation policy of the European Union. It is the result of research on measures of innovation, carried out since the 1960s of the 20th century in the OECD (Organisation for Economic Co-operation and Development).

According to the OSLO manual an innovation is "the implementation of a new or significantly improved product (goods or services), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations" (OECD, Eurostat, 2008, p. 48).

The above definition refers to the dimension of the company. It contains information about the nature of novelties introduced in the microscale, and is therefore related to Drucker's meaning of innovation.

The Oslo Manual requires interpreting innovation as a significant change, from those of a routine and insignificant character. "The requirement for an innovation is a situation in which a product, process, marketing method or organizational method is new (or significantly improved) for the company. This includes products, processes and methods that a company has developed first, and those that have been assimilated from other companies or entities" (OECD, Eurostat, 2008, p. 48–49). However, one should realize that innovation can also be based on a series of smaller, incremental changes.

In the case of product innovation, implementation consists of the introducing of new processes, marketing methods or organizational methods, and is when they start to be actually used in businesses. This information confirms the importance of an idea and invention actually being used in the economy. Even the greatest scientific discovery should not be considered as an innovation if it is not possible to introduce it onto the market and thus gain economic benefits. At the same time, a constant trend observed in economic practice is to break the inventor's (or innovator's) monopoly on innovation. Innovations are always accompanied by an immediate reaction from competitors, tracing the progress of innovation in their sector.

It is important to distinguish innovation according to its aspect, a division which refers to the Schumpeterian approach (OECD, Eurostat, 2008, p. 49–55):

- a product innovation is "the introduction of goods or services that are new or significantly improved with respect to their characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics".
- a process innovation is "the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software."
- a marketing innovation is "the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing."
- an organisational innovation is "the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations."

The basic difference between the categories of product and process innovations is that the former is far more sensitive to market factors than the latter. A firm's preference for product innovation is dictated primarily by its importance in controlling and maintaining its market position. In a highly competitive environment, there is a constant need to maintain the company's position and longevity, which is impossible without an extensive introduction of new products.

Types of innovation processes

On the basis of the definition proposed by Schumpeter, the classic "Schumpeter's triad" was created (Fig. 1), and can be considered as the first description of the innovation process, as well as being a basis for new innovation processes: invention, innovation and imitation.

Any dissemination of innovation is, in his view, a distinct set of changes that are called imitation. This means that at all times innovation is a unique change (one-time, non-continuous), and the processes of imitative or inventive changes are continuous and repetitive.

Figure 1. Schumpeter's Triad

Source: Adopted from Teoria innowacji by Fiedor R. (1979), PWN, Warszawa.

For Schumpeter, innovation is the first introduction of an invention onto the market, ending the phase of invention. The phase of imitation consists of the spread of news among many customers in numerous geographical and sector markets. For an innovator, the most important goal is to shorten the phase of creativity and prolong the phase of innovation diffusion, while protecting the solutions introduced[4].

Schumpeter's Triad was followed by seven types of innovation processes. First five were divided into linear models[5] (science-push/technology-push and demand pull/need-pull), interactive models (coupling model Mowery, Rosenberg, 1979) and integrated one (Rothwell, Zegveld, 1985), and chain-link models (Kline, Rosenberg, 1986, Table 1). The latest innovative models assume building close relationships in the business environment, as in the case of the network model or the model of open innovation (Rothwell, 1994; Chesbrough, 2003).

First innovation process, termed as the science or technology push one, was focused on supply presumption of success (Fig. 2). It was presumed that implementing new technology onto the market gives better possibilities of achieving a competitive advantage. Nowadays, it is recommended to define current state of art in technology and production, highly emphasized in coupling model of innovation (Fig. 3).

Table 1. Innovation models evolution in historical perspective

Generation	Period	Authors of fundamental ideas	Innovation model	Essence of the model
1.	1950's – late 1960's	NASA	Technology (Science) push	Linear process
2.	Late 1960's – first half of 1970's	Myers and Marquis, 1969	Market (Demand, Need) pull	R&D on customer wishes
3.	Second half of 1970's – end of 1980's	Mowery and Rosenberg, 1979	Coupling model	Interaction of different functions
		Rothwell and Zegveld, 1985	Interactive model	Interaction with research institutions and market
4.	End of 1980's – early 1990's	Kline and Rosenberg, 1986	Integrated model	simultaneous process with feedback loops; "Chain-linked" Model"
5.	1990's	Rothwell, 1992	Networking-model	System integration and networks (SIN)
6.	2000's	Chesbrough, 2003	Open innovation	Innovation collaboration and multiple exploitation paths
7. (emerging, not fully formed yet)	2010's		Open innovator	Focus on the individual and framework conditions under which to become innovative

Source: Kotsemir and Meissner, 2013, p. 5.

[4] When introducing a new product the highest costs are related to the phase of creativity in the absence of revenue from sales. In the innovation phase, that is the introduction phase of the product life cycle, the launch costs typically exceed revenues. The biggest gains, that is the excess of revenues over costs, are made in the phase of imitation, also known as the diffusion phase of innovation.

[5] In the Chapter, expression "innovation model" and "given model of innovation" is used as synonym of "innovation process".

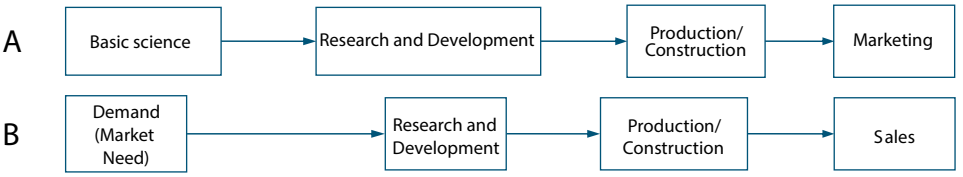


Figure 2. Linear models of innovation: Technology (science) push model Market (need, demand) pull model

Source: NASA, Myers and Marquis (1969).

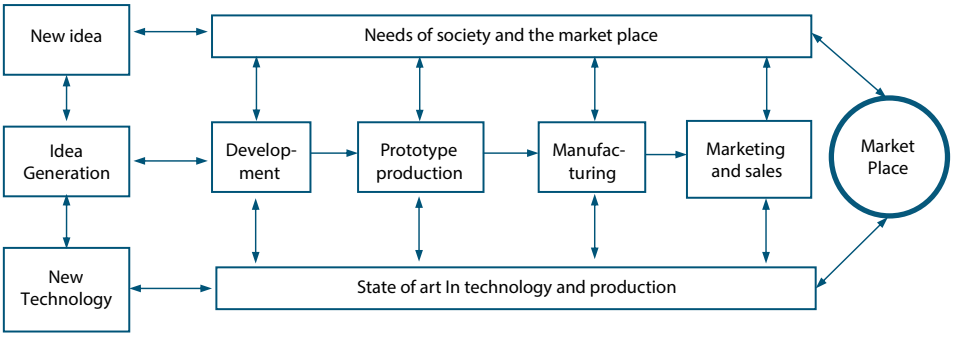


Figure 3. Coupling model of innovation

Source: Adapted from The influence of market demand upon innovation: a critical review of some recent empirical studies article, by Mowery D., Rosenberg N. (1979). Research Policy, Elsevier, vol. 8(2), pp. 102–153, April.

Myers and Marquis (1969) heralded the 1960-s "technology push" view of market-relevant aspects (2nd generation). They reasoned that innovations resulting from R&D activities are targeted towards the satisfaction of customer needs (market pull approach).

The Development of marketing function in enterprises shed new light on the innovation process. When markets become mature, customers are as good source of new ideas as technical staff in R&D departments. A new model, a market pull one, appears (Fig. 2).

As a consequence, Mowery and Rosenberg (1978) first described the importance of interactions of the innovation process of corporate functions involved. Rothwell and Zegveld (1985) extended this by connecting the traditional linear approach to businesses with external research institutions and the market (3rd Generation; Fig. 3 and 4).

The "chain-linked" model of Kline and Rosenberg (1986) (4th generation, Fig. 5) considered the innovation process a fundamentally parallel process in which the parties (corporate) function through numerous backward loops (feedback loops) are connected.

In addition they cause interactions of internal innovation activities with external research/science system at all stages of the process. They differ, however, between direct external research services and the general (publicly) available knowledge bases.

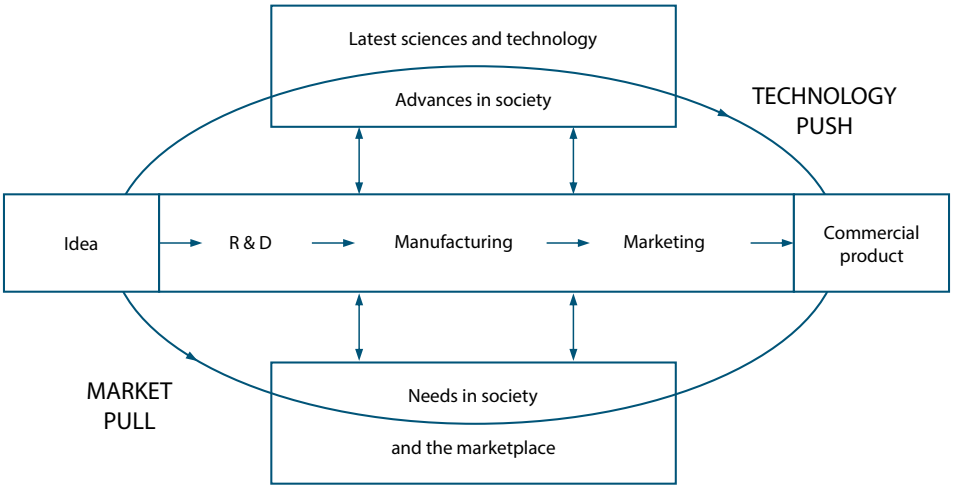
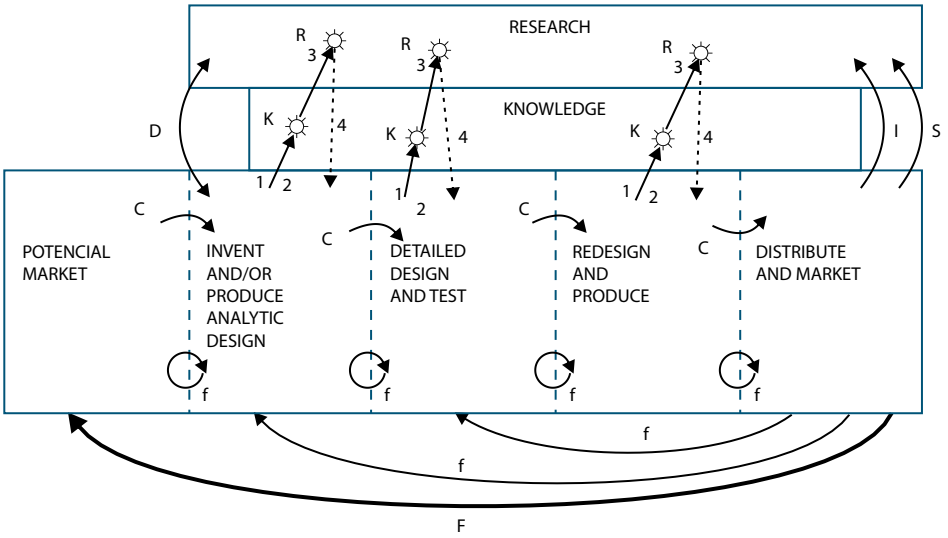


Figure 4. Interactive Model of Innovation

Source: adapted from Reindustralization and technology, by Rothwell R., Zegveld W. (1985), Longman Group Limited, London.



Chain-linked model showing flow paths flow of information and cooperation.
Symbls on arrows: C – central-chain-of-innovation; f – feedback loops; F – particularly important feedback.
K–R: Links through knowledge to research and return paths. If problems solved at node K, link 3 to R not activated. Return from research (link 4) is problematic – therefore dasehed line.
D: Direct link to and from research from problems in invention and design.
I: Support of sceientific research by instruments, machines, tools and procedures of technology.
S: Support of research in sciences underlying product area to gain information directly and by monitoring outside work. The information obtained may apply anywhere along the chain.

Figure 5. Integrated Model of Innovation/Chain linked Model of Innovation

Source: Adapted from An Overview of Innovation by Kline, S., Rosenberg, N. (1986). The positive sum strategy: harnessing technology for economic growth, Washington, DC, National Academy Press, 275–305.

The two authors arrives to the conclusion that science and technology were interdependent and suggestible. Thus, science is based on new technologies, and allows the development of new technological breakthroughs in science fields.

The innovation process of the "fifth generation" is based on the "chain-linked" model of Kline and Rosenberg (1986) and adds a strategic component of the integration of cooperating companies, the growing importance of information and communication technologies and the use of expert systems and networks (Rothwell, 1992). The above mentioned types of process are based on presumption for shortening the phase of inventiveness results from the need to reduce the so-called "Valley of death" in the innovation process (Fig. 6) (see also Romanowski, 2016).

The "Valley of death" is the most important moment in the invention phase because leaving it determines the technical, marketing, and financial success of the innovation process. Technical success occurs when, after the development phase and testing, the product launch takes place. Marketing success occurs when a new product gains a growing group of customers and current revenues exceed current costs (success of a new product). Financial success occurs when the cumulative costs of the innovation processes are covered (the break-even point is reached) and the innovator has a global surplus of revenues over global costs.

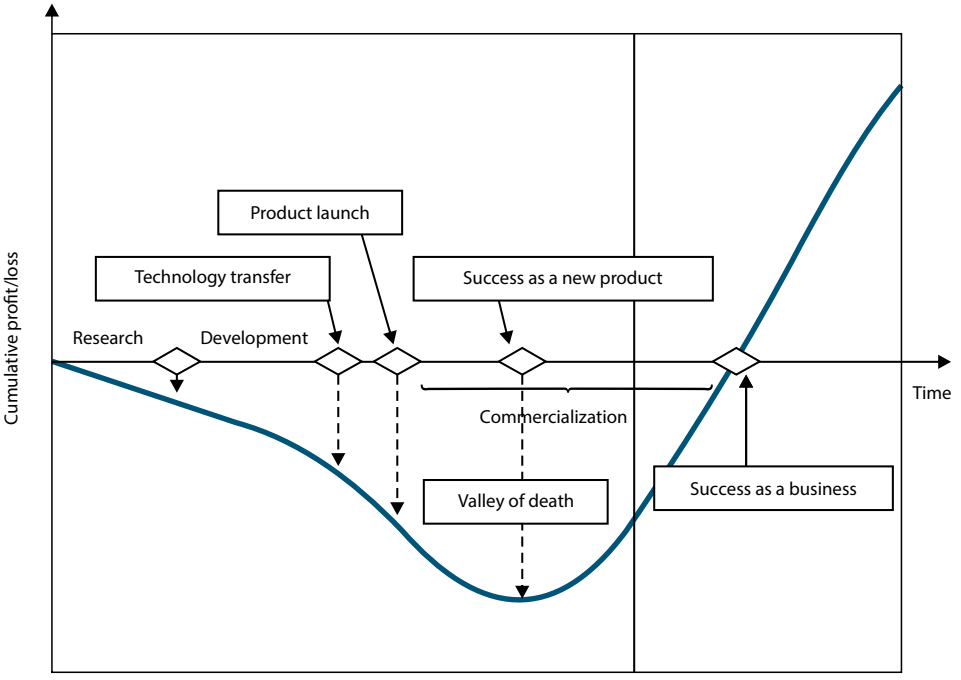


Figure 6. Valley of death

Source: Osawa, Miyazaki, 2006.

The invention phase can also be shortened if the parameters for new product success are defined: demand, supply, technological, and financial. Setting the demand parameter may help to adjust the features of a new product to meet the needs of customers in accordance with current consumer trends (Romanowski, 2013). The demand parameter can also be based on the distinct features of a new product currently available on the market that are different from other offers. The technology parameter assumes the use of technologies that have not been used in the market, even if they are available in other markets. The financial parameter is related to the possibilities of obtaining external financing from sources such as private entities, (e.g. business angels) as well as public (e.g. guarantee funds or operators of European funds) and social ones, (e.g. in the form of crowdsourcing). The risks associated with the invention phase are then greatly reduced through the introduction of open innovation assumptions, involving the use of external resources to create new solutions in an enterprise. The model based on open innovation requires not only the cooperation of enterprises with research units and local administrations, but also a skilful acquisition of knowledge from all entities surrounding the company in question, especially from customers. Open innovation frequently allows the formulation of a business model better suited to market needs than the model of a market pioneer. This approach is consistent with the concept of "imovation", which gives better results than imitative diffusion, or creative diffusion (Shenkar, 2011) and seen in such countries as Japan and South Korea.

Networking and open innovations as a new paradigm of innovation process

The 6th generation of innovation models introduces the paradigm shift from science push (black box model) to open innovation processes. The generation of innovation at company level thus far was mainly considered a company internal process and function. Chesbrough (2003) established the currently predominating thinking of open innovation which highlights the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively[6]. It assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology (Chesbrough, 2006). Hence one of the most promising forms lies in the collaboration within the model of open innovation.

The idea of networking innovation model relates to Schumpeter's second mark (hypothesis), which focuses on supporting the innovation processes in small and medium enterprises, because the large ones are developed enough to carry out their own R&D efforts[7]. Innovations are no longer "just" seen as a process, involving various functions and can be explained by the participation of a number of different institutions. Here cooperating companies (including suppliers) and customers with varying degrees of

[6] The idea of open innovations is described in chapter *The concept of open innovation – the essence, types and examples in the petrol station sector.*

[7] Big companies tend to create oligopolies based on public tenders.

intensity are involved continuously in various phases of the overall activity, while public R&D facilities and (business) external R&D facilities are included only at certain stages in the innovation process (Fig. 7).

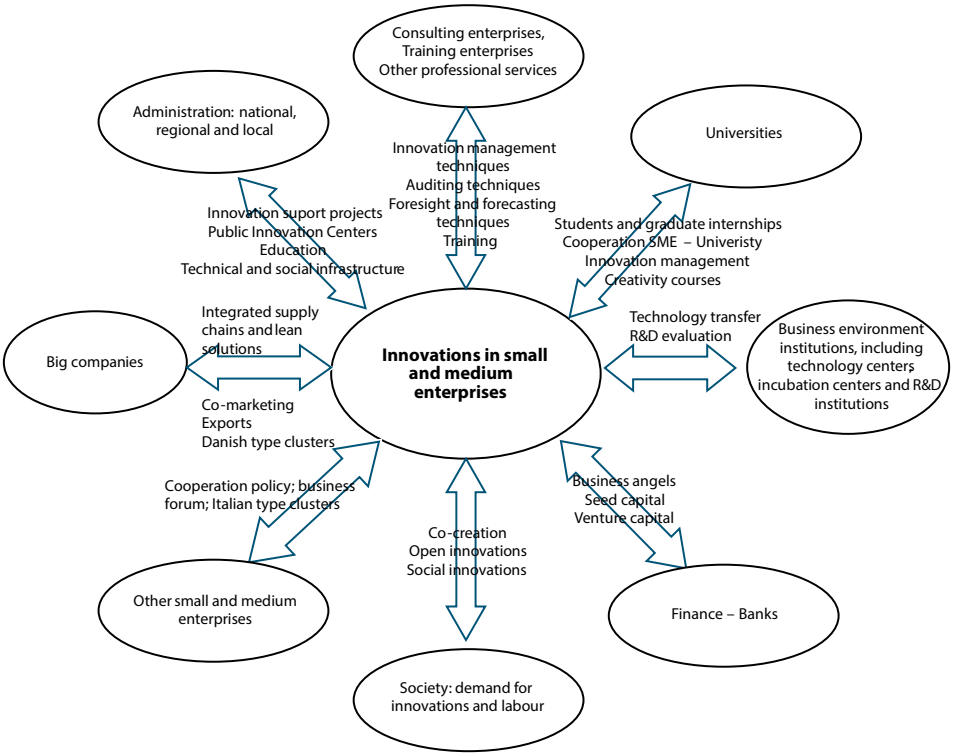


Figure 7. Relationships in network economy

Source: Adapted Innovation networks: concepts and challenges in the European perspective (p. 247), by Koschatzky K., Kulicke M., Zenker A. (2001), Physica – Verlag – Springer, Heidelberg.

Over time, the development of new technologies and knowledge companies become increasingly dependent on external knowledge and external technology. This knowledge and technologies can be either publicly accessible or be privately owned by other companies, individuals or research institutions. Furthermore, external knowledge and external technologies are available either in a codified or personal and published or undisclosed form.

Business environment institutions, especially research and development service providers together with public and private research institutions and, increasingly, training institutions contribute much to build, develop and diffuse existing, publicly available "knowledge and technology pools". Moreover, the role of universities as employer and educator of highly skilled workers and researchers especially for R&D needs further consideration. These institutions also provide services for external innovation-related activities, especially

technology transfer, R&D activities and its evaluation. The small and medium enterprises, to implement successful innovation, should use both company's internal R&D activities in innovation process, including the company knowledge and existing technologies prerequisite for the implementation of in-house innovation activities, and external sources for innovation. This attitude is described in literature within Triple Helix Model (Etzkowitz and Leydesdorff, 1995, p. 14–19) and all the derivate ones[8].

New paradigm of innovation process, based on networking and openness, helps to define new set of innovations, treated as a result of a process (Table 2).

Ten types of innovation is directly related to Schumpeter's and the Oslo Manual classification. A new set of innovations emphasise the economic side of innovation process. The technical novelties are to support new configurations, offerings or customers' experience. This new approach is based on presumptions coming from design thinking, leading to user – driven innovation and cooperation with institutions and entities supporting innovation process.

The multidimensionality of innovation processes can be described by means of nine characteristics (Guinet, 1995, as cited in Nowakowska, 2009):

- innovation is interactive in nature, because it is created based on relationships arising in a company as well as contacts in its environment;
- innovation is located, because most often it comes up in a particular area with specific resources that play a key and unique role in the process of its creation, meaning "transfer" of the innovation process is difficult, even if possible;
- innovation is a process of integration, because it is based on an integrated structure and a specific organizational form which promotes the processes of creating, absorbing and diffusing knowledge as well as new solutions;
- innovation is a learning and interactive process, resulting from an organizational and institutional context;
- innovation is largely non-technical, only in exceptional cases does it depend entirely on technical knowledge;
- innovation has a social dimension, it is the result of various interactions and relations between individual entities, and thus is rooted in systems and social institutions;
- innovation is based on creative destruction, since its introduction often changes the existing structure of the market, economy, and organizational systems; it entails changes of management, individual and group behaviour, etc.;
- innovation is a source of culture, it stems from accepted community norms, value systems and patterns of behaviour, and is often created taking into account the historical context;

[8] The idea of Quintaple Helix model, a derivate of Triple Helix model, is described in chapter *Green Entrepreneurship in Quintaple Helix Model*.

Table 2. Ten types of innovations

Profit model	Network	Structure	Process	Product performance	Product system	Service	Channel	Brand	Customer Engagement	10 types
Configuration These types of innovations are focused on innermost workings of an enterprise and its business system				Offering These types of innovations are focused on an enterprises' core product (good or service), or a collection of its products		Experience These types of innovation are focused on more customers-facing elements of an enterprise and its business system				(Keeley)
The company make money in the ways that are different form competitors or industry norms	The company work with other firms or surprising collaborators to develop new offerings that drive a shift from business as usual	The company have a unique or unusual organizational structure and approach to attracting the best assets	The company are uniquely skilled at doing or delivering across goods, services and platforms	The company produce a notably superior offering that dominates market share or earn a substantial premium	The company make multiply products that connect with one another in unique ways	The customers rave about their interactions with the company, particularly those instances where things went wrong and the company somehow made everything right	The company deliver its offerings to customers and users in ways that challenge or cofound what is usual within the industry	The company have an unusually distinct or vivid identity, particularly compared to the rivals	The offerings confer a unique identity, status, or sense of recognition to users and they become a part of their lives	Definition
Ad-supported Bundled Pricing Flexible Pricing Freemium Membership Premium	Alliances Collaboration Franchising Open Innovations Secondary Markets Merger/Aquisitions	Competency Center Corporate University Decentralized Management Incentive systems Knowlegde Management Organizational Design	User Generated Process Flexible Manufacturing Intellectual Property Lean Production On-Demand Production Process Automation	Customization Ease of Use Engaging Functionality Environmental Sensitivity Safety Styling	Extensions Plug-ins Integrated Offerings Modular Systems Product Bundling Goods/Service Platforms	Guarantee Loyalty Programs Personalized Service Self-Service Supplementary Service "Try Before You Buy"	Cross-Selling Experience Center Flagship Store Go Direct On-Demand Pop-up Presence	Brand Extension Certification Co-Branding Component Branding Private Label Transparency	Community and Belonging Curation Experience Simplification Mastery Personalization Status and Recognition	Tactics/instruments

Source: Reprinted from Ten Types of Innovation: The Discipline of Building Breakthroughs. by Keeley L., Walters H., Pikkel R., Quinn B. (2013). Hoboken N.J.: John Wiley, Sons.

- innovation is risky and costly, especially for small and medium-sized enterprises, which is of great importance in the process of its development and commercialization.

Conclusion

Innovation almost never fails due to lack of creativity but almost always due to a lack of discipline. The most certain way to fail is to focus only on products. Successful innovators analyse the patterns of innovation in their industry and make conscious, considered choices to innovate in different ways. Innovations can be broken down and analysed, to define the reason of failure. Innovation is the creation of a viable new offering (Keeley, Walters, Pikkel, Quinn, 2013, p. 8) and can be built up systematically to increase the odds of success exponentially.

The idea of innovation management is based on two general presumptions: shortening the process of invention with cost reductions and making the outcome of innovation successful by market acceptation. When searching for assumptions concerning the introduction of a new product on the market one should be guided by market logic to a much greater extent than by technical one[9]. The innovative processes taking place in a knowledge based economy are complex and largely dependent on both technical and economic conditions.

It is worth remembering that innovations by their nature are variable and, together with changes in customers' needs and developments in science and technology, as well as the tendency to share knowledge, will move in the direction of an open innovation model.

In the new paradigm of innovation, the risk of a result (type of innovation) is reduced by the way it was achieved (the process of innovation). Reduction of innovation risk is possible when an innovator uses both his own and other entities' resources in the process. It is the premise of modern innovation management.

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[9] As was the case of Apple in the mobile market, where changes made to iPhone functionality (the phone stopped being just a communication device and became a personal mobile entertainment center), brought about in a couple of years the collapse of the then market leader – Nokia.

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Chapter 2

Intellectual Property Management – An American Start-up Case Study

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Abstract: This chapter explores the impact which intellectual capital has on innovation management and illustrates this impact using the example of PuppTech Inc., a technology start-up working on environment-monitoring technology to protect the wellbeing of pets in vehicles. The goal of the authors is to use PuppTech as a tool in the exploration of the impact intellectual capital and its protection has on innovation management within start-ups. First, the concepts of intellectual capital and innovation management are introduced through the example of PuppTech. Next, different types and methodologies of intellectual property protection are defined and discussed, using PuppTech as the main illustrative tool. Lastly, the benefits of protecting intellectual property in regard to innovation management are given, along with a list of common mistakes and their consequences.

Keywords: Start-ups, Information technology, Intellectual property, Intellectual capital protection, Management, Patent law

Introduction

This chapter discusses the issues involved in protecting intellectual property ("IP") in start-up companies. Typically, start-up companies generate considerable valuable IP

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– but protection of that IP represents a considerable problem with non-obvious solutions. Clearly IP is important in start-ups, although just how critical depends on the nature of the company and the sector in which it finds itself. But IP protection is only one of many challenges confronting a start-up, between developing the product/service, understanding the environment in which the company will be evolving, validating that a market exists and that customers are willing to pay for it, creating a strategy to reach that market, putting together the management team and raising money to fund the costs of these operations. IP protection must compete with these other priorities for the never-sufficient early-stage funds and management time (an even scarcer resource). Understanding these trade-offs is best accomplished by analyzing how "real-life" companies deal with these issues.

To study this problem in a real-world setting, we have examined a case study to determine what steps the start-up did – and did not – take to protect its IP. PuppTech, Inc. is a Denver (CO, USA)-based start-up that provides an example of how IP protection has competed with these other priorities in more than four years since the PuppTech project began. The authors are intimately familiar with this project as one is a co-founder (with his son) and Chairman of the Board of Directors, and thus involved at all stages of the deliberations and decisions concerning PuppTech's IP. The second has been an intern and is now employee with the company for three years and is currently Director of Communication.

PuppTech background

PuppTech is an "Internet-of-Things" company in its early stages. It has three initial products: (1) the PuppComm, a monitoring device that captures temperature, humidity, and ambient noise and transmits this data to a cloud-based system, including a smartphone application so that traveling dog owners who must leave their dogs alone (e.g., in a parked car) can know the conditions of the dog's environment; (2) BSCUIT (Breed Specific Climate Understanding Information Technology), an algorithm that calculates environmental risk for individual dogs; and (3) the K9 Weather Vane, a web app that provides current and future local weather information and recommendations as to when it is safe to be outside with the dog.

PuppTech saves dogs' lives and lowers handler/owner stress. Its integrated hardware/software system helps dog owners understand how environment risks affect dog health and provides information to keep them safe when handlers/owners are absent, reducing stress. BSCUIT is the first tool providing individualized environmental information allowing handlers/owners and businesses serving them to protect the health of dogs. Through this, the handlers/owners can leave dogs in vehicles and know the conditions through a smartphone app, thus lowering anxiety. Businesses serving dogs can establish an optimal temperature range for each dog and receive alerts when temperatures diverge from that range.

The PuppComm also lowers owners' anxiety by providing passersby with a way to check on the conditions inside the car, thus removing the temptation to call the

police or break the car's window. Owners spend more time with their best friend (often dubbed their "fur baby") by being able to bring the dog for shopping, errands or excursions without endangering them and thus include dogs in many more daily activities.

PuppTech's initial market is consumers, although before targeting the general public, it will go after the "low-hanging fruit" – working dog owners in their individual dog-owning capacity, hunters and dog show owners, as these groups spend much time with and money on their dogs and understand the PuppTech value proposition more readily than the general public. In addition to the consumer market, PuppTech will target working dog owners (e.g., the military, police, border patrol) that have to travel with their dogs and leave them in vehicles in the course of their work.

PuppTech intends to develop the PuppComm into an ecosystem platform to which other pet-related devices (e.g., video cameras, health monitors, treat dispensers) may be connected so that traveling dog owners can use these devices to the same extent as when they are home with their dogs. The PuppComm will also gather data about how dogs experience temperature changes in cars and other environments, for use in the research and the development of additional products and services (data may become valuable assets in themselves).

The development of the PuppComm has not been a linear process and provides a good example of how early-stage businesses must adapt to market conditions. PuppTech's founders initially intended to solve the "dogs-in-hot-cars" problem by developing a portable, ice-cooled air-conditioning unit that could be left in a car while the owner was absent to provide cooling in warm weather. They developed (at a cost of approximately $50,000) a working prototype, the PuppWaggin', that was effective in keeping a car with a dog inside at a non-dangerous temperature for 90–120 minutes (namely, enough time to do an errand or stop for a meal). PuppTech's management, however, realized that they were not going to be able to attract investment capital to build PuppWaggin as potential investors balked at the cost and complexity of manufacturing portable air conditioners. Although effective, the proposed cooling solution had no competitive advantage over other portable coolers as dog owners did not want to purchase a large and expensive (some $500 retail) cooling unit. Moreover, high-end cars such as the Tesla Model S and Model 3 have already "solved" the problem the PuppWaggin' was addressing, and management came to believe that portable air-conditioners could, as car technology advances and becomes less expensive, rapidly become obsolete.

For this reason, the PuppTech team decided to abandon the cooling unit with embedded electronics and "pivot" towards the sensing device (i.e., the electronics alone) and app. PuppTech's current system offers a cloud-based "passerby interface", with a unique identification number sticker allowing those passing by to text and know the conditions inside the car, thereby eliminating the need to break the windows or call the police to save the dog. PuppTech after launching the PuppComm is also offering third-party cooling units to those owners who wanted to keep the car cool. The pivot was successful, as PuppTech was able to raise an initial round of angel funding, and as of this writing (March 2019), has completed a product crowdfunding campaign to launch the PuppComm commercially and raised additional equity investment from a strategic

partner. PuppTech is, as of the time of this chapter, seeking to raise additional equity capital for further development.

PuppTech's intellectual property

PuppTech finds itself in a situation common to many start-ups – it has a clever idea which solves a problem in the market place (dog owners who want to know the condition of their pet when they are not with them, particularly those left in cars that can heat up quickly in warm weather), combining hardware and software in an innovative way, but one that is unlikely to result in a patent. The real protection for PuppTech's IP comes from being first to market and developing faster than potential competitors (as well as building up a community of loyal dog-owners that would be difficult for knock-off firms to replicate).

Threshold questions

In evaluating any business opportunity and the IP required to support it, the authors propose three threshold questions. While the questions are easy to state, the answers require an in-depth understanding of the market and the environment in which the company will be operating.

To what problem currently perceived by our proposed clients do we offer a solution?

While inventors often fall in love with their technology, if the customers do not have a problem or feel a need, the proposed invention, no matter how brilliant, will not gain "traction" (a magic word in start-up circles). A medical analogy illustrates this point. If a person doesn't feel sickness or pain, they would not see a doctor. If they do seek medical advice, they do not care why the proposed treatment is technically better than other medications or devices as they only want the pain to go away. Products that eliminate customers' pain will find resonance; identifying that pain is the critical first step.

This question also emphasizes another key point – customer perception is more important than any objective or underlying "reality". Until a start-up understands how its customers perceive their situation, it will not be able to present its solution in a way that responds to customer needs.

How can we offer our customers the "quiet life"?

The 21st century marketplace grows "noisier" by the day. Potential customers in every domain complain of the complexity of their lives and that they don't have enough time. Products that can simplify customers' lives and lower the levels of stress and complexity

have the greatest chance of breaking through the ever-mounting noise in an increasingly crowded market.

If this idea is so great, why hasn't some organization with more human and financial resources already produce a solution to the problem we propose to solve?

This question forces inventors (at least temporarily) to take on a certain level of modesty. The chances of being able to answer the above two questions with an idea that no one has previously considered are small. If a company thinks an idea can make it the next Facebook (or Amazon, Google, etc.), why hasn't Facebook, with its thousands of bright, ambitious employees and vast financial resources, not already done what the company is proposing to do?

PuppTech has spent years trying to respond to these questions. The answer to the first of the three questions came from the founders' personal experience, hiking in the mountains with their dog and wanting to stop for lunch afterward – and experiencing the stress of worrying about the dog in a rapidly heating car on a warm day. For the second question, while the first instinct in positioning the product was "spend more time with your dog", conversations with hundreds of dog owners (at trade shows and other dog-oriented events), convinced management that the negatives of worrying about the dog and wanting to know the real time conditions of the dog's environment when the owner is absent were more important than the positives of more companionship. The last question has been the hardest to answer (and management is still not certain why). It appears, however, that the technical challenges of controlling a parked car's environment and the legal implications of leaving a dog in conditions which threaten its safety have kept others out of this space. But the search continues . . .

Types of IP protection for start-ups

For most start-ups, IP protection involves confidentiality agreements, patents and trademarks. While copyright may be important for software companies, this chapter will not consider copyright further.

Confidentiality (non-disclosure agreements)

For all start-ups, IP protection begins with the creation of a non-disclosure agreement ("NDA" – also called a "confidentiality agreement"). An NDA is generally a brief legal document in the form of a contract between the company and the potential recipient of information from the company (the "Promisor") whereby the Promisor acknowledges that the company regards the information it wants to furnish to the Promisor as potentially trade secrets, and that the Promisor will treat such information as it would its own confidential information and thus use the information being disclosed only for the purposes of the potential business relationship between the company and the

Promisor. Such agreements also often (and should) contain non-circumvention and invention assignment language. Prudent companies will only disclose the most general information without a signed NDA.

In the context of start-up companies, the legal value of such agreements is limited. They are difficult to enforce (McCarthy, n.d.) and rarely result in lawsuits, at least in the authors' experience. They are appropriately used among co-founders, start-up employees, independent contractors, strategic partners and should not be used with potential investors (who see many opportunities and will not want to limit their ability to examine others), lawyers or accountants (both of whom already have non-disclosure requirements through their professional codes). The primary utility is to show that the company takes IP protection seriously and to act as a "shot across the bow" that will discourage promisors from potential competitive use of the information.

Signing such an agreement is commonplace in the US and failure to sign such an agreement is considered a "red flag". For foreigners entering into contact with an American start-up, such an agreement may be their first (and not entirely welcome) contact with the American legal system.

As mentioned above, start-up companies should not seek to obtain an NDA from potential investors. Investors see hundreds if not thousands of deals every year, and a company asking a potential investor to sign a confidentiality agreement will simply result in the investor not considering the deal any further (and the company's organizers being considered hopelessly naïve). Investors live by the "Financial Golden Rule" – that is, "He who has the gold makes the rules"). Showing the deal to a potential investor may involve a risk, but it is a risk that the company must accept if it wants funding.

Patents

A patent is a government-granted monopoly (in the United States, from the United States Patent and Trademark Office ["USPTO"]) to use the information or technology covered by the patent during a limited period of time (in the US, 20 years from the date of the full patent application). In the US (and the law is similar – but not identical – in European and other jurisdictions), to receive a patent the information/technology must meet each of the following four criteria, as shown in Table 1 (Tysver, 2018).

While the US definition of patentable subject matter is among the broadest, it is still controversial as patents for software, medical tests and diagnostics are currently open questions. The subject matter also must not come within one of the exceptions to patentability – abstract ideas, laws of nature, and natural phenomena. What qualifies as patentable subject matter may change from time to time, as new statutes are enacted and new cases decided.

Should inventors get a patent for their new product or idea? The answer is not obvious. According to Richard Harroch in the American business magazine Forbes, "Patents are the best protection you can get for a new product" (Harroch, 2017). Others disagree as "Early stage startups tend to worry about patents. Usually they shouldn't" (Crompton, 2017) says Singapore entrepreneur Alex Crompton, while Appster argues " ...in the

vast majority of cases we at Appster recommend that entrepreneurs skip the entire patent seeking process whilst their start-ups are still in their beginning stage" (Appster, 2017). What's am entrepreneur to do?

Table 1. Definition of different patent types and their utility

Type of Patent	Definition	Utility or Lack Thereof
Statutory	For the USPTO to issue a patent, the subject matter must come within the definition of the US Patent Act Section 101 as to whether the subject matter is patentable.	Patents may be issued for processes, machines, articles of manufacture, and compositions of matter.
New	The invention must be considered "new" or "novel". An exception in the US exists for disclosures by the inventor within 12 months of filing the application, but "the clock may start ticking" from, e.g., a casual disclosure to a friend who is not under an NDA. This exception is not, however, available in many other countries and is not as robust as it was prior to the effective date of the America Invents Act in 2013, so that prudent inventors file an application prior to any public disclosure. If the invention is deemed disclosed, it permanently loses any possibility of patentability.	The invention cannot be known to the public, described in a printed publication, or described in a published patent application or issued patent.
Useful	The invention must be used in products or services which have a useful purpose.	Invention must work and have some practical utility or application.
Non-obvious	The invention must be a non-obvious improvement over "prior art", defined as whether it would have been obvious "to a person having ordinary skill in the art to which the claimed invention pertains".	This criteria is one of the most difficult areas to determine in patent law.

Below is a discussion of the advantages and disadvantages of getting a patent:

Advantages

Among the benefits of having a patent are:

- Patents encourage organic growth. Having a patent increases:
  - Start-up sales growth (51%);
  - Employment growth (36%);
  - The probability of an initial public offering (IPO) (136%); and
  - The probability of being acquired (86%).
- Patents increase the multiple when the company is sold. Companies with good to great patent coverage generate sales of 5–21 times earnings. A 24% premium in market valuation has been attributed to a doubling of a company's patent inventory.

- Patents attract investor attention. Receiving a patent grant increases the likelihood of venture capital funding by 53% over the unconditional probability. The effect is greatest for companies that had little or no venture capital funding before the patent grant, were founded by inexperienced entrepreneurs, and are in the information technology sector.
- A patent is a monetizable asset. Patents are intangible assets that can be used as collateral, may be depreciated and qualify for research and development tax credits. The mean value of a patent in 3Q2015 was $288,000; the median value was $233,000.
- Patents offer first-mover advantages. Patents show innovation and establish credibility with investors and customers.
- Patents are used as stock performance predictors. A number of stock-predictor algorithms include patents as predictors of innovations that can be converted into new products.

Disadvantages

Patent skeptics offer the following arguments (Appster, 2017):

- Start-up patents are too costly, too time-consuming and too restrictive
  - An "extremely simple" patent tends to cost a minimum of $6000; the total cost of preparation and prosecution is in practice closer to $60,000.
  - Some 97% of patents generate less revenue than the cost of obtaining them.
  - A basic patent filing can take from 2–5 years to complete; the USPTO reports that the average wait time for the first office action in 2016 was 16 months, and total patent pendency averages 25 months.
  - Patent applications have only a 56% chance of being approved.
- Fast execution is better than a patent. Companies like Google, Facebook, Apple and Airbnb began operations without patent protection (and sought patents only after they were generating revenues). Groupon has been cloned by thousands of other companies but still had its IPO in 2011 and remains in operation. In addition to industry evidence, there has been extensive academic evidence suggesting the speeds at which innovations are publicly disclosed "are related to the pecuniary reward from licensing" those innovations (Link, 2003).
- Businesses change. The head of one of the top US accelerators estimates that 70–100% of new start-ups have a different core idea at the center of their business after the first three months of operations (as PuppTech discovered).
- Other more cost-effective IP protection strategies exist. Some of the more important IP assets that are much easier and cheaper to obtain than patents include:
  - Domain names;
  - User names on social media sites; and
  - Trademarks.

Provisional patents

If a company decides to follow the patent route, in the US most start-ups with potentially patentable IP file a provisional patent application with the USPTO. A provisional patent gives the IP owner a filing date, but it does not require the detailed information that a non-provisional patent application requires and involves a significantly lower fee. A provisional patent application is valid for 12 months; after that time, the IP owner must file a non-provisional application to preserve its rights.

The primary purpose of a provisional patent application is to establish priority for the subject of the application. While the application is not reviewed by a patent examiner, inventors should disclose as much as possible in the provisional application, including drawings, specifications and photographs. Anything not included in the provisional patent application is not considered part of the invention (Quinn, 2017).

The United Kingdom (Go, n.d.) and Australia offer similar possibilities. On the continent, provisional patents as such are unknown, but, as IP owners have the right to make a filing and get a priority date without paying a fee for up to 12 months, the effect is more or less the same.

It is worth noting that in the early stages of developing the PuppWaggin', PuppTech's founders filed a preliminary patent application on February 9, 2016, followed by a full application on February 9, 2017. PuppTech's attorney received initial comments from the USPTO reviewer in May 2018. PuppTech's costs to date for its patent-related activities have been some $5300. Although PuppTech does not intend to pursue commercialization of the PuppWaggin', its patent attorney indicates that a patent for the PuppWaggin' is likely available, and PuppTech is currently considering whether to pursue the patent application for defensive purposes (i.e., to make it more difficult for potential competitors to offer a cooling solution).

Developing a patent strategy

Every start-up needs a patent strategy (which should be part of a broader IP strategy). The strategy should be written as it forces management to think through the hard questions in developing a strategy. As Dwight Eisenhower said, "Plans are worthless; planning is everything." The strategy should cover both patentable and non-patentable IP (the value of which companies often underestimate at their peril). Even if an idea is patentable, a patent does not guarantee that the underlying idea is commercially valuable.

Some suggestions for inclusion in the patent strategy are (Harrock, 2017):

- Seek patents directed to the core value of the company's innovation. Filing a large number of patents (which inevitably leads to cutting corners) is rarely good value for money.
- Look for patent claims that can be monitored. A company should be able to learn enough about competing products/technologies to determine whether infringement is occurring.

- Consider a global patent strategy early on. Particularly if the company is producing hardware, obtaining patent protection in international markets (even China) may be cost-effective.
- Avoid patent litigation whenever possible. Litigation is slow, costly, a drain on management time and uncontrollable. As appealing as the idea of suing on principle may appear, it is rarely cost-effective.

Trademarks

As noted above, trademarks present fewer technical and drafting difficulties than patents, but the rights can be just as significant – and mistakes just as costly. Choosing company and product names carefully and doing some initial research on domain names, the Internet and with the appropriate trademark registration authorities are an essential minimum.

Definition and key issues

The Business Dictionary defines a trademark as a:

"Definitive design, graphics, logo, symbols, words or any combination thereof that uniquely identifies a firm and/or its goods or services, guarantees the item's genuineness, and gives [its] owner the legal rights to prevent the trademark's unauthorized use" (Business Dictionary, n.d.)

A trademark must be:

- Distinctive or arbitrary instead of descriptive or generic (although, if a mark is descriptive or generic, it can still be used as a trademark, but without registration and the same levels of protection by a court as distinctive or fanciful ["arbitrary"] marks);
- Affixed to the item sold;
- Registered with the appropriate authority (in the US, the USPTO) to obtain legal ownership and protection rights.

The key test applied in most jurisdictions is whether the new mark is likely to cause consumer confusion in the marketplace. The "consumer confusion" test is based upon a number of factors, including:

- The degree of similarity between
  - The marks;
  - The underlying goods or services;
- The parties' channels of distribution and advertising;
- Whether consumers for the two marks are sophisticated; and
- The presence or absence of actual confusion (Huston, 2015).

Obtaining a trademark

In the US, the USPTO handles both patents and trademarks. The owner files an application (usually after doing a search for competing marks) and pays the application fee (a minimum $225 as of August 2018 (T, n.d.). Usually about three months later, an examiner will review the filing. If the examiner finds that the application properly describes the product or service, that the mark is not merely descriptive and that the proposed mark is not confusingly similar to existing marks, it will be "published for opposition". If no opposition occurs within 30 days, the mark will be registered, subject to the mark actually being used in commerce. The USPTO will, however, grant a conditional approval for a trademark based upon an "intent to use". This "intent to use" declaration may be renewed every six months (with up to five extensions). Once the trademark has been used, the owner files a Declaration of Use, at which time it can continue using the trademark indefinitely (unlike a patent, which has a specific expiration date). In Europe, the procedure is similar, although in many countries the mark will be registered prior to opposition.

PuppTech spent $675 in its unsuccessful attempt (without hiring a trademark lawyer) to register the "Go Pawsible" trademark; the USPTO refused to take a position until it reached a decision concerning the trademark of "Healthy Pawsibilities" and could provide no timetable as to when a decision might issue. These amounts do not include any of the costs associated with the name change. While the owners did receive preliminary approval for the "PuppWaggin'" trademark, soon after such notification, the company decided to abandon commercialization of the cooling product and thus abandoned the trademark application for "PuppWaggin'".

The company name

Choosing an appropriate name is an often under-appreciated and extremely important task. The name should not only be descriptive or at least suggestive of what the company does, but it should be distinctive and memorable. It should also provide the opportunity for growth and expansion into other products and services. Some of the considerations in choosing a name are:

- Search the name carefully at the following sources to make sure the name you are seeking (or a similar name) is not already in use
  - The Internet;
  - The USPTO (or similar organizations in other countries);
  - The Secretary of State or other official registrar in which the founders propose to create the company as a legal entity.

We strongly recommend having a trademark lawyer conduct a search after a company has made a preliminary decision on a name. Trademark lawyers can evaluate far better than any layman whether the company is likely to be able to obtain a trademark and whether use of the name risks infringement on existing trademarks.

- Make sure the domain name is available for the company's proposed web address.
- Verify (and, for companies considering going international, appropriate and easy to pronounce and spell) in other languages; the Chevy Nova ("Chevy doesn't go" in Spanish) is a cautionary tale.

Once the company has completed the above "due diligence" and is convinced that the name is available, it should file a trademark application as soon as possible. Changing a name (as PuppTech learned, much to its sorrow) is a painstaking and difficult process as the further along a company is in its development, the more difficult, painful and costly a name change becomes.

Because of the uncertainty surrounding the name "Go Pawsible", the company decided to change the name of the company to "PuppTech" (and the name of its product to the "PuppComm" when it made the "pivot" from a cooling device with embedded sensors to a sensing device only). The owners subsequently hired a trademark attorney to file new applications for "PuppTech", "PuppComm" and a paw in a blue circle as a logo. These applications have been approved on an "Intent to Use" basis (and PuppTech management suspects that the fact of having an attorney doing the filing, rather than a lay person, was a significant factor in its successful applications). The cost of the PuppTech-related trademark applications to date has been some $5000.

Trade secrets

The US Uniform Trade Secrets Act (adopted by 47 states and the District of Columbia) defines a "trade secret" as:

- "information, including a formula, pattern, compilation, program, device, method, technique, or process that:
  - Derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain economic value from its disclosure or use;
  - Is the subject of efforts that are reasonable under the circumstances to maintain its secrecy" (Staff, 2017).

Some of the steps to protect trade secrets include (Aeton, 2018).

- Identifying what trade secrets the company has. The first step in protecting valuable company information is identifying which information is valuable (and, to the extent possible, establishing a valuation).
- Keeping the information confidential. Trade secrets are by their nature intangible and ethereal. Some steps to prevent them from "walking out the door" are:
  - Making sure collaborative efforts with third parties are done under the protection of an NDA;

- Having employees, independent contractors and third-party vendors sign non-disclosure/invention assignment agreements;
- Protecting trade secrets stored electronically with passwords with administrative privileges (and tracking who has such privileges);
- Marking documents leaving the company with a notice that the information contained is confidential;
- Restricting access to documents containing trade secrets;
- Checking and reporting periodically on the status of trade secrets (as some information may inadvertently become public through marketing or testing efforts).

One method for gathering and protecting a company's IP is to establish an online "data room" (Harroch, 2017). This data room should contain:

- Patents and patent applications;
- Confidentiality, non-competition and invention assignment agreements;
- Trademarks and service marks;
- Trade secrets and proprietary know-how;
- Technology licenses from third parties;
- Technology licenses given to third parties;
- Software and databases;
- Contracts providing indemnification to third parties for IP matters;
- Open-source software used to create company products/services;
- Claims for IP infringement, including IP litigation or arbitrations;
- A list of domain names;
- Liens or encumbrances on the company's IP;
- Source code or object code escrows;
- Social media accounts.

- Excluding trade secret information from public filings. Companies should make sure that they exclude confidential information from public filings (e.g., patents, as these filings, by their nature, make such information publicly available).
- Creating employee awareness of trade secrets. Companies need to make sure employees are aware of the information that management considers to be trade secrets by talking openly with employees and establishing safeguards to prevent inadvertent disclosure.

Unlike with patents and trademarks, no government entity exists to protect trade secrets. While start-ups can (and should) use caution in deciding to whom and how much to disclose and avail themselves of confidentiality agreements to the greatest extent possible, any protection that such agreements provide is limited at best. The value of such agreements depends (beyond the "in terrorem" effect) largely on the good faith

of the "disclosee" and the ability and willingness of the company to defend its trade secrets legally (which, at least in the US, can be prohibitively expensive).

PuppTech has not yet made an inventory of trade secrets beyond its patent and trademark applications (although it intends to do so post-crowdfunding). It has signed NDAs with all team members (and invention assignment agreements with its employees) and its third-party suppliers.

Protecting IP in developing a start-up

While the value of IP may vary depending on the nature of the start-up, at least for some it may be the most valuable asset the company has (Harroch, 2017). Founders need to address IP protection issues at the very earliest stages – even when the concept is only a vague idea (as the steps below suggest). The steps to protect start-up IP include:

- Keeping the idea separate from employment work. If the potential founder is working in a technological environment, it is likely that their employer may have had them sign an agreement covering non-competition and invention assignment providing that any new ideas and inventions belong to the employer. Founders need to be aware of the agreements signed and the scope of their coverage and to make sure that they do not give any tangible form to an idea that might trigger such agreement.
- Avoiding giving ownership of the idea to others. Some of the best new ideas arise from informal discussions with friends, entrepreneurs or advisers. Offering co-founder status or submitting applications together without a clear understanding of the roles and ownership shares in the idea can cause considerable problems in a later stage. Creating a "pre-nuptial" agreement with such understandings is prudent (if hardly ever done). The terms such an agreement should provide include:
  - Who gets what ownership interest?
  - If one co-founder leaves, can the other(s) buy them out, and on what terms?
  - What are the different roles and responsibilities of each co-founder?
  - How much time commitment is expected from each co-founder?
  - To what compensation (if any) is each co-founder entitled?
  - How are key decisions to be made? (Majority vote? Unanimous vote? Sole discretion of the CEO?)
  - Under what conditions and with what procedures can a co-founder be removed?
  - What assets does each co-founder bring or invest?
  - What happens if one co-founder isn't meeting expectations? (A common solution is confidential binding arbitration);
  - What is the overall goal or vision of the business?

- Having IP contributors assign their IP to the company. Without an explicit assignment agreement, IP in most cases belongs to the creator, and certain types of IP may require an assignment for the transfer to be effective.
- Hiring employees carefully. New employees represent a risk, particularly if they previously worked for a competitor. Hiring an employee from a competitor may expose the company to the risk of IP infringement litigation. Among the due diligence steps a company should take in hiring are:
  - Make sure that the proposed employee is not covered by a non-compete or invention assignment agreement with an existing or previous employer;
  - Require a written representation that they are not bringing any confidential or proprietary information from:
    - Their prior employer;
    - A third party;
    - Perform detailed, complete reference checks on the proposed employee.

Being careful in using open-source software. While open-source software is in most cases free and may expedite development, its use is often subject to restrictions. Start-up management should read open source licenses carefully to avoid breach of contract or copyright infringement litigation. Not all open-source software licenses are the same; some are more restrictive than others. Also, incorporation of open-source software in a customized start-up product may inadvertently turn the company's proprietary software into open-source software, destroying any IP protection and subjecting the company's proprietary code to public disclosure.

Common start-up mistakes in IP protection

"You should never make the same mistake twice. There are so many new ones to make," (Bertrand Russell) or, as first attributed to American politician Sam Rayburn, "There's no education in the second kick of a mule." Many start-ups have made the mistakes below; new entrepreneurs add nothing to the world's store of knowledge by making them again.

Underestimating the importance of IP

This common mistake is unlikely to survive the first round of contacts with serious potential third-party investors – although by then it may be too late. A few statistics should disabuse even the earliest stage entrepreneurs of this idea:

- IP represents the largest asset class held by American companies – worth some 40% of the value of all assets.

- Among the Fortune 500 companies, IP assets represent a significantly larger portion of value than among other companies – by some estimates, up to 90% (Klinck, 2017).
- Some have argued there are no direct impacts of intellectual capital on innovation, though many who take this view have later clarified that "intellectual capital did have a significant impact on knowledge management and . . . on innovation" (Obeidat 2017).
- Most IP experts, professionals, and academics agree, "superior innovative performance is dependent on a firm's intellectual capital and its ability to sense opportunities and threats" (Han, 2015).

IP should not be viewed solely defensively as something to protect; entrepreneurs need to see it as a source of value that is part of the company's competitive advantage.

Misunderstanding the role of lawyers

Many entrepreneurs fear lawyers, focusing primarily on the high bills they receive from them. A lawyer experienced in working with start-up businesses should be one of the first member of any entrepreneur's core group; not having one is as crucial a hole in the management team as not having a marketing or finance expert.

In the authors' experience, Americans tend to understand this idea better than Europeans. It is noteworthy that, in the US, if a potential business partner arrives with his lawyer, most businessmen see the lawyer's presence as an extremely positive sign, as it means that the potential partner is "sold" (i.e., prepared to negotiate a transaction without the need for further convincing) and ready to discuss the terms of the deal. Most Europeans the authors have asked see the presence of a lawyer as indicating a lack of trust. It's important to remember that an experienced start-up lawyer can help entrepreneurs avoid many pitfalls and structure the business (and the entrepreneur's thinking) in ways that will make the business more likely to succeed – and to attract investment. Many lawyers (as in PuppTech's case) will work on an advisory basis at early stage on the expectation that as the company develops, substantial billable legal work will be inevitable, and when those opportunities arise, the marketing that such advisory work represents will turn out to be a good investment.

Using trade secrets or other materials from a previous employer

Many entrepreneurs start their business using trade secrets, customer lists, management strategies, computer software or other information gained from their previous employment. Entrepreneurs must examine carefully any documents they have signed (particularly if these employers have been following the recommendations in this chapter). If a potential entrepreneur has any doubts, consultation with a lawyer, while expensive, may prove to be an extremely cost-effective investment (Guest, 2015).

Failing to create an IP plan

Most business will create a business plan, a marketing plan, a product development plan – but not a IP plan. A good IP plan has two aspects – defensive (making sure that the company does not infringe on existing trade secrets [by, for example, using the ideas of someone who is under an NDA with another organization], patents or trademarks), and offensive- looking at future product development and expansion opportunities and determining the role that IP can play in creating those opportunities (Klinck, 2017). A successful IP plan – that is, one which supports value creation – includes both a plan to manage static (IP) assets and the management of such assets in a way which protects IP without stifling its use within the company (Kianto, 2014).

Not setting up communications procedures among team members

Once the team grows beyond a handful of members, there will inevitably a separation between those creating IP and those making decisions about its protection. Good regular communications with standardized procedures between IP creators and deciders are essential as decision makers can't protect assets they don't know or take steps to minimize the risks.

Failing to hire a lawyer to register a trademark

"An ounce of prevention is worth a pound of cure". Start-ups spend considerable time agonizing over product names and branding strategies without taking the steps to secure the name. PuppTech's example is telling; it tried to save money by doing trademark applications itself and had to undergo a painful name change a year after the initial filing. When it used a lawyer the second time, it got the marks it sought without a problem (despite potential confusing names that appeared to the owners more serious threats than when it did the applications internally).

Not setting up appropriate confidentiality procedures for trade secrets

While companies do not need to go to the lengths that companies such as Coca-Cola and KFC have gone to protect trade secrets, failure to institute proper procedures can result in the loss of control of the company's IP. Once a trade secret is disclosed without protection to any third party, it is gone forever.

Disclosing patentable information prematurely

Inventors may be prevented from getting a patent if the information has previously been disclosed publicly. Such disclosures may occur through written publications, oral presentations, or electronic disclosure on websites or in social media. Premature disclosures may include offers for sale, beta testing, disclosing plans or showing prototypes at a scientific or business meeting, dissertations or other academic articles, grant proposals or filings with the US Securities and Exchange Commission (Evans, 2006). It has

also been established that disclosing – and protecting – IP preemptively can avoid unnecessary legal interactions, which usually take the form of mediations (Inkinen, 2015).

Seeking large-company partnerships too early

It is easy for start-up company management to be dazzled by the possibility of a partnership with an established company in the technology or manufacturing sector. But marriages between mice and elephants rarely work to the mouse's advantage. The problem is particularly true in distribution agreements. It may be very prestigious for a start-up to sign an agreement with an HP or an IBM. However, the agreement, while extremely important to the start-up, will never be a priority for the larger company and risks being ignored. And should the distribution agreement be successful for the parties, at some point the larger company will face the "make or buy" decision – namely, if the large company sees that the start-up's offering is truly successful, it can easily decide to end the agreement (or let it lapse with a slow death) and make the product, with a few modifications, itself. And what small company wants to sue IBM or Microsoft for IP theft?

Conclusion

This chapter has examined how a specific start-up has addressed its IP protection issues, as IP protection must be a significant part of any start-up's development strategy. It is widely recognized that start-ups, being new entrants to their respective markets, produce much of the innovation which occurs in the marketplace. Established companies' tendency toward aggressive self-preservation put start-ups in a more vulnerable position for IP theft or mismanagement. Having an IP strategy doesn't necessarily require spending considerable amounts of early-stage cash, but it does require the company to think through the value of the IP assets it possesses to take proactive steps to protect them. Though IP – and measures taken to prevent the misuse or theft thereof – can seem clerical, or even trivial to some, it is absolutely essential for startups to develop a comprehensive IP management strategy. Start-ups should not become so complacent in the fast-paced activities of their own burgeoning business that IP management is simply made an afterthought.

Many of the steps listed in this chapter are not costly but require painstaking procedures and constant vigilance (rare occurrences in start-ups). The risks of IP loss are considerable and can pose an existential threat. PuppTech's case is illustrative: its path has not been linear, it has made mistakes, without putting the company in peril. The company was advantaged to realize early-on that IP management was crucial to its own long-term success. The authors hope that by understanding the PuppTech experience, other start-up entrepreneurs may avoid some of the blind alleys that PuppTech has encountered.

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Chapter 3

Knowledge Mobilisation for Innovation

Jan Fazlagić

Abstract: The term knowledge mobilisation (KMb) describes the process of transferring knowledge (usually from formal research institutions such as universities) into active use by business organisations. KMb includes motivating the agents on both "ends" to engage into the process which should result in more innovation outputs. Whether new knowledge or new research results can be economically used or converted into innovations heavily depends on the social, political, and economic contexts, the available resources, the local potential of a highly skilled and creative labor force, and the knowledge environment in which actors and social systems strive to achieve their objectives. Advanced IT systems are still incapable of substituting human intelligence in many circumstances. A comprehensive literature review of KMb definitions is provided. Mobilisation, to be effective, must not only be well organised, but must also have everything in step. In the business context, the mobilisation of resources can be described as the time needed to launch a new product or service (*time-to-market*). Although knowledge transfer and industry-academia relationships have been subject to research investigations by various authors (some pioneering studies were conducted in Canada), they mainly focus on one sector: healthcare and, to some extent on education. The terms 'knowledge', 'research' and 'evidence' are used to describe a hierarchical relationship where research is a form of evidence and evidence is a source of knowledge. Knowledge is considered the capacity (potential or actual) to take effective action in varied and uncertain situations and innovation efforts should be supported with appropriate knowledge mobilisation strategies that channel much needed resources (especially public funds). One of the promising solutions could be to invest into KMb programmes, according to the highlights described in this chapter.

Keywords: Knowledge mobilisation, science-business relations, knowledge transfer, innovation, systems of innovation

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Introduction

Knowledge has always been used by humans to achieve their personal and business goals. There is nothing new in applying knowledge to human work. Engineers working at the pyramids of Egypt had to use advanced knowledge of geometry and physics. The Roman Empire would not develop without the use of advanced knowledge. The issue at hand is that until 100 years the pace of knowledge development was slow and did not affect the lives of individuals as much. We are now witnessing an unprecedented pace of change and the vast amount of knowledge and information we have is posing a great challenge to develop methods for the organization of these knowledge resources. Adults can no longer count on the fact that their current professional skills will be useful throughout their working lives. The rate of knowledge growth in the 21st century correlates with its citizens ability to learn, unlearn and re-learn at a fast pace.

Whether new knowledge or new research results can be economically used or converted into innovations heavily depends on the social, political, and economic contexts, the available resources, the local potential of a highly skilled and creative labor force, and the knowledge environment in which actors and social systems strive to achieve their objectives (Meusburger, 2013). The phenomenon of applying existing knowledge into practice is commonly referred to as 'knowledge mobilisation'. Many research studies (see e.g.: PARP, 2013) indicate that knowledge possessed and produced by research institutions (including universities) in Poland (and elsewhere) is not fully utilized. Large amounts of public funds are being spent to fund research activities, with often low or no meaningful impact on the quality of life and innovation of the economy. The university-business relationships have been subject to research studies for several decades but the concept of Knowledge Mobilisation (KMb) (with its conceptual framework and research approaches) was introduced to the public debate fairly recently (in the last 10 years), mainly focusing on health care sector. Improved KMb can bring benefits to many sectors of the economy, including, healthcare, pharmaceuticals, IT, engineering, consulting, biotech. The pace of knowledge spill-over from research organisations to companies is crucial and the dynamics of the process deserves in-depth investigation, for which a theoretical framework is needed. Therefore, the aim of this chapter is to provide a better understanding of the concept "Knowledge Mobilisation" as one of the prerequisites for innovation, and, in some contexts, an enabler of innovation.

Knowledge as an object of Knowledge Mobilisation efforts

Knowledge is considered as *the capacity (potential or actual) to take effective action in varied and uncertain situations* (Bennet, Bennet, 2004) and a human capacity that consists of understanding, insights, meaning, intuition, creativity, judgment, and the ability to anticipate the outcome of our actions. According to Lundvall (2003) knowledge and information appear in economic models in two different contexts. In the first context, knowledge is a means of rational decision making for *individual agents*. Thus the amount of information at the disposal of those agents determines the quality of deci-

sions and also determines their *ability to process the information*. The other major perspective is one in which knowledge is regarded as an *asset*. Here, knowledge may appear both as an input (competence) and output (innovation) in the production process. Under certain circumstances, it can be privately owned and/or bought and sold in the market as a commodity. Lundvall (2003) maintains that the economics of knowledge concerns specifying the conditions for knowledge to appear as "a normal commodity", i.e. as something similar to a producible and reproducible tangible product. Alfred Marshall (1920) observed that knowledge is not dispersed evenly but rather concentrated in some centres of gravity which he called *industrial districts*. His principal explanation was that knowledge was localised in a region and rooted both in the labour force and in local institutions and businesses. This phenomenon was later used to explain the success of the Silicon Valley and other industrial regions.

Knowledge represents the mental capacity of individuals and groups of individuals (collective knowledge), including ideas, facts, expertise, and judgments relevant to individuals, team, and organisational performance. The concept of knowledge should be distinguished from other related concepts such as data, information and wisdom[1]. The hierarchical pyramid of value was described in relation of knowledge against the other three concepts. While data is considered as raw, unorganized bits of information which have no meaning, information is the result of processing, organizing and structuring of said data. "Information" is an older word which dates back to 1300s with Old French and Middle English origins. Knowledge, in turn, is what humans dispose of, or "know". Knowledge is subjective, relates to a specific context and much of its nature is still to be discovered. The structure of human brain and its functioning is still subject to intensive research. Tacit knowledge (as opposed to formal, codified or explicit knowledge) is characteristic to an individual. It resembles our DNA imprinted in brain cells. Due to its nature it is difficult to transfer to another person by means of writing down or verbally. We can possess tacit knowledge by means of observing more knowledgeable people and interacting with them. It is best transferred through a master-apprentice relationship. It cannot be easily passed on in form of documents and other codified representations. Knowledge is here divided into four categories which in fact have ancient roots (Lundvall, Johnson, 1994):

- Know-what,
- Know-why,
- Know-how,
- Know-who.

Know-what refers to knowledge about "facts". The population of Warsaw, ingredients in a vegetable soup, and the date of the Battle of Grunwald are examples of this kind of knowledge. Knowledge is here synonymous with information. *Know-why* refers to knowledge about principles and laws in nature, in human mind and in society. This kind of knowledge has been extremely important for technological development in

[1] Defined as an ability to make good decisions based on knowledge and in absence of all necessary information and data.

certain science-based areas, such as chemical and electric/electronic industries. Access to this kind of knowledge will often make advances in technology more rapid and reduce the frequency of errors in procedures involving trial and error. *Know-how* refers to competences, habits, skills and describes the ability to solve practical and theoretical problems. It is synonymous with tacit knowledge. A manager of a Higher education Institution (HEI) preparing the launch of a new specialty or conducting interviews with applicants for teaching positions uses his tacit knowledge to achieve results. *Know-how* is knowledge which is difficult to share or describe. Networks of cooperating individuals and organisations also constitute tacit knowledge embedded in communities and organizational cultures of the participating partners. Similar networks may be formed by HEI's, especially in the case of mergers and acquisitions. Know-who involves information about who knows what and who knows what to do. But it also involves the social ability to co-operate and communicate with different kinds of people and experts (Lundvall, Johnson, 1994). Know who describes social knowledge about other people and social relationships. Today social networking sites such as LinkedIn or GoldenLine are substituting for lack of time and ability to engage in face-to-face relationships between professionals. Until recently such role was played by telephone books and yellow pages. Such social and personal relationships are not public – they constitute personal knowledge of each person. They cannot be transferred and, more specifically, they cannot be bought or sold on the market. The Noble-prize winner Kenneth Arrow (1971) explicitly defined the importance of trust by saying: "you cannot buy trust and, if you could, it would have no value whatsoever".

Knowledge is tacit and socially embedded which means that transfer from one person to another is costly and often impossible. The tacit dimension of knowledge means that organisations cannot afford to neglect the role of trained and experienced professionals. Today, advanced IT systems are still incapable of substituting human intelligence in many circumstances. Especially reliant on tacit knowledge are the business cultures of the east. For example the Japanese business culture emphasizes the importance of tacit knowledge diffused across organizational structure to a high degree. This may cause conflicts in the case of mergers of international organisations. Organisations in the west have a somewhat different approach to knowledge. The Western tradition emphasizes the value of codified knowledge and task specialization. As a result of these conflicting models, joint ventures may turn into arm's length relationships with poor project performance and asymmetry in knowledge transfer.

Lambe (2014) maintains that knowledge consists of two parts: Knowledge (Informing) and Knowledge (Proceeding). This builds on the distinction between "knowing that" and "knowing how" (the *potential* and *actual* capacity to take effective action). Knowledge (Informing) is the *information (or content)* part of knowledge. While this information part of knowledge is still generic information (organized patterns), it is special because of its structure and relationships with other information. Knowledge (Informing) consists of information that may represent understanding, meaning, insights, expectations, intuition, theories and principles that support or lead to effective action. It is considered knowledge when used as *part of the knowledge process* (Lambe, 2014). The second type of knowledge: knowledge (Proceeding), relates to the *process*

and *action* part of knowledge. Note that the process our minds use to find, create and semantically mix the information needed to take effective action is often unconscious and difficult to communicate to someone else and therefore, tacit.

Defining Knowledge Mobilisation (KMb)

In sociology the concept of mobilisation is present in the form of "resource mobilisation theory" which is an alternative interpretation of social movements. The concept of "mobllilisation" has also military connotations. Similarly, Jenkins (1982a) has distinguished power resources that provide the means for controlling the actions of targets from mobilising resources such as facilities that provide for mobilising power resources. Here, mobilisation is understood as a process by which a group secures collective control over the resources needed for collective action (Jenkins, 1983). In management science, knowledge mobilisation includes the products, processes and relationships among knowledge creators, users, and mediators (individuals or intermediary organisations that support knowledge brokering). Within KMb knowledge is moved "into active service for the broadest possible common good." Mobilisation is conducted by increasing "connectivity" or the multidirectional pathways for knowledge discovery, exchange and uptake (Hawkins/ICES). The term KMb involves efforts to bridge the gap between research, policy and practice in order to improve outcomes in various organisations or sectors. It also involves knowledge sharing between research producers (e.g. university researchers) and research users (including professionals or others whose work can benefit from research findings), often with the help of third parties or intermediaries (Knowledge Mobilization Institute; Fazlagić, 2008; Fazlagić, 2012; Fazlagić, 2013a; Fazlagić, 2013b). According to Levin (2008) 'knowledge mobilisation' is the relationship between research and practice. It is characterized by a multidimensional approach, longer-term orientation and the political nature of the work in comparison to earlier terms that seem to imply a one directional and linear move from research to practice. KMb could be defined as a set of goal-orientated practices aimed at reducing the gap between what we know and what we do. In the military context, mobilisation, for any kind of war, includes the procurement and training of manpower for military purposes. In the context of education systems, mobilisation may relate to the procurement of knowledge assets correlated with the procurement of financial resources necessary for implementation at institutional and organisational levels and must be synchronised with timetables for training (knowledge development) and strategic deployment. Another term consistent with KMb is "knowledge translation". The Knowledge Translation (KT) strategy is intended to support and increase the impact of research programs on the quality of life through changing policy, practice, and research. Specifically, the KT Strategy promotes new knowledge from research and innovation (Fazlagić, Erkol, 2015; Fazlagić, Erkol, 2016; Moore, 2016). KMb is an emerging field of inquiry that seeks to strengthen connections between research, policy and practice across sectors, disciplines and countries, attempting to harness the benefits of research for organizational and societal improvement (Cooper, Levin, 2010; Kislov et al., 2014). KMb helps make

research useful to society, and does so in a way that solution seeking can itself inform the research agenda (Fazlagić, 2008; Matheson, Edwards, 2016).

The terms 'knowledge', 'research' and 'evidence' are used to describe a hierarchical relationship where research is a form of evidence and evidence is a source of knowledge (Crilly, 2013). It is often claimed that KMb supports decision-making and innovation. Mobilisation of knowledge could be defined as a set of goal-orientated practices aimed at reducing the gap between what we know and what we do. In the military context, mobilisation, for any kind of war, includes the procurement and training of manpower for military purposes. In the context of education systems, mobilisation may relate to the procurement of knowledge assets correlated with the procurement of financial resources necessary for implementation at institutional and organisational levels and must be synchronised with timetables for training (knowledge development) and strategic deployment (Fazlagić, Erkol, 2015).

The effectiveness of Knowledge Mobilisation

In the business context, the mobilisation of resources can be described as the time needed to launch a new product or service (*time-to-market*). In education, time-to-market can be translated into time-to-problem solution. In a perfect economic system, all resources are perfectly distributed and fully utilised. In social systems, such as the system of education, gaps exist between the stock of their intellectual capital and the degree to which this capital is employed for the benefit of organisations. A helpful metaphor to describe this state could be the concept of strategic readiness proposed by Kaplan and Norton (2004). The capacity of identifying the right knowledge and applying it promptly to solve the problem is what mobilisation of knowledge is all about. According to Pfeffer and Sutton (2000), the gap between knowing and doing is more important than the gap between ignorance and knowing. Organisations that are better at learning and translating knowledge into action understand the virtue of simple language, simple structures, simple concepts and the power of common sense, which is remarkably uncommon in its application (Pfeffer, Sutton, 2000).
The effectiveness of knowledge mobilisation efforts is determined by the following conditions (Fazlagić, Erkol 2015):

1) Speed (of transfer or identification: see above): how fast was the knowledge delivered to the end user? How quickly did the end user realise that they possess the right knowledge? Were they made confident that they were able to solve the problem?
2) Accuracy of intervention; was the proper type of knowledge applied and delivered to the user? Inappropriate diagnosis of the problem may cause mobilisation of inappropriate type of knowledge.
3) Sustainability of knowledge: was knowledge, which was mobilised a quick-fix solution ('a fish') or a sustainable solution ('a fishing rod')?

4) Stickiness of knowledge: was the knowledge adequate to the absorptive capacity of the beneficiaries? The recipients of knowledge may not be able to absorb the knowledge due to lack of absorptive capacity. Knowledge which does not fit into the mental models, cultural context, and language of the recipients will not be fully absorbed and, as a result the KMb will be a wasteful effort.
5) The role of emotions: emotions may either support or hinder the KMb.

   KMb may be enhanced by ensuring that (German, 2008):

   - researchers and practitioners are given the chance to interface regularly in order to help make research both more directly applicable to immediate needs and more easily transferable;
   - the involvement of both academic and service funders in the Communities of Practice (CoP) to help encourage funding practices which would require more actionable research outcomes and evidence of practitioner/researcher collaboration. This would explicitly link their cooperation to the financial aspirations of both;
   - an ongoing performance assessment of the collaborative behaviour and contributions of both practitioners and researchers as a factor of continued funding; and
   - a commitment to foster ongoing outreach to stakeholders in the sector to validate both the assumptions and directions of the CoP forums.

Towards a Knowledge Mobilisation strategy for Innovation

KMb strategy is defined here as a (potential) plan to transfer (translate) knowledge produced or/and available at research institutions, including universities to business practice, including companies. It consists of the following elements:

1) research activities, including identification of available knowledge, production of new knowledge, establishing new connections and partnership within the research community, development of new methods and research instruments and posing new research questions;
2) dissemination activities, including publications, participation in conferences, social media presence, IP;
3) uptake, including validation of research, new research questions, contextualization of research, establishment of good practices;
4) implementation benefits, including research informed policy, new research questions, new programme funding, new product development, changes in programmes;
5) impact, including citizens served, economic, environmental and health benefits, media and public awareness, vulnerabilities addressed, new research questions.

   Such strategy may also consists of the following elements (Phipps, 2018):

1) Identification of Partners.
2) Partner Engagement.
3) Establishing Partner Roles.
4) Establishing KT Expertise (related to the definition of roles of partners and expertise needed).
5) Knowledge Users Audiences (including: researchers, practitioners/service providers, public, media consumers, decision makers, policy makers, private sector/industry. It is crucial at this stage to establish what audiences will be you prioritised).
6) Main Messages to share.
7) KT Goals. This stage may include such goals as: generating awareness/interest/practice change/behavioural change/policy action; impart knowledge and tools; inform research/policy/practice).
8) KT Strategies.
9) KT Process.
10) KT Impact & Evaluation. This stage includes research indicators, evaluation of indicators; application of indicators.
11) Resources Required.
12) Related Budget Items.
13) Implementation.

The strategy for KMb should take under consideration the industry context (Table 1). The degree of competition plays an important role in explaining the dynamics of KMb.

Table 1. A matrix to identify four types of knowledge base

Degree of competition Science and technology interface	Competitive environment	Non (or less)- competitive environment
Science model (Science is in a predictive stage, formal R&D is crucial and knowledge is highly codified)	Biotechnology, Semiconductor	Defense equipment
Humanistic model (Learning-by-doing is they key process, formal R and D is of a secondary importance and knowledge is poorly articulated)	Consulting activity	Education (primary school) Early XIX medicine

Source: Adapted from The Development of Knowledge of Different Sectors: a Model and Some Hypotheses, by D. Foray, D. Hargreaves, 2002, Management in Education and Learning, Oxford.

In Canada, Knowledge Mobilisation has a strategic dimension: the impacts of research are a feature of most research funding programs. The Canadian Institutes of Health Research (CIHR) (2012) and most Canadian health charities require grant applicants to articulate a knowledge translation strategy that articulates what impacts will occur and what efforts will be made to achieve them (Phipps et al., 2016)

(Table 2). Every grant application submitted to the Social Sciences and Humanities Research Council (SSHRC, 2015) requires an outcomes statement (what impacts are anticipated) and a knowledge mobilisation strategy (Phipps et al., 2016). Phipps et al. (2016) understand KMb strategy as a strategy for achieving impacts from research findings. There is a theoretical bias in favour of networks and partnerships, rather than hierarchies or markets, as effective vehicles for organisational learning (Adler, 2001) but there is also scientific evidence not supporting such view (Addicott, McGivern, Ferlie, 2006). Managed networks have been formed in health, partly on the rationale that knowledge will thereby be more effectively shared (Bate, Robert, 2002). Some governments introduced KMb strategies to promote transfer of knowledge. The Dutch government has made available for schooling, which is about € 9.500 per student per year on average (Rijksoverheid, 2017), which is mostly given to the educating institutions. The government, however, does not only fund universities, but also companies for promoting research. A good example is the Innovation Subsidy, which is a subsidy given to companies for doing research and development projects in collaboration with a research institution. This does not only promote innovation, but also cooperation between research institutions and industries. Next to public funding the Dutch government has also set up a workgroup called ICES/KIS (Interdepartmental Committee Economic Structure of Knowledge Infrastructure), which has been granted a budget of 800 million Euros to stimulate fundamental strategic and industrial research as well as to promote long-term research collaborations and networks to improve the knowledge transfer between science and industry. Arvanitis and Wörter (2007) conducted a study on behalf of the Konjunkturforschungsstelleof the university Zürich about Technology Transfer (TT). They did a survey with 5 categories: informal contacts, technical infrastructure, training activities, research and consulting. As a result, TT was found to affect the innovation power and labour productivity of Swiss companies positively. 28% of the Swiss companies are pursuing knowledge transfer. In Switzerland there is an organisation called Unitectra, that helps to organize TT for the universities Basel, Bern and Zürich. Unitectra is a non-profit organisation that is entirely owned by the three universities. It supports scientists with cooperation with private and public institutions as well as the implementation of research results into new products. Its main services include the commercialization of research results and the support of building a new business. There are also trainings in the field of knowledge transfer and contact points to business partners with regard to technology transfer. Unitectra is about 20 years old, has more than 100 inventions per year with most of them in the pharmaceutical field. Most of the experimental development is financed through private sponsors (>90%), whereas the fundamental research is financed through universities (>70%) (SBFI, 2016, p. 38).

Table 2. Four core elements of knowledge mobilisation planning

Element	Description
Engagement/Audiences	Before Principal Investigators think about what they want to do they need to start with partnerships and forms of engagement with identified audiences. This speaks to the purposefulness of KMb/KT and involves end users in the development of the rest of strategy.
Goals/Objectives	Frame the project in terms what do you want to achieve and how you plan to achieve it. • Overall Objective; high level, long horizon • Specific Goals: more granular, measurable; achieving goals by undertaking activities (below) allows you to fulfill your overall objective.
Activities	Articulated of KMb Planning Chart. Activities need to be mapped to specific audiences and correlated to goals and objective. Activities need to speak to academic and non-academic audiences. Identifymetrics and key performance indicators.
Impact, Indicators and Accountability	A longitudinal look at the results of knowledge mobilization plan. Impact are measured at level of end user/receptor/partner by measuring indicators specific to the activities.

Note. Reprinted from Supporting Knowledge Mobilization And Research Impact Strategies In Grant Applications, by Phipps D., Jensen K., Johnny M., Poetz A. (2016). The Journal of Research Administration, (47)2. p. 54.

The Israeli state continues to exhibit its long-standing concern with improving academia–industry cooperation as a way to fuel innovation. It is this concern that has prompted the launch of most of the new OCS support programs that have appeared since 2000. A stream of new programs, including Magneton, Nufar, Zemer, Nataf, all address such cooperation (Offenhauer, 2008). Working of KMb/KT strategies in a combined total of 53 grant applications has allowed the knowledge brokers at York and NeuroDevNet to identify those characteristics common to weak or strong plans to maximise the potential for research impact (Table 3).

Table 3. Strengths and weaknesses of KMb programmes

Strong KT/Knowledge Mobilisation plan	Weak KT/Knowledge Mobilisation plan
Balances end-of-grant and integrated KT strategies (stakeholder engagement)and has effective engagement of end users throughout the research	Only focuses on end-of-grant (dissemination) products and activities, poor engagements of end users in the research.
Demonstrates understanding of impact being change in policy, practice, behaviour, measured at the level of the end users, not the researcher.	Conflates impact with outputs such as of website page views of video views of documents downloads of conference presentations with are measures of reach and dissemination of research.
Focuses on what the project team will do (i.e. activities)	Literature review about KT with no link to activities.
Includes: KT goals/objectives, activities that support the achievement of those goals/objectives, budget for activities, accountability.	Unfocused, list of activities and stakeholder groups with no unifying goals/objectives, no budget of accountability for KT activities.
Stated evaluation framework for specific indicators.	Poor or no evaluation plan, no indicators.

Note. Reprinted from Supporting Knowledge Mobilization And Research Impact Strategies In Grant Applications, by Phipps D., Jensen K., Johnny M., Poetz A. (2016). The Journal of Research Administration, (47)2. p. 57.

Researchers (Nutley, Percy-Smith, Solesbury, 2003; Nutley, 2003) have found that the early interaction between producers and users of knowledge helps to effectively shape the conceptual dimensions of research and its subsequent adoption. Closer and longer-term interactions between research producers and users is the most effective method of ensuring that knowledge is used (Nutley, Davis, Walter, 2003). The component of tacit knowledge is more highly prized in the social sector than in the areas of scientific and engineering research (Nutley, Percy-Smith, Solesbury, 2003) because its more likely to influence practice. Therefore the sharing of tacit knowledge needs to become a part of knowledge mobilisation in the sector in order for that process to be perceived as legitimate in the eyes of practitioner (German, 2008). Organisational theory, in the context of KMb and research utilisation, reflects on what characteristics of an organisation (its organisational form) are more likely to promote learning and hence the use of knowledge and research. There is a theoretical bias in favour of networks and partnerships, rather than hierarchies or markets, as effective vehicles for organisational learning (Adler, 2001). However, empirical results have been less conclusive (Addicott, McGivern, Ferlie, 2006). Managed networks have been formed in health, partly on the rationale that knowledge will thereby be more effectively shared (Bate, Robert, 2002). Organisational theory, in the context of KMb and research utilisation, reflects on what characteristics of an organisation (its organisational form) are more likely to promote learning and hence the use of knowledge and research. Strategic alliances, joint ventures, networks, hierarchies, Professional Service Firms, are all different organisational forms that are considered in the literature in relation to knowledge sharing (Crilly, 2013). Relationships, reciprocity and trust are of interest at the boundaries of organisations as preconditions for effective knowledge transfer and creation (Adler, 2001; Inkpen, 2000; Becerra et al., 2008; Kachra, White, 2008).

KMb relies on evidence of sufficient quality to enable appropriate decision making. Although many established sectors produce well-controlled research with sufficient sample sizes to guide decision making confidently, the KMb process is challenged in sectors where the pace of change outpaces the ability to complete high-quality research methodologies (Lemaire, 2016).

This evidence is analysed under three distinct headings:

- Formal R&D is of secondary importance. The ability to conduct educational experiments is limited, so that many benefits of research and learning are not exploited.
- Most of the practical knowledge remains tacit, so that an important contribution of knowledge codification to the rapid accumulation of human know how is kept at a low level.

There is a great deal of innovation without R&D (*learning-by-teaching*). However, two factors limit the economic value of those innovations: i) Linkages and feedbacks between formal R&D and professional practices are weak so that the practical knowledge of the innovative practitioners is rarely drawn upon by professional researchers. ii) Due to the absence of proper incentive structures, spillovers and diffusion of

innovation kept at low level: much innovation in education, unless it is mandated, does not get beyond the classroom where it has been generated.

Moore et al. (2016) identified seven challenges related to KMb:

- Different contexts,
- Consistency and responsiveness,
- Applicant capacity for knowledge translation,
- Program capability to support knowledge translation
- Rapid learning,
- A systems approach,
- Infrastructure for knowledge translation.

In some sectors of the economy such as education formal R&D is of secondary importance both for the training of people and for the generation of useful innovation. In the words of Murnane and Nelson (1984), R&D should not be viewed as creating 'programs that work' and only provides tidy new technologies to schools and teachers. It is, thus, certainly a mistake to think of educational R&D as industrial or biomedical R&D (i.e. generating knowledge of "immediate" value for solving problems and developing applications) (McPhee, 2016). Most of available literature sources on knowledge mobilisation focus on health but the concept is more generally applicable to other fields, with or without a technology focus. The emphasis is on the mobilisation of the knowledge produced through research. In this way, the insights play an important role in bridging the gap between research and practice (McPhee, 2016).

The core business of technology transfer/commercialization offices is supporting the development of commercialization strategies for grant applications. Furthermore, in Canada for example such offices *"must endorse and work on each new proposal"* (Natural Sciences and Engineering Research Council of Canada, 2016). In many countries, excluding Poland the majority of grant applications require specific strategies to support impacts. If not, how can research managers and administrators support knowledge mobilisation strategies which create the conditions that will maximize impacts of university research? This support is present for commercialization and industry engagement so why not for other sectors and other impacts? Research offices and other units at Canadian universities in the Research Impact network are developing knowledge mobilisation services designed to create grant applications that provide specific knowledge mobilisation strategies to enable future impact (Phipps et al., 2016). York University's Knowledge Mobilisation Unit in Toronto, Canada has been supporting knowledge mobilisation and impact strategies in grant applications for over ten years. The Knowledge Mobilisation Unit has developed standardized processes using tools for knowledge mobilisation planning that structure knowledge mobilisation plans around four key elements: audience/end users; goals of the knowledge mobilisation strategy; knowledge mobilisation activities; evaluation and accountability. The Knowledge Translation (KT) Core facility has been providing services to NeuroDevNet, a national Network of Centres of Excellence, since August 2013. The KT Core is housed within York University's Knowledge Mobilisation Unit and has adapted their method for planning

for use at the beginning of research programs for Autism Spectrum Disorders (ASD), Cerebral Palsy (CP) and Fetal Alcohol Spectrum Disorders (FASD).

KMb activities often take the form of relatively short-term projects dependent on limited funding, which raises issues about the long-term sustainability and quality improvement designed, facilitated and supported by these initiatives (Kislov et al. 2014). It is becoming increasingly recognised that the translation of research evidence into practice undertaken by KMb initiatives has to be supported by developing the internal capacity of healthcare organisations to engage with and apply research, with 'capacity building' seen by many as one of the key aims of KMb strategies. The focus of modern research initiatives must be shifted from "undertaking" research projects towards the development of skills required to successfully utilise research in practice.

There is a rich body of literature on KMb in health care. It reveals that "approximately eight to fifteen years elapse from the production of information to when it is used in practice" (Provincial Centre of Excellence for Child and Youth Mental Health at CHEO, 2006). It may take a generation for sector knowledge to filter up through knowledge infrastructures enough to influence community paradigms and then back down to guide community policies and practices more generally (German et al. 2008). Despite researchers and community organisations both being interested in providing better service to community members, expediting this lag via knowledge transfer can consume significant resources and time (Hahn, Subramani, 2000). Much of this delay may be attributed to ideational "zombies" – ideas held to be common within the community despite a lack of evidence or new evidence to the contrary (Provincial Centre of Excellence for Child and Youth Mental Health at CHEO, 2006). These "zombies" are the cultural artifacts of collective assumptions, values and behaviours that have evolved from past knowledge and experience but which underlie current decision making and resist innovation (Schein, 1985). The continued separation between the policy making, practice and research fails to evolve cultural artifacts in line with the general advancement of knowledge and practice, creating a challenge to find the common ground upon which all stakeholders can stand (Nutley, Davies, Walter, 2003). Both new research and new practice must be able to concurrently contribute an evolving set of community assumptions in order for each to find validation in the local paradigm (German, 2008). KMb involves a transfer of knowledge from the "producer" to the "user". It is often claimed that KMb supports decision-making and innovation. A resources mobilisation strategy provides an essential roadmap, detailing how resources might be leveraged to meet organization's resource requirement (Taylor, 2012). Publication citations are a proxy for scholarly impact, albeit a contentious proxy (Archambault, Gagne, 2004), especially for the humanities and creative arts (Phipps et al., 2016).

Conclusion

The terms 'knowledge', 'research' and 'evidence' are used to describe a hierarchical relationship where research is a form of evidence and evidence is a source of knowledge. Knowledge is considered the capacity (potential or actual) to take effective action in

varied and uncertain situations. Effective knowledge must not only be well organised, but must also have everything in step. In the business context, the mobilisation of resources can be described as the time needed to launch a new product or service (*time-to-market*) and innovation efforts should be supported with appropriate knowledge mobilisation strategies to channel the resources (especially public funds).

In this chapter, a general description of the concept of knowledge mobilisation was presented. Firms aiming to increase their innovation efforts should look for partnerships with science and research organisations. KMb is more than simply "increasing R&D expenditure". Contrary to the traditional perspective of innovation where firms are encouraged to increase their R&D spending, KMb is described through the lenses of coordination and organizational efforts which aim to synchronize the processes of many different players in the innovation systems. In many countries such as Canada or the UK, the concept of knowledge mobilisation has gained popularity as a systemic approach to linking research institutions and businesses. Governments in many countries are striving to increase innovation outputs in their economies and stimulate high-tech exports. One such promising solution could be to invest into KMb programmes, according to the highlights described in this chapter.

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Chapter 4

The Role of Higher Education Institutions in Developing Innovation Skills Among University Students

Jan Fazlagić

Abstract: Higher education institutions (HEIs) play an important role in the advancement of knowledge, social and economic progress. Through a literature review a list of 18 competences which are a good compromise between the requirements for standardization and the multifariousness of innovation competences was developed. nnovation depends on people who are able to generate and apply knowledge and ideas in the workplace and in society at large. Fostering critical thinking, creativity, and behavioural and social skills should be viewed as central elements of schools, colleges and universities. Developing creativity and resilience has been difficult due to pressure from the government for schools and students to report good tests results. The chapter is rounded up with some practical recommendations for HEIs regarding the development of innovation skills.

Keywords: Higher-Education Institutions, Universities, Higher Education, 21st Century Skills, Innovation Management

Introduction

Higher education institutions (HEIs) play an important role as contributors to the overall science and technology performance. Scientific publications and patents are, however, only intermediate outputs of research. Their general purpose is the achievement

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of broader goals in the advancement of knowledge and achievement of social and economic progress. A well-educated cohort of university graduates equipped with innovation skills will have a much stronger impact on the overall performance of an economy than an elite of innovators without followers. Thus, the development of innovation skills should play an equally important role as one of the key outputs of HEIs. Science and technology (S&T) are recognised as producing tangible (e.g. new technological artefacts) and intangible (knowledge, skills, education etc.), codified (publications, patents, technical blueprints etc.) and tacit outputs (skills, cultural predisposition towards innovation, ways of approaching problems etc) (Sullivan, Sullivan Sr, 2000; Barré et al., 2002). Innovation skills are considered as *tacit outputs* here. The main purpose of this chapter is to highlight the role of HEIs in shaping the future innovation performance of economies through the delivery of educated R&D personnel working not only in the S&T sectors but also in other types of organisations. It is argued that HEIs underutilize their potential in the development of innovation skills among students by focusing on the development of knowledge rather that innovation skills and competences. It is argued that the development of innovation skills by HEIs should gain in importance. HEIs should re-design their curriculums and syllabuses to meet the demands of the 21 century labour market and Industry 4.0. Through a literature review a list of competences which are a good compromise between the requirements for standardization and the multifariousness of innovation competences was developed.

The case for innovation skill development in HEIs

A popular distinction used in measurement models in the social sciences is the division between input indicators and output indicators. Input indicators should, in principle, measure the resources mobilized with an expectation to achieve certain results. Output indicators measure the quantity of goods and services produced and the efficiency of their production. However, the quality of these goods and services is often subjective and depends on the priorities and the context. Human Capital development is one of the major functions of universities. High added-value in Human Capital formation does not always correspond, however with the development of innovation skills.

Part of the reason that the well described and defined innovation skills will pave the way to school reforms focused on the 21st century are the requirements of the job market. Therefore university teachers need to develop their teaching skills around our list of innovation skills. On the other hand, HEIs lack clear definitions and guidelines on what innovation skills are.

Many countries around the world, especially in Asia and Africa started developing their higher education systems only recently. Such situations offers an opportunity to structure the higher education systems in a manner different to those in Europe where innovation skill development is not an important output (with the exception of Germany). For countries such as Kazakhstan or Malaysia, the creation of a competitive higher education system is a fairly new experience. Even within the Western world, the context for higher education may vary depending on the tradition (Leitner, 2005; Leitner, 2007,

pp. 97–105) Koch points to three traditions of university development, each of which comprise a different context for the measurement of HEIs' results and outputs (Koch et al., 2000):

- The German Humboldtian tradition, in which education is referred to as "scientific" (unity of teaching and research),
- The French tradition, in which education is regarded as "professional",
- And the Anglo-Saxon tradition, which stresses the "liberal" nature of education.

Naturally the German and French traditions of university, which, incidentally is dominant in the Polish system of education, should be the most resistant any changes regarding the innovation skills agenda.

In the case of a university, as in the case of many other outputs of HEIs, there exists a substantial time lag between the moment of graduation and the observable impact on the innovation performance of their employers. Innovation skills developed in the HEIs go beyond the situation of an individual university and individual employer who has hired a university's graduate. It is often difficult, however, to distinguish between inputs and outputs. As in the Marx's example, "the pickpocket becomes a productive worker too, since he indirectly produces books on criminal law" (Marginson, 1998).

Innovation depends on people who are able to generate and apply knowledge and ideas in the workplace and in society at large. OECD countries have long recognised the need to develop skilled people through education and training. Skills for innovation can be grouped into three broad categories (OECD 2016):

- Subject-based skills, which represent knowledge in a particular field.
- Thinking and creativity, including both higher-order skills and creative cognitive habits. These competencies include critical faculties, imagination and curiosity.
- Behavioural and social skills, including skills such as self-confidence, leadership and management, collaboration and persuasion.

The innovation skills are defined very broadly depending on the research agenda and focus. Such a situation is not helpful for implementing school reforms aimed at making systems of education more adaptive to the requirements of the changing economy. According to many predictions (see for example: Beblavý 7 Veselková, 2014) the demand for high-skilled workers performing creative tasks will increase in the 21st century. We argue that the role of primary and secondary education in the development of innovation competences is somewhat overshadowed by the vastly overestimated role of higher education in the development of those skills. Many countries promote creativity and innovation in universities but the actual competences are developed at earlier stages of the education process. Therefore, it is necessary to create frameworks and agendas for innovation competency development in tertiary education.

Developing excellent subject-based knowledge is undoubtedly important for an innovative society, but it is not enough on its own. HEIs are at the front of knowledge-creation. We must not, however, lose sight of the innovation skills development as providing students with state-of-the-art knowledge does not equate with preparing them

for functioning in innovative environments, especially given the fact that we are facing a transition from the linear growth of human knowledge to exponential growth. In addition to raising academic achievement across all levels of education, HEIs need to pay more attention to which skills young people acquire. Looking at the economics and business education, possession of subject knowledge (e.g. accounting, marketing principles, coding and programming, foreign languages) is important but does not ensure that university graduates will be able to deliver added-value to innovative companies where thinking outside the box, critical thinking, ability to change mental models and re-frame thinking patterns are of paramount importance. Fostering critical thinking, creativity, and behavioural and social skills should be viewed as a central element of the remit of schools, colleges and universities (OECD 2016). Creativity and innovation are key to EU education policy (Ferrari et.al, 2009; European Union, 2010; Coate, Boulos 2012; Grifiths 2014). The words 'creativity' and 'innovation' both cover a range of meanings in English, though they tend to appear as a couple in EU policies. Moreover, the connections between the different meanings are not clear or agreed. So the terms are extremely ambiguous especially in how they relate to the purposes of education (Griffiths, 2014). Fostering creativity in education is intended to address many concerns including those in the economy. The role of creativity in the economy is being seen as crucial (Burnard, 2006) to assist nations for attaining higher rates of growth (including the catching-up processes with the most developed economies of the world), higher values and to cope with increased competition (Shaheen, 2010). Creativity is being made the focus of "curriculum and pedagogy" (Wilson, 2005) and an "official agenda" for improving schools (Burnard, 2006). Creativity is at the focus of many education reforms including Hong-Kong, China and Scotland (Shaheen, 2010). For example, in the Cultural Policy Statement by the Scottish Executive the Minister for Tourism, Culture and Sport it says that "The creativity of Scots – from the classroom to the board-room – is the edge we need in a competitive world."

Defining Innovation skills

The need to develop students' creative abilities is fundamentally important, because it is this quality that ensures skills demanded by contemporary employers (Ramankulov et al., 2016). Education policies to foster innovation have traditionally focused on increasing participation in science, technology, engineering, and mathematics (STEM) disciplines. Recently, however, a more comprehensive view of innovation has emerged which recognises the contribution of a wider set of skills and disciplines (OECD, 2016). Our understanding of creativity in the last 25 years has evolved from a belief in domain generality to one of domain specificity. In other words creative performance of an individual will vary depending on the domain. Baer (1994a, 1994b, 1994c) proved that creativity is not only content specific but is also task specific within content areas. The Consensual Assessment Technique (CAT), originally developed by Teresa Amabile (1983, 1997) and further developed by others is one method of creativity assessment, well-suited to test the domain specificity question. In order to define innovation skills a thorough literature review was conducted (Gordon, O'Toole, 2015; Alshannag, Ham-

da, 2015; Amabile, 1983; Amabile, 1997; Banaji et al. 2013; Berger, 2014; Brookhart, 2013; Cropley, 2015; Csapó, Funke (Eds.). 2017; Dror, Gershon, 2012; Erol et al. 2012; Fuller, Clarke, 1994; Hallam, Ireson, 1999; Hebert, Link. 2006; Heilmann, Korte, 2010; Herbig, Day, 1993; Kabukcu, 2015; Markides, 2013; OECD, 2011, OECD, 2015; OECD, 2016; McCrory, 2010; Muijs, Reynolds, 2011; OECD, 2014, Scott et al. 2010; Scott, Bruce, 1994; Sternberg, Williams, 1996; Ulijn, Brown, 2004; Williams, 1999; Trehan, 2017, Ray, 2019).

Surprisingly, there is no one popular definition of innovation skills. According to the "genus by dfference" definition[1], innovation skills should be defined as skills which are used by organizations to make them more innovative, the skills which help the employer to achieve innovation results". Thus, innovation skills should be defined as "skills which are used for innovation". "Extensional" definitions simply list all the things that could be considered as an example of this. This approach is the most dominant in the literature as most of the authors of research publications and reports simply provide lists of specific skills which are labeled "innovation skills" (e.g.: Levy, Cannon, 2016; World Economic Forum, 2018). Despite the plethora of publications on innovation skills, there are surprisingly few studies covering the issue of identification of those skills. For the purpose of this discussion innovation skills will be defined according to the "Extensional" definitions, and produced below are a list of innovation skills based on an extensive literature review.

1. **Curiosity and exploring possibilities** – teaching to be curious and looking beyond the horizon; rewarding students for asking questions; teaching how not to be satisfied with the first option, encouraging curiosity about finding out what other options could be; teaching how to experiment and be open to empirical verification of one's assumptions.
2. **Idea formation** – teaching how to develop own ideas and other people's ideas.
3. **Problem solving** – teaching how to solve problems and overcome obstacles.
4. **Independent thinking** – breaking up mental models, teaching that 'not all the glitter is gold' even if this sometimes may go against popular opinion. Identifying useful sources of information and gathering and utilizing only that information which is essential.
5. **Divergent thinking** – teaching on how to change the perspective and see the problem from another angle; thinking outside-the-box.
6. **Framing problems** – teaching how to put an abstract and vague concept into measurable frames which can be described and elaborated.
7. **Multiple idea facilitation** – teaching how to work on parallel ideas without prematurely selecting the 'correct one'.
8. **Ability to learn** – active approach to one's learning; appreciating the need to learn and the ability to reflect upon one's performance; receiving and asking for feedback and accepting criticism from others.

[1] Definition by genus and difference relies directly on the intension of the termsdefined, and it does so in the most helpful way. Definitions by genus and difference are also called analyticaldefinitions, or by their Latinname, definitions per genus et differentia

9. **Courage and risk-taking** – teaching to be brave and facing the challenges; rewarding 'those who dare', teaching that disagreement is a positive attitude in certain situations; importance of taking risk in lives and accepting failures, coping with failures.
10. **Problem visualization and developing imagination through useful metaphors** – teaching how to explain and make sense of the world through indirect communication, including metaphors; utilizing art, poetry, theatre etc. to develop imagination; teaching how to put abstract concepts, problems, projects into pictures and graphs visualizing workflow, responsibilities of team members etc.
11. **Decision making** – meeting deadlines, taking responsibility and risk management, taking leadership roles,
12. **Leading people** – teaching how to be leaders, teaching about the importance of good leadership for the success of plans, taking initiative.
13. **Delayed gratification**, or **deferred gratification** - the ability to resist the temptation for an immediate reward and wait for a later reward.
14. **Change management and improvisation** – teaching how to improvise, work without or outside of agenda, trying to achieve the result without previous preparation, ad hoc mobilising of resources, teaching how to how to cope with uncertainty and changes, preparing students for situations in which several interpretations are plausible; assessing situational forces that are promoting and inhibiting an idea for change.
15. **Perseverance** – importance of not giving up; trying harder, testing all options, not being discouraged to easily, working-hard.
16. **Developing hobbies and teaching that having a hobby is an asset** – rewarding students for nourishing their extracurricular interests; encouraging students to engage in extracurricular activities, including voluntary work, student entrepreneurship etc.
17. **Collaborating** – teaching how to achieve synergies, use the resources and skills of other people on a win-win basis; teaching to listen to suggestions from others and to trying new ideas.
18. **Developing future orientation** – teaching about the benefits of looking to future opportunities; evaluating future directions and risks based on current and future strengths, weaknesses, opportunities and threats.
19. **Empathy** – although empathy can be thought of as a skill which is loosely related to innovation many research studies on creativity point to the importance of empathy. Innovations are developed by people characterised by compassion and their ability to understand and share the feelings of others.

The challenge for HEIs

As it was previously established that development of innovation skills should be one of key outputs of HEIs, the overarching challenge is how to implement the generally accepted postulate that HEIs should put more emphasis on development of innovation skills. Below is a list of possible specific challenges which HEIs may face while introducing the innovation skills development agenda:

- How to convince more conservative academics that making higher education more responsive to the needs of the job market does not jeopardize their academic mission and centuries long tradition;
- How to restructure academic culture which traditionally was aimed to develop academic competences? – academic teaching is currently strongly aligned with the requirements of academic careers, i.e. the best university graduates are predestined to become university professors;
- How to train academic teachers to develop innovation skills? – academic teachers do not have a business background which is very useful in teaching innovation skills;
- How to evaluate innovation skills learning outcomes? – currently the baseline for evaluating learning outcomes such as student projects, essays, tests is often in the discipline pursued by the academic teacher;
- How to account for long-term benefits of innovation skills development? – many HEIs use a short-term to medium-term proxies of salaries earned by university graduates. In the case of innovation skills the long term outcomes would be innovation performance of the organizations employing university graduates.

Teaching innovation skills

Developing creativity and resilience has been difficult due to pressure from the government for schools and students to report good test results. Systems of education in most countries in the world can be described as relics of the industrial age but some countries such as Japan are moving forward. Japan changed its rote based learning system by removing 30% of the content in its curriculum to encourage deeper learning and added a greater emphasis on creativity (Anderson, 2019).

As stated previously, teaching innovation skills should be the primary goal of 21st century HEIs. Teachers' beliefs, practices and attitudes are important for understanding and improving educational processes. They are closely linked to teachers' strategies for coping with challenges in their daily professional life and to their general well-being. They shape students' learning environment and influence student motivation and achievements (OECD, 2009). In the lecture hall, university teachers are likely to put greater emphasis on ensuring that learning is well structured than on student-oriented activities which give them more autonomy. Another concern of many academic teachers will be meeting the academic standards of students' learning outcomes which,

according to the teachers should be as close as possible to the requirements of scientific journals. The criteria for excellence in the business world, especially in the case of economics and business are different from those required by academia. Andreas Schleicher, the head of the education division at the Organisation for Economic Cooperation and Development (OECD) claims that although society is scared that human jobs will be replaced by robots, we are still teaching children to think like machines (OECD, 2009).[2] The countries that are succeeding in developing skills like empathy and communication—Singapore, Finland, certain Canadian states—have relatively small educational systems, but scale to create new challenges. In England, for example, the school inspection body (OFSTED) has acknowledged that developing creativity and resilience has been difficult due to pressure from the government for schools and students to report good tests results.[3]

Some practical recommendations for HEIs

Some research on implementing the innovation skills in HEIs has been conducted by OECD (Blašková et al., 2014; Hoidn, Kärkkäinen, 2014) but further endeavours in the field are still needed. The success in the implementation of innovation skills agenda in HEIs depends not so much on making the decision makers aware of the challenge as in implementing some hands-on, pragmatic improvements and sharing good practices in this area. Below is a list of some suggestions for HEIs regarding the implementation of the innovation skills agenda:

1. Redesign syllabi in such a way that each syllabus contains a specific section labeled "Innovation skills development". Every teacher should demonstrate how (s)he wants to develop innovation skills within the core subject knowledge. This postulate is easy to implement for almost every university subject, including those which by definition do not focus on soft skills development. For example, accounting class may simply contain accounting in start-up companies, biology class may describe the application of newly developed substances in innovative products etc.
2. Implement interactive teaching methods which facilitate students' own inquiry. Students learn best by finding solutions to problems on their own and should be allowed to think of solutions to practical problems themselves before the teacher shows them how they are solved. Thinking and reasoning processes are more important than specific curriculum content.
3. Provide more opportunities for university teachers to interact with business practitioners. Tacit knowledge transfer should be promoted.

[2] J. Anderson, The unlikely champion for testing kids around the world on empathy and creativity, https://qz.com/1540222/how-changing-the-pisa-test-could-change-how-kids-learn/.

[3] The Future of Education and Skills 2030 project aims to help countries find answers to what knowledge, skills, attitudes and values are needed for today's students to thrive and shape their world, as well as how instructional systems can effectively develop them. http://www.oecd.org/education/2030/.

4. Expose students to more challenging problems, including so called "ill-defined problems" (see for example: Davidson and Sternberg, 2003) and exposure to different cultural contexts.
5. Putting more emphasis on the process of solving a problem rather than on the final outcome. The way a student approaches the problem and works on the solution is usually neglected by university teachers who concentrate on the result.
6. Introducing a broadened selection of grades within the university evaluation schemes. Innovation skills could be subject to separate evaluation and their progress could be measured during the educational cycle at the university.

Conclusions

It is argued that innovation skills developed in tertiary education are an important innovation output for the economy. Innovation calls for a large number of – often highly educated – people equipped with diverse skills sets. It is increasingly acknowledged that future innovators and entrepreneurs will require a large range of skills to be able to meet the demands of the changing economy (OECD, 2010). Universities have traditionally positioned themselves as: (1) producers of knowledge in the form of scientific papers and patents; (2) educational institutions which provide skilled labour for the economy and for universities themselves. Today the demands and expectations should be raised as innovation skills should become an integral part of university education. In this chapter the rationale for such a statement was presented along with some practical suggestions on how the innovation skills agenda could be launched in HEIs.

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Chapter 5

The Role of Quality in Customer Relationship Management

Paweł Dobski

Abstract: Never before has the issue of quality been the focus of so many scientific disciplines. Deliberations conducted within the realm of qualitology (Kolman 2009) clearly indicate that quality is a category that can have different definitions depending on the context in which it is used. Until recently, the definitions of quality referred primarily to manufacturing. Currently, the attention of researchers and practitioners dealing with quality is not only focused on the quality of products, but also increasingly in connection with the service sector. The purpose of this chapter is to reformulate the concept of normative quality (quality based on norms and standards) into the concept of relational quality (the perception of quality from a customer's perspective). In addition, an attempt was made to demonstrate the extent to which the implementation of the quality management concept in an enterprise affects the process of continuously improving cooperation with broadly understood stakeholders. The employment of the deductive method enabled the author to substantively re-interpret the concept of quality management by "adding value" to the orientation based on cooperation with customers. The adoption of the relational paradigm and extensive use of the Nordic School's achievements made it possible to develop a marketing interpretation of the quality of services. The author undertook to highlight the importance of long-term customer relationships in the context of shaping organizational culture.

Keywords: quality, service quality, customer relationship management, marketing innovation

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Introduction

In the 1970s, developed economies began to experience the diversification of mass markets and the emergence of smaller parts – market segments. The essence of this process was connected with the necessity to meet the individual needs of increasingly demanding customers. This process continues to-date and was the subject of interest of such authors as Ch. Grönroos and E. Gummesson associated with the Nordic School of marketing development, as well as researchers from the University of Texas: A. Parasuraman, V. Zeithmal and L. Berry. The work of the above-mentioned authors led to developing the concept of relationship marketing, which is of fundamental importance for reinterpreting the approach to quality. Relationship marketing is defined as a configuration of three components: marketing, relationships (30 different types of relationships can be distinguished), and a network created through building different types of relationships. Relationship marketing focuses on activities aimed at not only making customers the co-creators of value (a product), but also connecting them permanently with the company. The theory of relationship marketing stems from the assumption that customer retention is a critical point (a necessary condition) for long-term business profitability. The main purpose of the discussion presented in this chapter is to reformulate normative quality into a relational approach, which will make it possible to obtain benefits from cooperation with the organization's stakeholders.

The importance of quality increased with the appearance of the social division of labour and the accompanying development of the exchange of goods. Guaranteeing the high quality of both goods and services is regarded as a priority for every organization, which is a consequence of increased competition on the global market. One of the reasons why companies all over the world started to pay attention to the role of quality and quality management were the successes of Japanese companies introducing cheap and reliable products onto the global markets. In the 1970s and 80s, companies from the United States and Western Europe began to be forced out of sectors such as automotives and electronics in which they had previously held a dominant position.

Japanese companies implemented the concept of quality management based on the philosophy of W.E. Deming and J.M. Juran. It must be remembered that after World War II, Japanese products were associated with low quality. This was largely due to the fact that manufacturing in Japan was based on Taylor's assumptions regarding the organization of work. This approach, which emphasised the importance of a strict adherence to technical specifications and quality inspection, made it possible to reduce costs but did not guarantee increasing the quality of the product offering.

In 1946, the Union of Japanese Scientists and Engineers (JUSE) was founded in Japan comprising representatives of science, industry and government, and which established the Quality Control Research Group in 1949 (Haffer, 2003, p. 124).

J.M. Juran, who propagated the idea of implementing a pro-quality orientation, emphasized the role of managers in the work aimed at quality improvement. According to W.E. Deming, quality management is simply a philosophy of continuous improvement. To convey this to the managers of the largest Japanese companies W.E. Deming presented the concept of the PDCA cycle (Hamrol, Mantura, 2006).

The philosophy of W.E. Deming was based upon three main pillars (Drummond, 1998, p. 25):

- customer orientation,
- continuous improvement,
- commitment of all employees.

Evolution of the approach to quality management

The idea of continuous improvement that was advocated by the luminaries of the Total Quality Management (TQM) concept, W.E. Deming and J. Juran, referred to the definition of quality proposed by Plato in ancient Greece. This philosophical approach to quality assumed that quality is a state of perfection that cannot be achieved, but which should be pursued.

An important time in the development of the approach to quality was the end of the 1970s and the beginning of the 1980s. It was then that the sphere of services began to be included in research on quality. Since the mid-1980s, quality has been one of the most frequently discussed issues in the literature relating to service marketing. The first to undertake the issue of the quality of services were researchers connected with the Nordic School of marketing (Payne, 1995, pp. 19–20), as well as a group of academics from the University of Texas: A. Parasuraman, V. Zeithmal and L. Berry. Ch. Grönroos believes that a service is perceived individually and therefore subjectively, which justifies the introduction of the categories of expected quality and experienced quality (Figure 1).

Global service quality is determined by comparing the expected quality with the experienced quality. Expectations regarding quality are shaped by the following elements (Rogoziński, 1998, p. 207):

- market communications such as advertising, direct mail and public relations. Due to their nature, it can be said that these are forms of communication over which the company has an influence,
- the image and the opinions of customers, which the company can influence only indirectly. Other people's suggestions and opinions may have some impact, but a person's opinions and views about a company are primarily determined by their previous relationships with it,
- the customer's needs also influence expectations with regard to quality.

Considering the above, Ch. Grönroos suggests taking into account two dimensions of service quality (Otto, 2002, p. 140):

1) technical quality (what the customer receives),
2) functional quality (what the standard of the service is, how the service is provided).

The perceived service quality model developed by Ch. Grönroos was based on the approach to the service provision process formulated by L. Swan and L. Combs. These

authors stated that the perceived performance of a given product can be divided into two sub-processes (Otto, 2002, p. 140):

- instrumental performance: connected with production and is technical in nature. With regard to services, it may be associated with the technical requirements necessary to perform a service,
- expressive performance: concerns the psychological dimension of production. In the case of services, it concerns the relationships between the service provider and the recipient.

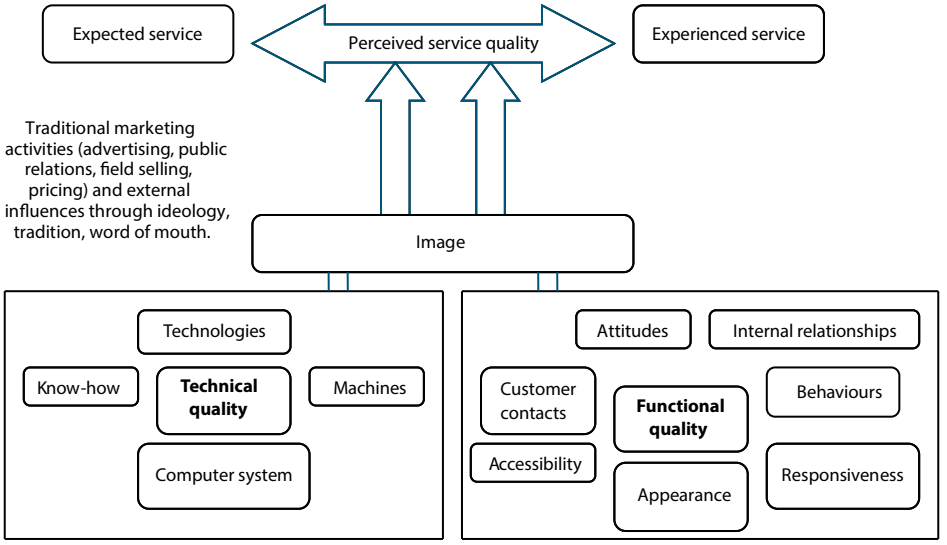

Figure 1. Perceived quality model

Source: (Otto, 2001, p. 139).

In 1985, when analysing the importance of expected and experienced quality in assessing the service offer, a team led by A. Parasuraman developed the service quality model. This was the first model designed to measure the quality of service (Rogoziński, 1998, p. 201) and permitted the identification of universal criteria for assessing the quality of services from the perspectives of both customers and company managers (Zeithaml, Parasuraman, Berry, 1990, pp. 175–186). Five areas in which differences in quality assessment may occur have been identified in this model:

- gap 1 – addresses the difference between consumers' expectations and the interpretation of these expectations by the management,
- gap 2 – addresses the difference between the management's interpretation of customers' expectations and the normative quality of service,
- gap 3 – addresses the difference between the quality specifications that a service should meet and the actual level of service delivered,

- gap 4 – addresses the difference that can occur between the information received by the customer through promotional activity about the quality of the offer and the actual quality of the service,
- gap 5 – addresses the difference between the quality that customers expect and that which they actually receive.

A. Parasuraman, V. Zeithamal and L. Berry identified ten criterion used by consumers when assessing the quality of services (Zeithaml, Parasuraman, Berry, 1990, p. 20):

1) credibility – trust, integrity of the entrepreneur,
2) security – lack of danger, risk or doubt,
3) accessibility – approachability and ease of contact,
4) communication – listening to customers and keeping them informed,
5) understanding – striving to get to know customers and their needs,
6) tangibles – appearance of the facility, equipment, devices, and of the personnel,
7) responsiveness – the desire to assist customers and provide quick service,
8) reliability – the ability to perform services in a reliable and accurate manner,
9) competence – having the knowledge and qualifications necessary to serve customers,
10) courtesy – friendly attitude towards clients and respect.

Later, A. Parasuraman and his team narrowed this list of criterion to five dimensions of service quality:

- tangibles – understood as the external and internal appearance of the facility, equipment, media, dress and behaviour of the staff,
- reliability – the company's ability to provide the service in a competent and reliable manner,
- responsiveness – willingness to help customers and quickly respond to customers' expectations,
- assurance – competence of the service provider's staff and their ability to gain customer trust,
- empathy – the ability to personalize the approach to each client and meet their expectations.

The above criterieon were used as a basis for developing the Servqual questionnaire, designed for assessing the quality of services. Additionally, the questionnaire aimed to identify and interpret possible discrepancies in the assessment of quality between the customer and the service supplier (Rogoziński, 1998, pp. 202–203).

In view of the discussion so far, it can be said that the quality of services seems to be more complex and more difficult to define clearly than the quality of products. This is largely due to the fact that customers, rather than simply being the addressee and reviewer of the company's market offer in the case of product assessment, actively participate in the process of creating services, thus becoming to some extent their

co-creators. However, in order for a customer to be an active co-creator of a service, they must fulfil certain functions (Rogoziński, 1998, p. 125):

- service description or problem description: particularly important in the case of services delivered to individual orders because the customer must specify their requirements as to the expected results of the service. The service provider, in turn, should adapt the process of providing the service to the customer's expectations,
- co-creation of services: related to the customer's involvement in the work necessary for the implementation of the service, for example data collection (consulting services or monitoring life functions in medical services),
- involvement of customers in controlling the quality of service: in service stations, for example, customers can observe the work of mechanics during car repairs (glass walls),
- impact on staff morale: a service company may consciously incorporate the relationship created between the contact personnel and the customer into the process of providing the service, considering them to be an essential component because of the beneficial effect they have on the staff. An employee, observing the professionalism of the customer's activities, tries to guarantee a high standard of service in order to become a partner in this relationship (e.g. customer account managers in banks),
- impact on the development of the service delivery system: it should be emphasized that the best stimulus for the development of a service company is a conscious and demanding customer who, based on previous experience with companies operating in a given industry, expects a higher standard in the service offer (increased awareness of patients in healthcare institutions),
- inclusion of clients in the marketing communication process: customers, based on their previous experience in dealing with other people, formulate opinions on the service offer and in this way make certain recommendations that may encourage or discourage using the services of a given service company.

Another author who identified the criteria for assessing the quality of services is C. King, who distinguished dimensions such as responsibility, competence, accessibility, courtesy, communication, credibility, security and understanding (Karaszewski, 2006, p. 20).

Research on quality had also resulted in the development of other models, one of the most important being that developed by E. Gummesson. His model appears to have a clearly industrial origin. E. Gummesson introduced the 4Q's, which are treated as premises for perceived quality and satisfaction: design quality, production quality, delivery quality, and relationship quality. The first of these means that the more perfect the design, the better the product can fulfil the functions expected by both internal and external customers. Production quality refers to the best manufacturing in accordance with the design, which is influenced not only by the service providers but also by everyone involved in this process. Delivery quality means not only a timely delivery

of goods and services, but also the provision of proper documentation and efficient transport. Finally, relationship quality serves to determine and assess how successful a company is in creating external relationships (and networks) with customers, partners and business associates.

Comparing the models developed by Ch. Grönroos and E. Gummesson, it can be noticed that a common element is the assumption that the quality of the offer is ultimately determined by the perception of the buyer. This premise led to the construction of the integrated Ch. Grönroos – E. Gummesson model (Figure 2).

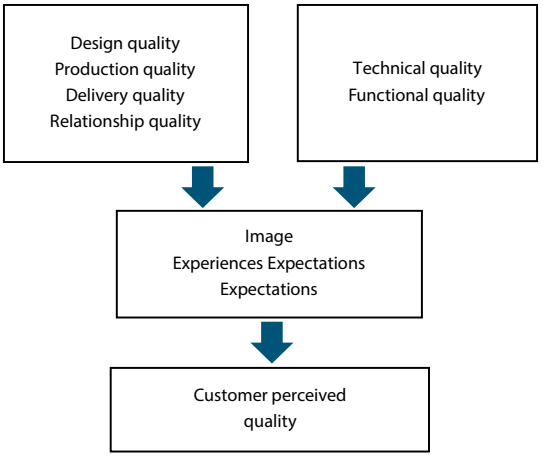

Figure 2. Ch. Grönroos – E. Gummesson quality model

Source: (Rogoziński 1998, p. 209)

The model is characterised by the following features (Rogoziński, 2012, p. 209):

1) it integrates two approaches: one (Ch. Grönroos) which used empirical data from qualitative research in services; and another (E. Gummesson) which was an adaptation of a qualitative model developed in a manufacturing company for the service sector,
2) the syncretic version of the model can be used by service companies, as well as in providing a map of how customers think: for them, quality assessment is the sum of experiences and observations gained from obtaining a service,
3) in the improved version of this model, the authors also assume that from the point of view of the content of the offering, goods and services constitute an integral/indivisible whole.

The impact of quality management on customer relationships

In the context of the discussion presented above, it can be assumed that the quality of services means the provision of services that meet or exceed customer expectations. Therefore, in order for a service to be considered of sufficient quality, it must be provided in accordance with the requirements of the recipient (Zeithaml, Parasuraman, Berry, 1990, p. 18).

By adopting a relational interpretation of quality management, it becomes possible to re-interpret the theory of competition. To achieve this, it is necessary to "add value" to the concept of cooperation with stakeholders. Such an approach to the issue is consistent with an innovative approach to management, highlighting the importance of organizational culture. Following the Oslo Manual in relation to the role of relationship management in organizations implementing a pro-quality orientation, it can be stated that such activities are marketing innovations. This category includes changes in the rules of operation which aim to achieve better results through greater staff satisfaction (an increase in the productivity of employees who identify with the company) and access to resources; including the knowledge possessed by the stakeholders as well as those that were previously regarded only as competitors (Oslo Manual, 2005).

This approach was an inspiration for other authors, one of whom was R. Hoffer, who assumed that quality analysed in the context of business improvement enforces the pursuit of maximizing business results in every area of the company's operations. This should be understood as not only optimizing the processes related to the production of material goods or the provision of services, but also managing relationships that exists both within the organization and between the organization and its environment (Haffer, 2011, p. 3). It seems useful at this point to explain the concept of improvement, understood as a process leading to perfection. According to A. Hamrol, improvement should be understood as activity undertaken in order to achieve benefits both for the company and its stakeholders. Underlining the role of stakeholders indicates the need to emphasise broadly understood relationships. Hamrol also noted that the improvement process should follow the Deming cycle so that it will be possible to identify both existing and potential problems. According to standardized quality management systems, such problems are called non-conformities (Hamrol, 2012, p. 120). The next step, therefore, should be to implement actions that will address the causes of a detected or potential non-conformity. It is essential, however, that organizations should rationally determine the pace of implementing improvement solutions. It is important to remember that people are a key element of this process, and their commitment depends on how well they understand the importance of the implemented actions. Only conscious and motivated employees will be able to become truly committed, taking into account all the different constraints which organisations may face (personnel, premises, finances or information). The implementation of the continuous improvement principle requires the involvement of all the employees. At management level, this can mean setting increasingly ambitious goals. In the case of operational employees, this may involve submitting proposals for streamlining processes, which may result in speeding up individual activities, improving communication, reducing waste, etc.

It must be remembered that the ultimate judge of quality is the customer, who bases their assessment on what they see and understand. It is also important to consider the phenomenon of information asymmetry. The customer usually does not have the same knowledge or experience that company employees and managers have. Thus, a company that wants to guarantee a high quality of their products or services must focus not only on technological processes or work standardization, but also on its relationships with customers.

When building an organizational culture that allows the company to optimize the process of managing relationships with both internal and external clients, it is crucial to remember that quality is a multidimensional concept. According to D.A. Garvin, as a product progresses from the pre-production to production and finally to the distribution phase, the approach to quality changes as the specific phases are characterised by product, production and user orientation. For this reason, D. Garvin proposed various approaches to the concept of quality (Karaszewski, 2006, pp. 16–18):

The transcendent approach: absolute quality defined in a transcendent perspective is defined as an abstract, moral or even religious entity. In this approach quality is intuitively defined as a certain state of perfection that makes it possible to distinguish great quality from poor quality. The transcendent approach was the basis for creating numerous concepts that are fundamental to the development of quality management. These include Deming's fourteen points; W. Shewhart's approach, in which quality is treated as a "good"; or G. Taguchi's discussion of quality in the context of social losses (Kamieński, 1980, pp.138–192)[1]. In the transcendent perspective, quality is synonymous with innate perfection. People learn to recognize quality through experience gained as a result of participating in various types of performances or exhibitions (in relation to art), as well as through principles passed down from generation to generation. T. Peters, characterizing the "German" approach to quality, emphasizes that it is one of the basic values through the prism of which people and societies are evaluated (Karaszewski, 2006, p. 134).

The product-based approach: assumes assessing quality in terms of product characteristics or attributes. Different assessments of quality are connected with the presence or absence of measurable features and properties of products. Thus, this approach has the characteristics of objectivity.

[1] This refers to the concept of 'ideal quality', which is the benchmark for assessing the quality of both products and services. According to G. Taguchi, a product is of ideal quality if it fulfills its designated functions for a specified period of time under specified operating conditions without producing side effects. With regard to services, ideal quality is a function of customer perception and satisfaction. Ideal quality is therefore a certain target value and deviations from it cause losses for society. Losses caused by harmful side effects are referred to in economics as external production and consumption diseconomies. Production diseconomies occur when the producer's market activity generates irreparable losses to other elements in the environment. Consumption diseconomies occur when using a product or service causes other parties, not necessarily involved in the consumption process, to incur certain losses on this account.
According to G. Taguchi's assumptions, a cigarette should be considered a low-quality product even if it has been manufactured by a reputable tobacco company because a person smoking it has a negative impact on other people.

The manufacturing-based approach: approaching quality from the perspective of the manufacturing process involves the need to ensure that the technological process complies with the specified requirements. This approach emphasizes the importance of standardization, which aims to guarantee a product's compliance with the adopted standard. According to this approach, quality is created during the manufacturing process and is identified with the degree to which the requirements specified during the design phase are fulfilled. Analysing the evolution of quality assurance systems complying with ISO 9000 standards, it can be seen that the process of standardizing quality assurance systems increasingly takes into account customer needs. According to ISO 9000:2015, quality (item 3.5.2) is the degree to which a set of inherent characteristics of an object fulfils requirements. It should be emphasized that this applies to both specified and unspecified requirements. This means that organizations implementing systems consistent with ISO 9000:2015 standards must guarantee compliance not only with technical guidelines but also with customer preferences [PN-EN ISO 9000: 2015-10].

The use-based approach: assumes that the customer is the ultimate judge of quality. Thus, quality depends on the subjective assessment of the customer, who verifies the usability of the product. The need to consider the customers' perspective and needs was stressed by J. Oakland (1992). Focus on the customer is also the basis of W.E. Deming's conceptualisation of quality, as emphasized by R. Karaszewski. A product cannot be considered to be of high quality if it does not satisfy both expressed and latent customer needs (Karaszewski, 2006, p. 17). In this approach, quality is therefore equated with the degree to which broadly understood customer requirements are fulfilled.

The value-based approach: assumes the need for taking into account the cost of production or service provision when assessing quality. It should therefore be assumed that a high quality product will be one that complies with the specified requirements and has low manufacturing costs. This approach on the one hand focuses on the benefits for the producer, who will make a profit; but on the other hand, the manufacturer has to provide the customer with a high level of quality at a good price. A product can only be considered of high quality if it represents a value for which the customer is willing to pay.

Based on the above approaches, D. Garvin distinguished eight dimensions of quality (Karaszewski, 2005, pp. 20–21):

- performance – refers to the durability and efficiency when using a product. If the product retains its properties for a long time and guarantees high satisfaction during its use, it can be considered as being of high quality,
- features – understood as additional attributes exceeding the basic product specifications,
- reliability – usually defined as the probability of a product surviving for at least a specified period of time (e.g. warranty period). A product is considered reliable if the possibility of a fault occurring within a specified period of time is negligible,

- conformance – when the product design is complete, its characteristic features are determined. It is important to ensure that the parameters of each product match the previous assumptions,
- durability – the degree to which a product withstands all the harmful effects of external factors without a deterioration in both its functional and non-functional features,
- serviceability – refers to the possibility and economic sense of making repairs. A defect does not have to disqualify a product. The speed and ease of repairing it are important,
- aesthetics – refers to the subjective dimension of quality assessment, taking into account such elements as colour, taste, smell, etc. In terms of aesthetics, the measure of quality is the degree to which product attributes meet customer expectations,
- perceived quality – this aspect also refers to customers' subjective assessment of quality. Customers are often influenced by certain stereotypes about the quality of products connected with, for example, the country of manufacture, qualifications of the staff, historical considerations, or even commonly-held opinions about certain products resulting from promotional campaigns.

Table 1. Changing approach to quality in organizations

Essence	Phase 1	Phase 2	Phase 3
	Compliance of quality with requirements	Customer satisfaction	Customer value
Focus on	• compliance with specifications, • fault-free manufacturing from the start • reduction in faults and corrections	• close contact with customers, • understanding customer requirements, • orientation to customer	• use of measurement tools and value indicators for customers, • monitoring competitors, • orientation to market expectations.

Source: (Prussak, 2006, p.18).

The approach to quality in organizations has evolved over time (Table 1). While initially the focus was on the technological process and the elimination of defects, in the future, the goal will be to create an offering that guarantees the highest possible value for customers. This change is largely a result of companies recognising the primary role of quality in managing organizations, and it involves both the management and lower-level employees recognising that the primary goal of each company should be the satisfaction of not only the external customer but also, and perhaps above all, the internal customer. This is largely due to the fact that only a satisfied employee will be interested in working towards quality improvement. Therefore, the role of the organization is to create such working conditions in which the employees will feel that their knowledge and experience are properly used, and that their professional development and commitment to work are duly rewarded.

Therefore, another role of the organization is building appropriate relationships within itself. Establishing a dialogue between internal customers creates the premises for creating the so-called quality chain (Konarzewska-Gubała, 2003, p. 26).

Emphasizing the importance of relationships in shaping a pro-quality organizational culture can lead to a certain re-evaluation, namely moving away from a competition paradigm towards a cooperation paradigm. Cooperation can be understood as a complex and multidimensional concept. As K. Rogoziński observes, cooperation can take various forms (Rogoziński, 2012, p. 311):

- limited cooperation, relating to the classic relationship between the service provider and the recipient. Assuming professional services as a reference point, the service provider limits the participation of other parties. This is a consequence of an asymmetrical arrangement with the recipient,
- autarkic cooperation that does not go beyond the organization. Although a service product is designed with the participation of the recipient, only the supplier's own service potential is involved,
- external support involving limited cooperation with external customers. This cooperation stems from cost analysis and optimization of individual phases, activities or functions,
- multilateral cooperation between managers of an institution, its owners/shareholders, the founding body, and customers in the context of satisfying their needs; but also with local authorities in promoting, for example, the region,
- cooperation between customers to transform potential customers into stakeholders,
- strategic multi-sector cooperation aimed at achieving long-term benefits.

Conclusions

Considering the importance of relationships in the development of the quality management concept, it seems clear that broadly understood cooperation will become increasingly important. The engagement of the entire internal potential of an organization as well as stakeholders' expectations is important for this process. Involving customers in the process of developing products helps companies obtain added value resulting from their greater attachment to the company's offering. If customers feel that their knowledge and experience are utilised by the company, they will be able to identify with it more strongly. When analysing cooperation in a strategic dimension, it is useful to refer to the work of a British economist, A. Marshall, who is considered to be the pioneer of the cluster concept. Building relationships with specialized producers or service providers operating in a specific area helps to obtain economies of scale, resulting not only from the possibility of exchanging experience with other entrepreneurs but also, and perhaps above all, a greater ability to attract potential buyers. (Klimczuk-Kochańska, 2016, p. 346) The conducted discussion has made it possible to

develop a marketing interpretation of the quality of services, which can be considered to be a marketing innovation.

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Chapter 6

The Concept of Open Innovation – the Essence, Types and Examples in the Petrol Station Sector

Patrycja Wyciszkiewicz, Tomasz Zawadzki

Abstract: The main objective of the chapter is to present the concept of open innovation in the theoretical aspect (i.e. conceptualization of the concept, presentation of OI types, etc.) and in practical terms, on the example of the service station sector in Poland. The concept of open innovation assumes that the organizational boundaries are not tight and there is a transfer of knowledge in both directions. Theoretical and practical aspect of the concept of open innovation have been presented. Authors have conducted research questionnaire among persons responsible for the management of petrol station facilities in Poland and the survey that was carried out on the nationwide sample of adult Poles. The conducted analyses have confirmed that innovations (including those created under the concept of open innovations) have a positive impact on the competitive advantage in the service station sector and are used in building it. Exactly 86.5% of sector experts say that innovation (including open innovation) has a positive impact on competitive advantage. On the demand point of view 49% of the surveyed customers say that the use of innovation by the service station (including those created under the concept of open innovation) will affect the fact that they would use the offer of service stations in this location, and not in a competitive location.

Keywords: innovation, open innovation, petrol station sector

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Introduction

The main objective of the chapter is to present the concept of open innovation in the theoretical aspect (i.e. conceptualization of the concept, presentation of OI types, etc.) and in practical terms, on the example of the service station sector in Poland. The petrol station sector in Poland is a sector of significant importance to the economy, due to the amount of generated turnover. The value of the retail market of fuel sales in Poland is estimated by the Polish Organization of Industry and Trade at approximately PLN 95 billion (POPiHN, 2018, p. 24) and the product and service offer of this type of retail outlets is also used by people who are not directly interested in purchasing fuel.

Theoretical aspect of the concept of open innovation

The issue of innovation has been the subject of research and scientific analysis for many years, but it has not been exhausted yet. Innovations are characterized by transiency, which appears when a given activity, process, production technology, product or service become a standard in a given industry. Only through constant modernization of production stages, organizational structures or processes taking place in an economic entity can it effectively compete with market rivals and try to build a competitive advantage. It can therefore be concluded that innovation is the driving force for the development of the 21st century economy (Sieniawska, 2010, p. 448). They are an indispensable element of the development of enterprises, events or products and services, and they also determine the size of the market competitiveness level of the organization (de Pourbaix, Warzybok, 2018). The researcher who first used the notion of innovation was J. Schumpeter, who described it as "an imbalance that permanently modifies and precipitates the previously existing state of equilibrium from the former bearing" (Schumpeter, 1960, p. 101). Management sciences in the 20th century, especially in the first half of the century, understood and perceived innovations at the production level. At the turn of the 80s and 90s in the 20th century, when the share of services in the market increased significantly, their organizational and marketing aspects were noticed. Drucker, who for the definitions of innovation gave the following statement: "innovation is a series of events that allows the entrepreneur to gain a competitive advantage" (Drucker, 1992, p. 43–44), is one of the first to see the multidimensionality and multi-aspect of innovation. According to P. Drucker, they are a process directly correlated with the occurring economic phenomena and the development of technology. The nature of innovation may be described as social and economic (Jasiulewicz, Waśkowski, 2015, p. 101). At present, through years of research, innovations have evolved from a purely supply or demand approach to the moment when the internal and external connection of the organization with the environment has become an important element of innovation.

When writing about innovations, one should mention the growing importance of the concept of open innovation. This concept was introduced to literature in 2003 by W. Chesbrough (2006), who stated that enterprises can, and even should, use processes

and ideas that arise not only within the organization, but also in its environment. Open innovations in this definition are understood as a manifestation of cooperation in the environment between various entities operating in it. Bilateral or unilateral character of knowledge exchange is assumed. According to many researchers, including K. Obłój, open innovations restore the right position and role of the issue of innovation in management (Obłój, 2007, p. 154). Figure 1 presents the functioning of the idea of open innovations.

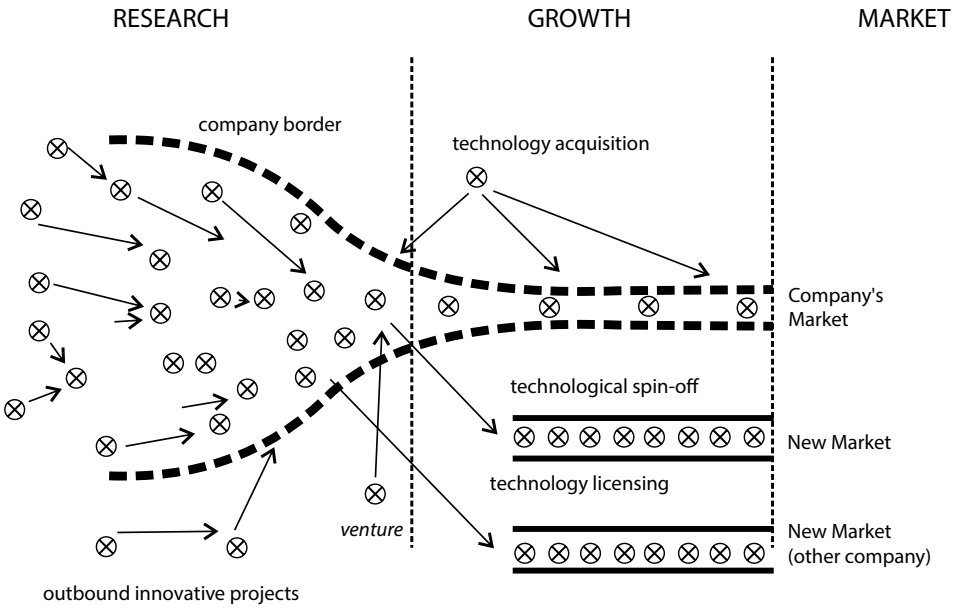

Figure 1. The idea of an open model of the innovation process

Source: Chesbrough (2016).

In the case of open innovations, enterprise boundaries are not "tight", as illustrated in figure 1, as opposed to the theory of closed innovations. This means free transfer of knowledge "from" and "to" the organization (Table 1).

It is emphasized that due to dynamic technological development and the emergence of innovations in many branches of the economy, the concept of open innovations should be treated holistically as a two-way exchange of resources between organizations (Stanisławski, Szymański, Trębska, 2018, p. 52–53). Current market realities are a factor that prevents building and maintaining a competitive advantage solely on the basis of less and less effective internal resources. "In a world of widespread and available knowledge, companies should not rely solely on research/own knowledge, but should acquire specific solutions and share knowledge with other companies" (Osbert-Pociecha, 2018, p. 24).

Table 1. Comparison of closed and open innovation rules

Rules	The paradigm of closed innovation	The paradigm of open innovation
Place for creating innovation	Inside the enterprise. Creating appropriate working conditions inside the company should result in creativity and ideas that will be transformed into innovations.	Inside the company and outside. In addition to the discoveries generated by your own staff, you should acquire or take ideas from outside.
Acquiring specialists	Acquiring the best specialists from the labour market for employment.	Acquiring the best specialists from the labour market for employment. It should be noted that many independent specialists work on behalf of external entities (especially that they are located all over the world).
Market leadership	Advantage by being the first on the market with a given innovation	Advantage also as a better structured business model and not just priority with the product.
Intellectual property protection	New inventions and discoveries require strict secrecy and protection. Patents and protection of intellectual property should be protected.	The company should benefit from the sale and use of its own intellectual property by other entities. If it is beneficial, it should acquire intellectual value from other entities.
Competition	This is our enemy	This is a valuable source of innovation.
Revenues for the organization	Revenues from the market	Income from the market, sale of licenses, *spin off* (separation of a unit from the parent company), licenses.
Costs for the organization	Internal costs of innovation development	Internal costs of innovation development reduced by time savings and increased by acquisition costs.

Author developed based on Kozarkiewicz (2010, p. 220) Limański (2011, pp. 138–139) Sus (2013, p. 374) Barańska-Fischer, Blażlak (2016, p. 35–37).

The concept of open innovations is based on mutual cooperation of a given enterprise with entities from the environment in order to better access to knowledge and new technologies, reduce the costs of implementing innovations, as well as to obtain inspiration from outside the given organization (Juchniewicz, 2014, p. 115). According to this logic, the more external sources available, the greater the company's openness (Laursen, Salter, 2004, p. 1201–1215). As researchers of the subject emphasize, open innovation not only consists of the use of ideas "acquired from the market", it is also a change in the way they are used, managing the enterprise and creating intellectual value (Pohulak-Żołędowska, Żabiński, 2016, p. 492). This concept, considered by some as a new paradigm in innovation management, assumes the use of inward knowledge (external acquisition, the so-called *outside-in*) or outflow of own knowledge , i.e. commercialization of the knowledge base owned by the company (Pichlak, 2012, p. 283). This flow (also referred to as *inside-out*) involves exploring own ideas, inventions and selling licenses. In literature, there is a possible third variant of cooperation, the most effective one, also known as *the blended* or mixed *model* . It involves two-way knowledge transfer between market participants (Lichtenthaler, Ernst, 2007; Lichtenthaler, 2008). According to Chesbrough, the most attention in academic research and industrial practice is gained by innovations using the inflow of knowledge from outside (Chesbrough, 2015, p. 12). Table 2 illustrates the main features associated with the duality of open innovation.

Table 2. Dualism of open innovations

Direction	Scope of activities	Partners
Outside-in (*inflow*, exploration of the environment, centripetal process)	Information flow from the environment to the enterprise. Searching for partners, ready innovations, knowledge, information and skills, inspiration. Purchase or free acquisition.	Horizontal approach: enterprises of a similar profile, competitors, external research centers and universities, technology parks, clusters. Vertical approach: suppliers, sales agents, customers.
Inside-out (*outflow*, exploitation of own resources)	Information flow from the enterprise to the environment. Sharing own resources, knowledge and solutions with other entities. Sale or free sharing.	
Blended	Establishing formal and informal networks. Two-way network exchange, mutual learning and sharing of benefits of working together.	

Author developed based on Stanisławski, Szymański, Trębska (2018, p. 44–46) Rojek (2014, p. 213).

Particularly noteworthy in the literature is the publication of Phillips, who divided open innovations into four types based on two criteria: selection of creators of innovation (open or regulated) and the content of the research question (whether it should come from the company or from clients). Figure 2 illustrates the described division.

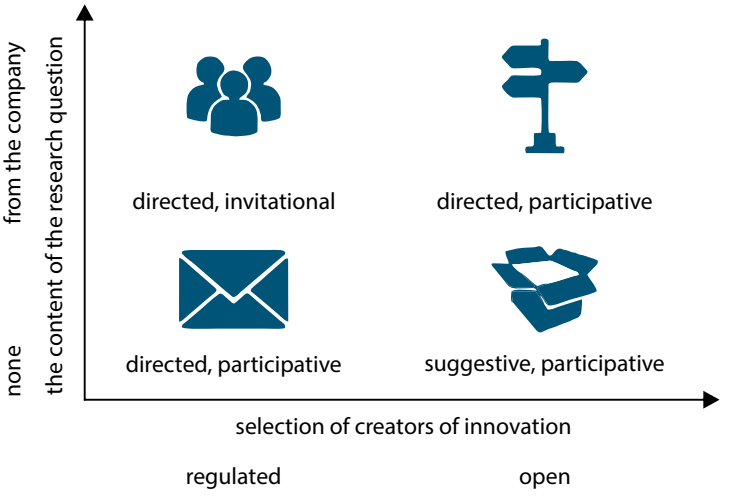

Figure 2. Types of open innovations

Adapted from Open Innovation Typology, by Phillips J. (2010). International Journal of Innovation Science, 2(4), 175–183.

- "Fully open" (*"suggestive, participative"*) it is a type of open innovation in which there is unlimited access and there is a lack of a formulated research problem – it

might be called "everyone has an idea". Everyone can submit their own innovative idea regarding individual products, element of the company's functioning, etc.

- "Expert Ideas" ("*suggestive, invitational*"), where one can also comment on any element of the company's operation, but access is limited to selected people with expert knowledge.
- "A riddle for everyone" ("*directed, participative*") is a type of open innovation, where the problem to be solved is provided by the company and the query is made available to all interested parties.
- "A riddle for some" (*"directed, invitational"*) is the most selective type, where the company defines the problem to be solved and who can participate (Pohulak-Żołędowska, Żabiński, 2016, p. 493–494).

Another division of open innovations found in the literature concerns the way of organizing the "network", the innovation ecosystem. The vertical network and the horizontal network of the innovation ecosystem are listed. Vertical networks are characterized by cooperation between customers, organization and suppliers, while horizontal networks can be a collection of competing organizations, research centers and enterprises created to stimulate innovation (Barańska-Fischer, Blażlak, 2016, p. 16–18)[1]. From a different perspective, cooperation processes under open innovation can take one of the following forms: active participation of users in creating innovation, alliances with external entities in the field of research and development, acquisition or sale of intellectual property rights, and creation of innovation markets – the virtual space of ideas trading (Pichlak, 2012, p. 284). An example of an enterprise operating in the area of open innovation is the Polish YouNick with the 'one-stop-shop for innovation' offer. This service offers a wide range of support for entrepreneurs, from obtaining financing through market research and tests, design and prototyping to commercialization. An example of direct actions can also be staff support in the field of research and analytical competences, sales and management or internal team expertise in the areas of *User Research* (One-Stop-Shop, 2018).

The development of the concept of "open innovation", which originally concerned high-tech sectors, is favored by changes in the social and cultural layer. From the point of view of human resource management, it is increasingly difficult to keep creative people with an "open mind" and eager to "conquer the world" within the enterprise. Young management has a lower level of attachment to the enterprise in which they work. Moreover, the number of independent research centres (development of knowledge markets) has developed over the past years, as well as globalization, the number of people who will be willing to work as a "freelancer", the number of pro-innovative institutions and open innovation platforms (Stanisławski, Szymański, Trębska, 2018, p. 33), as well as the development of communication platforms have increased. In business practice, multimedia platforms (also called forums) are increasingly used to acquire ideas. For example, the IBM group uses this type of innovation, using it as a source of

[1] This publication also contains an extensive stage of reflection on innovation ecosystems and networks of connections between entities (Barańska-Fischer, Blażlak, 2016, p. 8–43).

ideas for its employees and clients. The company organizes the Innovation Jam online festival. During only one edition of the event, over 140 thousand employees and clients (from 104 countries) reported and ranked by importance almost 37 thousand ideas (Kanter, 2012, p. 142). In the sector under discussion, the "Innovations @ Orlen" program deserves attention. PKN Orlen, the leader in terms of the number of petrol stations and innovations in this sector, launched an online innovation platform – "We created a direct bridge between the group and the startups and innovators who, using a simple application form, can send their proposals and get information on the implementation and implementation cooperation with PKN ORLEN "(PKN Orlen, 2018). For the oil company, it is a source of innovation, as individuals, research institutions and entrepreneurs can submit their own project to the platform to implement it within the framework of PKN Orlen's broad activity[2]. A characteristic feature of open innovations is the fact that the client can become a co-creator of innovation at an early stage of its development (Sawin, Rudolf, 2008, p. 94) – as it can be with the ideas submitted via the PKN Orlen platform. Customers play a dual role as they can become a source of knowledge and recipients of the final innovative products (Stanisławski, Szymański, 2017, p. 333). Figure 3 illustrates the dual role of customers.

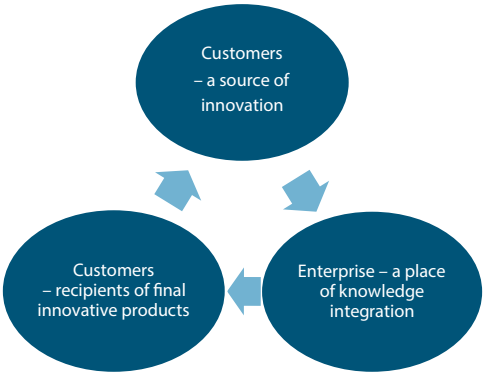

Figure 3. Circulation of ideas under open innovations

Author developed (2019).

Customers are a source of innovation for the enterprise and this stage is referred to as environmental exploration. The knowledge from clients is transferred to the enterprise, where it is integrated with knowledge from internal R&D resources. In the next step, accumulated knowledge, in the form of innovations, is passed on to customers

[2] In addition, PKN Orlen joined the Space3ac acceleration program, under which will search for innovative solutions in the field of, among others, petrochemicals, retail sales support tools and logistics. The implementation of the acceleration project is one of the strategic directions of development of the innovation ecosystem included in the updated Strategy of the PKN Orlen Group for 2019–2022 (PKN Orlen, 2019).

once again and this is the commercialization stage[3] . After some time, the same customers may once again become a source of innovation for the enterprise, due to the limited "viability" of innovation. The source literature often indicates that a satisfied, but still demanding client is the key to success in the process of creating innovation (Szwajlik, 2016, p. 123).

When considering open innovations, mention should be made of the emerging term crowdsourcing, i.e. drawing ideas from the "crowd" understood as cooperation between participants of the virtual world. The essence of crowdsourcing is to acquire intellectual and time resources from a large number of consumers, often geographically dispersed (Malinowski, Giełżak, 2015, p. 272). According to the Kotler concept of "Marketing 4.0.", the focus of creating customer relationships is shifted to consumer activity. It is the consumer who, through social media, has and can actively participate in shaping the company's offer (Kotler, Kartajaya, Setiawan, 2017, pp. 19–28). Crowdsourcing is also easy access to specialized services provided by the so-called *freelancers* (qualified self-employed persons). From the point of view of innovation, crowdsourcing is important as it focuses on creating ideas and product innovations (Dejnaka, 2018, p. 292–293). The concept of User-Driven Innovation (UDI) is associated with the concept of crowdsourcing based on the assumptions that customers are less and less interested in the current commercial offer of a given enterprise, and would prefer to create products and a product offer themselves. The inclusion of clients in the creation process is an indispensable element in today's market realities, and also a challenge for a particular organizations (Baran, Ostrowska, Pander, 2012, p. 37–39; Szwajlik, 2016, pp. 130–131). According to some researchers, the UDI concept is considered a consequence of linear innovation models and the evolution of the concept of open innovation (Hajdas, Wrona, 2018, p. 307). Owing to the current level of technological advancement and the pace of information transfer on a global scale, the management of ideas coming from customers – a dispersed external community has become a permanent institution that companies can use (Boudreau, Lakhani, 2013, p. 43).

The concepts presented above are relatively new. However, analysing the source literature, one can find research results that confirm the correctness of listening to the voice of customers. Research shows that obtaining information from customers has a positive impact on product innovation. Customers also indicate current and future trends (Dąbrowski, 2018, p. 18). It is important to engage customers at all stages of innovation, where customer ideas are transformed into specific parameters, patterns, functionalities, etc. The beneficiaries of *crowdsourcing* and UDI are both parties to the process: organization (through acquired knowledge resources, ideas and ready solutions) and participating community (due to a sense of satisfaction, stimulation of creativity and monetary gratification). The limitations and disadvantages of these processes include possible problems with the transfer of intellectual property and copyright (Lenart-Gansiniec, 2017, p. 224). Prosumption should also be mentioned when writing about the role of the customer in creating innovative products. It is a multidimensional

[3] Commercialization of ideas is associated with the term 'knowledge-based economy [GOW]' – 'it is an economy in which development is based on the commercialization of research and development activities leading to the constant introduction of innovation' (Romanowski, 2011, p. 26).

concept, which in the management perspective means part of the company's strategy focused on cooperation with clients (Murawska, Długosz, 2018, p. 242–243). A prosumer is a person who produces goods for their own use (e.g. electricity) or takes an active part in creating products or providing services (through UDI). When writing about the client as the main source of innovation for enterprises, one should mention the so-called "Dominant Model Theory". This theory assumes that the client is less interested in the technical aspects of a particular innovative solution, and definitely more interested in usability, understood as the ability to meet the needs at a level at least preferred by the individual (Gardocka-Jałowiec, 2015, p. 55).

Analysing the subject of open innovation and the flow of knowledge, one should also mention clusters as places and ways of creating innovation. Some researchers are of the opinion that the period of intensive cluster formation has already come to an end (Haberla, 2018, p. 112), however, they still play an important role in innovation. According to the definition, the cluster consists of enterprises, research centres, business environment institutions, public institutions, associated in a formal and informal way, cooperating or competing with each other in some areas (Bembenek and Moszkowicz, 2017, p. 301). In other words, clusters are a form of organization of enterprises with high innovation potential, and thus playing a key role in building competitiveness and socio-economic development. Relations between cluster participants, their complementary resources, and knowledge of occurring entities create positive conditions for predicting trends, creating innovation and developing novel ways of commercialization. The environment created inside the cluster creates a motivating atmosphere that translates into a high level of ability to create innovation. Analysing statistical data published by the Central Statistical Office, an upward trend can be observed among enterprises in the number of enterprises operating within clusters. The share of industrial enterprises cooperating under a cluster initiative or other formalized types of cooperation in the number of innovation-active enterprises (enterprises employing 10–249 persons) increased over the last seven years by two and a half times, i.e. it amounted to 4.0% in 2010 and 10.1% in 2016. Also the second indicator recorded an increase, albeit to a smaller extent – the share of enterprises from the services sector cooperating under the cluster initiative in the total number of enterprises cooperating in the field of innovation activities amounted to 10.5% in 2010 and 16.5% in 2016 (STRATEG, 2018). It should be emphasized that the level of innovation of Polish enterprises is low. There is still a gap between the level of innovation of the Polish economy and the economies of Western Europe. This is also confirmed by studies carried out by SGH employees regarding the use of the concept of open innovation by Polish enterprises (Sopińska, Mierzejewska, 2017). Business cooperation, in line with the open innovation paradigm, is a chance to even out differences in innovation. As the researchers of the subject record, 'current dominant models of creating innovation and the theory of diffusion of innovation, cooperation with the external environment is one of the conditions for effective creation of innovation' (Gardocka-Jałowiec, 2015, p. 56).

Open innovations, which also include activities within clusters, 'due to availability and lower cost, are an opportunity for the development of both business entities and entire economies' (Misztal, 2017, p. 31). These innovations, especially those using the

voice "from the crowd", are considered inevitable and are the basis in the current "network" society (Sopińska, 2013, p. 299).

The practical aspect of the concept of open innovation – for open innovations in the petrol station sector in Poland

Further considerations in this chapter will be based on surveys carried out by the Authors. The first of these is research questionnaire among persons responsible for the management of petrol station facilities in Poland. The "PetroTrend 2018" survey was conducted on 28/03/2018 at the "PetroTrend 2018" forum (a recurring event involving presidents, board members, senior fuel group directors and service station chains, key suppliers of goods and services, representatives of public administration, analysts and selected experts in the field of management and marketing). From among the 300 distributed questionnaires (the number corresponding to the number of participants), 37 correctly filled sheets were received, representing a 12.3% return level. Due to the nature of the event and the expert knowledge of the respondents, the received level of return should be considered satisfactory. Table 3 presents the breakdown of people completing the questionnaire due to the function performed in the petrol station sector in Poland.

Table 3. PetroTrend 2018 – performed in the sector of responders

Role in the sector	Percentage of total
Owner, petrol station manager	56.8
A fuel company employee	37.8
A company employee associated with the service station sector (e.g. a marketing agency employee)	2.7
Supplier for the petrol station sector	2.7
Total:	100 .0

Note. Author developed (2019).

The obtained survey results reflect the level of knowledge and the perception of the petrol station sector through active entrepreneurs and the senior management level of fuel concerns. One of the questions asked to the respondents' concerned innovations that are open in the aspect of sources of knowledge used to create innovations. Table 4 contains a summary of the answers.

Table 4. Relevance of information sources in the implementation of innovation – distribution of responses

Source of information	Percentage of responses for the particular assessment					Average
	1	2	3	4	5	
Competitors	0	5.4	2.7	59.5	32.4	4.2
Internal sources of information (e.g. employees, including management)	0	10.8	8.1	43.2	37.8	4.1
Benchmarking – copying solutions used in other countries	5.4	13.5	13.5	37.8	29.7	3.7
Information electronic network (Internet and databases)	8.1	16.2	18.9	29.7	27.0	3.5
Customers	0	21.6	27.0	40.5	10.8	3.4
Financial condition of the company (bad or good)	13.5	13.5	13.5	43.2	16.2	3.4
Fairs and exhibitions	18.9	13.5	16.2	40.5	10.8	3.1
Conferences, professional press	21.6	13.5	27.0	35.1	2.7	2.8
Literature	27.0	21.6	13.5	29.7	8.1	2.7
Suppliers of goods	18.9	37.8	21.6	18.9	2.7	2.5
Suppliers of equipment, materials and software	27.0	35.1	16.2	18.9	2.7	2.4
Consulting companies	43.2	32.4	8.1	13.5	2.7	2.0
Universities/research institutes	48.6	29.7	5.4	10.8	5.4	1.9
Technology development support organizations (incubators, chambers, associations, etc.)	54.1	24.3	18.9	2.7	0	1.7

The scale from 1 to 5, where 1 – irrelevant, 2 – not important, 3 – important, 4 – very important, 5 – decisive.
Note. Author developed (2019).

Analyzing the answers obtained, it should be stated that the people managing the service station sector in Poland use both internal and external sources of knowledge. In the case of open innovation concepts, ie innovations obtained from outside the organization's borders, benchmarking has been assessed as a method of copying solutions that have been successfully introduced in other market sectors or other organizations. One should also pay attention to the very poor assessment of the significance of knowledge coming from academic centers and business incubators. The authors of the chapter, after analyzing the answers above and taking into account the changes in retail trade and the development of the concept of open innovations in other market sectors, hypothesised for the purpose of this scientific article: innovations obtained under the concept of open innovation positively influence the competitive advantage in the station sector. In order to verify the above hypothesis, it was decided to conduct a survey among petrol station customers.

In the first place it was decided to identify innovations occurring in the petrol station sector in Poland. The extensive analysis of the offer of petrol stations in Poland, both large chain operators and individual business entities with one property was carried out. Websites of network operators have been migrated, dozens of visits to petrol station facilities have been made all over the country, and articles of internet branch websites have been collected. As a result of the above, a list of twenty-one innovations that are used in the fuel station segment in Poland has been created. Innovations, for the purposes of this study, are understood as new solutions in a given sector. Among

these twenty-one innovations, thirteen of them have the character of innovations obtained as part of the concept of open innovations. Table 5 summarizes the above-mentioned innovations with a brief description thereof.

Table 5. List of identified innovations occurring in the petrol station sector

Identified innovation	The character of innovation in the context of the concept of open innovation	Example
Innovations related to the improvement of the purchase process (eg the introduction of applications such as "Tankuj24", mobile cash registers, the possibility of ordering gastronomic products from the level of a fuel distributor)	Innovations of this character are both internal and external. The "JustDrive" application is an example of innovation created by an entity outside the organization (effect of cooperation between Itmagination and PKN Orlen). The idea of mobile cashiers, launched during rush hours, has been transposed from other formats of retail outlets, such as the Empik chain stores or fast-food establishments.	In the gas station sector in Poland, a departure from the traditional shopping model can be observed more and more often, where the customer is able to make payments for purchased fuel directly at the distributor. Such a solution is used, for example, at selected Lotos stations, where at the "peak" moments, so-called mobile cashiers located next to distributors.
Additional services in cooperation with an external entity (e.g. "Stacja z paczką" – petrol station with parcel services, rent a car service)	Innovation in terms of the shape of the offer, which arose as a result of cooperation with an external organization, eg joint catering offer Shell and Starbucks. Innovation developed together with an entity from outside the organization.	The service station offer is extended by services provided with an external entity, e.g. the LOTOS station network and 99RENT rental service, have launched a car rental service at petrol stations; MOYA station network cooperates with the LINK4 insurer, with non-fuel motor insurance.
Creating own brand of products (e.g. "O!")	Solution understood as an innovation from the perspective of the sector, as the creation of own brands was a phenomenon previously occurring among grocery stores (mainly discount shops, supermarkets and hypermarkets), not petrol stations. Innovation transposed from another sector.	PKN Orlen, as part of the adopted strategy for the development of non-fuel sales, created the "O!" Brand.
The possibility of buying at the store directly from the car (McDrive solution) of goods and services, including the gastronomic offer	Innovation transposed from another sector (gastronomy sector).	This solution can be found at several independent petrol stations. The idea is to provide comfort to customers – shopping at the petrol station store is identical to the McDonald's restaurants (e.g. Orlen Drive project).

Identified innovation	The character of innovation in the context of the concept of open innovation	Example
Extending communication with clients about social media activity	Proper account keeping on Facebook, Twitter or Instagram seems to be obvious and indispensable in the world of today's trade, however, the service station sector is lagging behind the rest of the sectors implementing this way of communication with clients. Innovation transposed from another sector.	Conducting two-way communication with clients via a Facebook fanpage and an Instagram account – a practice often used by independent petrol station chains.
Possibility of payment for fuel directly from the distributor level (eg via QR code)	Innovation in the purchase process. European pioneers are Shell and PayPal, which have developed a payment system based on a QR code (UK market). Innovation developed together with an entity from outside the organization.	Payment via QR code offers on other markets, among others Shell or BP. In Poland, the pioneer is PKN Orlen, which allows fleet customers to pay via the QR code located on the distributor.
Delivery of ordered shop goods to the address indicated by the customer	Innovation transposed from a different format of retail stores.	It can be assumed that the trend of "*convenience*" will evolve to such an extent that goods from the petrol station store will be delivered to the customer's address, especially at night or on a Sunday without trade.
Charging point for electric cars	Innovation developed together with an entity from outside the organization.	Both large operators of petrol station chains such as PKN Orlen and smaller ones (eg the Citronex service station network) have started implementation programs and installation of electric car chargers on their facilities.
Bicycle rental	Innovation developed together with an entity from outside the organization, usually in cooperation with local authorities.	For example, selected PKN Orlen petrol stations offer bike rental service that is associated with the municipal bike rental network.
Wireless charging of mobile phones for customers of petrol stations	Innovation developed together with an entity from outside the organization.	MOYA station in Warsaw at ul. Ordona as the first gas station introduced the possibility of wireless charging mobile devices while using the gastronomic offer.
Self-service gas cylinder replacement cages	Innovation developed together with an entity from outside the organization.	AmeriGas, an entity specializing in liquid gas trading, introduces the so-called butlomates – self-service machines for exchanging gas cylinders modeled on InPost's "parcel machines".

Identified innovation	The character of innovation in the context of the concept of open innovation	Example
Sales of regional goods	Innovation (a new category of products on offer) developed together with an entity from outside the organization. In the case of the "Spiżarnia Regionów" project, this is cooperation with the Ministry of Agriculture and Rural Development and the Agricultural Market Agency	Project implemented by PKN Orlen under the name "Spiżarnia Regionów" – a special, separate sales zone for products from local producers.
Independent ATM	Innovation (new service offer) developed together with an entity outside the organization (a banking institution).	Independent ATMs are installed in an increasing number of fuel petrol, mainly located on motorways and expressways.

Note. Author developed (2019).

The results obtained during the questionnaire survey of the managerial staff, the participant observation carried out and the analysis of secondary data were the basis for testing also customers using the service station offer. The survey was carried out using computer-assisted interviews using websites, the so-called CAWI (Computer-Assisted Web Interviews). It was conducted on the nationwide sample of adult Poles. The total sample size was N = 603. The survey was conducted in June 2018. In order to ensure the representativeness of the sample during the implementation, the shares for the following characteristics of respondents were checked: gender, age, size of the place of residence and the voivodship.

In this study, the respondents were asked to evaluate the innovations presented in Table 5. The station's clients were supposed to answer which innovations (named for the needs of this question) would benefit if they were offered by the service station they use. Figure 4 presents the ranking of innovations according to the Top2Boxes method, i.e. the sum of the answers "rather yes" and "definitely yes".

Out of the thirteen innovations that have been evaluated by customers, more than half of the responses have reached the level of customer acceptance exceeding 50% (Top2Boxes method). The most expected facility, which would be used by as many as 69% of respondents is an independent ATM. Customers of petrol stations spending time in the same facility would like to use the "stop" on the route or schedule of the day for the payment of money. It is true that in many types of petrol stations, "cashback " services are available, but their use is usually associated with purchases of goods and transaction fees.

In the further part of the study it was decided on how many identified innovations [2] affect the customers' purchasing decisions regarding the selection of a place to make purchases, which in turn translates into the company's financial result – building a competitive advantage based on innovation. Figure 5 presents the distribution of responses to the above question.

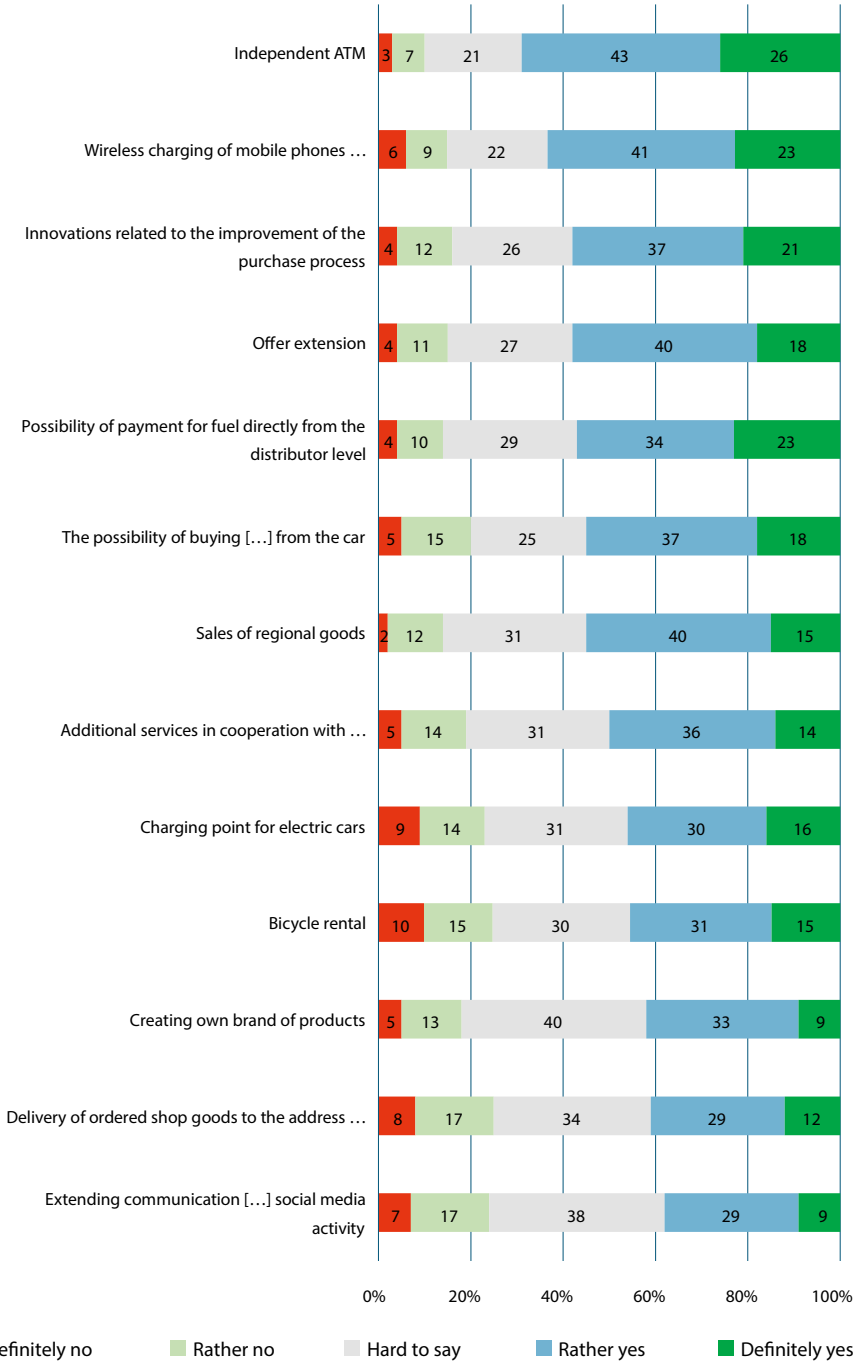

Figure 4. The scope of using the facilities at fuel stations by customers (in %)

Author developed (2019).

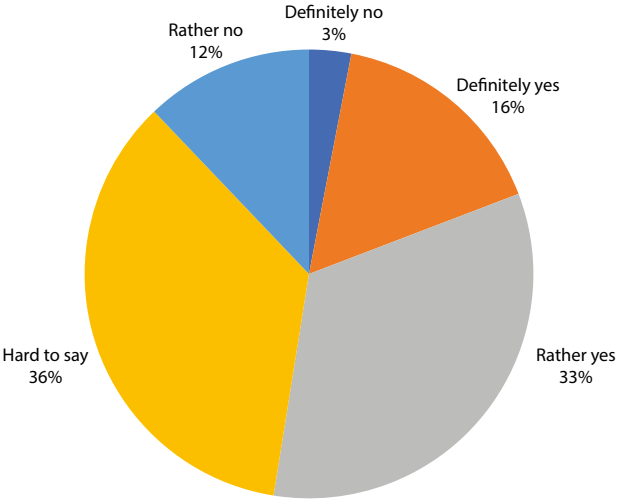

Figure 5. Impact of innovation on the use of petrol stations – distribution of responses (in %)

Author developed (2019).

In general, for the entire sector, almost half of respondents believe that the implementation of innovations by the given station (including open innovations) would positively affect their purchasing decision to use this particular outlet. For the respondents, the introduction of innovations (including open innovations) by an object or a network of petrol stations will be a factor encouraging to take advantage of its offer, and not the competition offer. From the point of view of the enterprise managing the station facility – introducing innovations (including open innovations) is synonymous with the fact that 49% of potential customers will choose a given facility with the implemented innovation, not the object of competition. It is worth noting that 35% of respondents indicated the answer "hard to say", which can be considered as a potential area to expand the impact of innovation. Such action may result in the participation of customers choosing a given petrol station with the implemented innovation at a level well above 50%. The research also shows that the impact of innovation (including open innovation) on the selection of a given petrol station is inversely proportional to the age of respondents. The distribution of responses by age is presented in Figure 6.

The impact of innovations (including those based on the concept of open innovation) on the competitive advantage was also asked during the "Petro Trend 2018" study mentioned above. The results of the survey indicate that 85% of respondents believe that innovations implemented in petrol stations are an important source of competition. Only 8.1% of respondents believe the opposite, and 5.4% do not have the relevant knowledge. Once again, it should be emphasized that the research has been carried out among people who successfully manage petrol station facilities in the Polish environment. The questionnaire also asked directly about the impact of marketing innovations (including those based on the concept of open innovation) on the competitive advantage of petrol station facilities. The vast majority, as many as 86.5%

of respondents claim that innovations (also those based on the concept of open innovations) positively influence the competitive advantage.

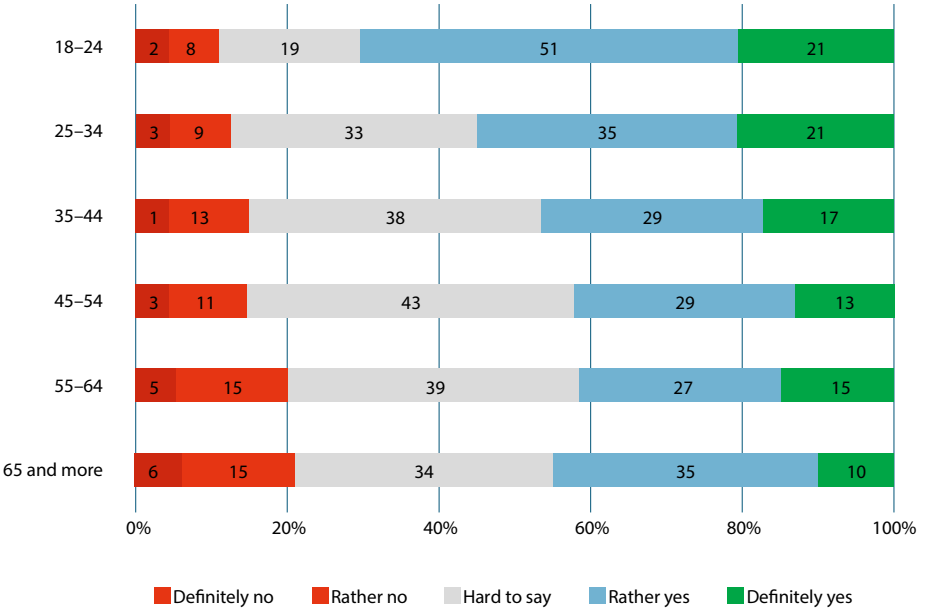

Figure 6. Impact of innovation on the use of petrol stations – distribution of responses by age (in %)

Author developed (2019).

Confirmation of empirical research (among people managing fuel stations and customers of these facilities) can also be found in the literature on the subject. Open innovations, as a relatively new paradigm, very often are indicated in publications as a source of competitive advantage. It is emphasized that they are focused on providing organization with a competitive advantage (Tylżanowski, 2015, p. 21). It results from the fact that mutual cooperation of enterprises enables knowledge transfer and proper development. Research carried out at SMEs proves that the use of open innovations is considered by managers as a source of innovation and improvement of competitive advantage (Stanisławski, 2014, p. 169,181).

Summary

The purpose of the chapter was fully fulfilled – the concept of open innovations was presented in both theoretical and practical aspects. This concept assumes that the organizational boundaries are not tight and there is a transfer of knowledge in both directions. There is a change in perception of the environment, where competition or

another sector of the economy can become a source of innovation. The concept of open innovation, especially in the area of obtaining information from customers, is widely used by organizations, also from the petrol station sector in Poland. Modern petrol stations with their rich assortment of goods and services show features previously attributed to other trade formats, and the fuel sold is only one of the elements of their wide offer. Persons managing petrol stations, taking into account the needs and expectations of customers, try to distinguish their own facilities through innovative solutions that are also obtained based on the concept of open innovation. The authors also managed to show, based on the results of market experts' and clients' answers, that innovations (including those created under the concept of open innovations) have a positive impact on the competitive advantage in the service station sector and are used in building it. Exactly 86.5% of sector experts say that innovation (including open innovation) has a positive impact on competitive advantage. Considering demand, 49% of the surveyed customers say that the use of innovation by the service station (including those created under the concept of open innovation) will affect the fact that they would use the offer of service stations in this location, and not in a competitive location. The conducted analyses have revealed the need for further research activities within the petrol station sector.

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Chapter 7

Green Entrepreneurship in The Quintaple Helix Model

Robert Romanowski, Marek Gnusowski

Abstract: The issue of green entrepreneurship has been receiving a great deal of attention. The purpose of this chapter is to indicate the importance of green entrepreneurs in the quintuple helix model with a supportive role of sustainability-oriented innovation intermediaries. In order to create a detailed review of the critical points of current knowledge on relationship between green entrepreneurship and the quintuple helix model, we employ a systematic literature review methodology. Thereby, the arguments based upon broadly accepted facts are presented and systematized.

Keywords: green entrepreneurship, sustainable development, innovation of services, Quintaple-Helix Model, institutions of innovation system

Introduction

Historically, the economy and the environment have often been at odds. The industrial revolution shifted the economy towards a geo-based economy of coal, iron and steel and to large-scale factory production. Numerous inventors and entrepreneurial firms drove this transition and businesses were mainly the cause of, rather than the solution to, environmental degradation.

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Since that time, the attitude has changed. Being green is nowadays treated not as a cost of doing business, but a catalyst for innovation, new market opportunities and wealth creation (Gliedt, Parker, 2007; Hartman, Stafford, 1997) based on presumptions of sustainable development. The challenge of sustainable development, especially under the aspect of global warming, proves that there is rising demand for 'new green' knowledge solutions and know-how in order to utilize resources innovatively for society and the economy in an environmentally conscious manner (Carayannis, Barth, Campbell, 2012). This idea of achieving sustainable development by innovative attitude is described within the quintuple helix model. The purpose of the chapter, therefore, is to indicate the importance of green entrepreneurs in the quintuple helix model with a supportive role of sustainability-oriented innovation intermediaries.

This study aimed to create a detailed review of previous work assessing the relationship between green entrepreneurship and the quintuple helix model using systematic literature review as a research method. Literature review is a method that helps identify, synthetize, and evaluate the existing work published by scholars and researchers (Onwuegbuzie, Leech, Collins, 2012). The first step was to identify concepts that are relevant to the topic area. We searched the major research databases (Emerald Insight, Google Scholar, Science Direct, Springer) by using specific keywords. Next, a synthesis of the concepts and definitions from each associated literature was constructed to provide a clearer understanding of the relationships between mentioned concepts.

Green entrepreneurship as a factor of innovation

The purpose of this part of the paper is to give an up-to-date assessment of key topics and methods discussed in the current literature on green entrepreneurship. Green entrepreneurship is an important phenomenon from the economic development point of view. Since the 1970s, numerous environmental laws and regulations have been enacted, leading to an "ecorevolution" in economics (Lin, Chen, 2018). Green decision-making implies that decisions are made within environmental constraints, with an emphasis on conservation of natural resources and improvement in the quality of life of consumers (Sorensen et. al., 2014). The main idea is that a business can be profitable while having sustainable aims such as preserving the ecosystem, counteracting climate change, reducing environmental degradation and deforestation, improving farming practices and improving the environment, transporting drinking water, and/or maintaining biodiversity (Dean, McMullen, 2007). Therefore, environmental entrepreneurship could be an opportunity for reduction of environmental degradation "Greening the firm" is a pervasive topic as it touches on all aspects of a firm, including the firm's products and processes, business model, organizational design and management, and financial performance, making it a topic that is relevant across all sub-disciplines of business management (Sorensen et al., 2014).

There is no general definition of green entrepreneurship and there are many available terms describing it such as: ecopreneurship, eco-entrepreneurship, environmental entrepreneurship, entrepreneurship of the environment, sustainable entrepreneurship,

and ecological entrepreneurship. In this study, it is preferred to use "green entrepreneurship" as a more comprehensive concept. Anderson and Leal (1997) have presented a broad definition of green entrepreneurship with an emphasis on environmental outcomes: usage commercial tools for outdoor preservation by entrepreneurs, wildlife habitat development, rescue of endangered species and, in general, improving the environment. Dean and McMullen (2007) define green entrepreneurship as a process for defining and exploiting existing economic opportunities that are environmentally compatible with market failures. This definition suggests that market failures such as public goods, negative externalities, monopoly power, government intervention, and imperfect information result in environmental problems, but simultaneously lead to profitable opportunities for entrepreneurs willing and able to discover them (Thompson, Kiefer, York, 2011). Although there are some differences in these definitions, they are unified in a common theme: ecological and social environmental benefits.

Perspectives taken in the context of traditional entrepreneurship research are insufficient for explaining opportunity recognition in green entrepreneurship, since they consider only economic aspects. The social and ethical dimensions, relationships and cultural networks that bind groups of individuals, places and communities of interest are key drivers to engage in sustainability-oriented behavior (Schlange, 2006; Vickers, Lyon, 2012). For instance, the desire to help other people is often referred to as entrepreneurs' prosocial motivation (Renko, 2013). In addition, the motivation for going green could be derived from the potential to gain reputational advantage related to "greening of the firm", as it may eventually enhance marketing and financial performances of the firm (Miles, Covin, 2000).

The most important characteristics of green entrepreneurs as per Farinelli, Bottini, and Akkoyunlu (2011) and Schaper (2010) are:

- they take new business opportunities and engage in undertakings which usually involve very high risks; the outcome of these business ventures is often unpredictable;
- they have strong internal motivation;
- their activities have a generally positive impact on the environment and on economic stability;
- they consciously seek to secure a more sustainable future.

Moreover, green entrepreneurs are less motivated to achieve financial goals than their traditional counterparts as per Walton and Kirkwood (2010). Their study identifies five primary motivators for being a green entrepreneur: green values, passion, being your own boss, seeing a gap in the market, and earning a living.

Based on a combination of internal motivations and external (hard and soft) structural influences, there are four types of green entrepreneurs: innovative opportunists (driven by structure, e.g. regulation), visionary champions (early adopters), ethical mavericks (value driven) and *ad hoc* enviropreneurs (accidental, finance driven) (Taylor, Walley, 2004).

Green entrepreneurs are said to combine the environmental, economic and social components of sustainability in a holistic manner and to have a different organising logic than the more conventional entrepreneurs (Tilley, Parrish, 2006). Economic goals can be connected with environmental objectives by either removing environmental damaging processes or introducing innovative solutions to address environmentally degrading market imperfections or both (Cohen, Smith, Mitchell, 2008; Young, Tilley, 2006). Moreover, green entrepreneurs can be distinguished from business entrepreneurs using a few distinct features (Schaper, 2010; Patzelt, Shepherd, 2011; Chell, 2008):

- all their activities are green and entrepreneurial,
- they accept risks in a new development and an uncertain field,
- they combine prior knowledge of natural and communal environments with entrepreneurial knowledge,
- they show both motivation for personal gain (perception of threat) and motivation to develop gains for others (altruism),
- they have their own set of ideals and values. Green entrepreneurs share five motives: green value, market gaps, life-style, self-esteem, and passion for industry, products or services,
- show internal *locus* of control,
- the net effect of their business activities on the natural environment and changes in the direction of a sustainable future also separates green entrepreneurs from their business partners.

It is believed, that the activities of green entrepreneurs are different in industrialized and developing countries. Developed countries and international organizations have a lot of emphasis on green and market opportunities, while developing countries tend to focus more on the term entrepreneurship and market needs (Farinelli, Bottini, Akkoyunlu, 2011).

Barriers of Green Entrepreneurship

According to Hamdouch and DePert (2013), financial and economic barriers are the most important ones for green entrepreneurs. In another study, factors like government constraints, financial constraints, sector constraints, company constraints, and lack of demand were identified as green entrepreneurship barriers (Abuzeinab, Arif, Kulonda, Awuzie, 2016)a change in business models is required. The purpose of this paper is to investigate green business models (GBMs. According to Linnanen (2002, p. 74), there are three categories of barriers that green entrepreneurs need to overcome when offering green products. The first obstacle is the challenge of creating a market. It means that there is still a lack of awareness among the general public about the environment, and consumer behavior is slowly changing. The second is the finance barrier. Environmental entrepreneurs with drive and ideas often find it difficult to find investors who share their objectives and ideals. The third obstacle is the ethical justification for

existence of green entrepreneurs, which is a major issue to take into account when mainstreaming environmental businesses and innovations. A quest for ethical excellence sometimes complicates management (Linnanen, 2002).

However, barriers to green entrepreneurship could be overcome with the use of philosophy related to helix models. Green entrepreneurship focuses on implementing green technologies and preventing environment degradation. What is more, the process of creating green innovations could and should be supported by many institutions, which can help to reduce the risk of launching green innovations and are described within Quintuple Helix Model (Carayannis, Barth Farinelli, Campbell, 2012).

The features of Quintuple Helix Model

The Quintuple Helix Model is derived from the triple helix model, developed in 1995 by Henry Etzkowitz and Leydesdorff (1995) and based on the work of Watson and Crick (1953) in the field of biology, who proposed a double helix model, quickly accepted as the discovery of the specific structure of DNA and awarded the Nobel prize in 1962. The triple helix model, based on the aforementioned concept, describes the dynamics of the relationships between universities (science), industry and public administrations in the context of the creation and development of innovation in national, regional and, increasingly, local innovation systems that underpin a knowledge-based economy (KBE).

The triple helix model can be treated as an empirical heuristic that uses economic and not only economic factors as explicators (Schumpeter, 1964; Nelson, Winter, 1982) and the policy of regional and national authorities (Freeman, 1987; Freeman, Perez, 1988). Moreover, the model theoretically defines internal dynamics of change caused by inventions and innovations based on science (Noble, 1977; Whitley, 1984).

The dependencies within this triangle are not defined in advance and are subject to dynamic change. The most important features of the model include the following:

- The emergence of links between the three types of entities (science – business – administration) responsible for the development of a knowledge-based economy and for constantly increasing the level of innovation in a given space. The most important player in this triad are enterprises, with science and administration taking a supporting role in the innovation processes developed in enterprises;
- playing a role originally assigned to another type of entity, universities begin to be entrepreneurial and become a space for the emergence of enterprises. They become key stimulators of the local community, often influencing the decisions of local and regional administrations. Companies, meanwhile, are involved in sharing knowledge, training employees or participating in research projects and developing academic functions. Administrative authorities, acting according to principles of new public management, also become similar to companies, and by educating their employees, to universities,

- the formation of intermediate organizations located in the functional space between the types of actors: spin-offs, spin-outs, incubators and technology parks, research commercialization and patent rights protection offices, scientific networks, as well as local production agreements.

The triple helix model became the basis for considering the directions of development for a knowledge-based economy. Attempts to describe the impact of national and regional innovation systems are made by various contributing authors along with the creator of the model's concept, Leydesdorff. Research on the relationships in national innovation systems using the triple helix model for Germany (Leydesdorff, Fritsch, 2006), Japan (Leydesdorff, Sun, 2009), Hungary (Lengyel, Leydesdorff, 2011), Norway (Leydesdorff, Strand, 2013), and Russia (Leydesdorff, et al., 2015) are based on the assumption that a knowledge-based economy should lead to the creation of patents (see Figure 1.).

The basic innovation 'core model' of the Triple Helix focuses on the knowledge economy. Quadruple Helix already brings in the perspective of the knowledge society (and of knowledge democracy). From the point-of-view of the Quadruple Helix innovation model, it is evident that there should be a coevolution of the knowledge economy and of knowledge society (see also Dubina et al. 2012). The Quintuple Helix finally stresses the socioecological perspective of the natural environments of society. In such a perspective, social ecology focuses on the interaction, co-development and co-evolution of society and nature (Carayannis, Campbell, 2010, p. 59). In the transformation to a knowledge-based society, knowledge-based economy and knowledge-based democracy (Carayannis, Campbell 2009) and simultaneosuly under the aspect of climate change, it is possible to generate new and usable knowledge in conjunction with sustainable development.

The goal and interest of the *Quintuple Helix* is to include *the natural environment* as a new subsystem for knowledge and innovation models, so that 'nature' becomes established as a central and equivalent component of and for knowledge production and innovation (Carayannis, Barth, Campbell, 2012). The *natural environment* is for the process of knowledge production, and the creation of a new innovation is particularly important because it serves for the preservation, survival, and vitalization of humanity, and the possible making of new green technologies. With the *Helix of Natural Environment*, 'sustainable development' and 'social ecology' become constituents for social innovation and knowledge production (Carayannis, Campbell, 2010):

> *"The Quintuple Helix furthermore outlines what sustainable development might mean and imply for 'eco-innovation' and 'eco-entrepreneurship' in the current situation and for our future"* (Carayannis, Campbell, 2010, pp. 62–63)."

The most important constituent element of the *Quintuple Helix* – apart from the active 'human agents' - is the resource of 'knowledge', which, through a circulation (*circulation of knowledge)* between social subsystems, changes to innovation and know-how in a society and for the economy (Barth, 2011). The *Quintuple Helix,* thereby, visualizes

the collective interaction and exchange of knowledge in a state (nation-state) by means of the following five subsystems: (1) *education system*, (2) *economic system*, (3) *natural environment*, (4) *media-based and culture-based public (also civil society)*, (5) and the *po-*

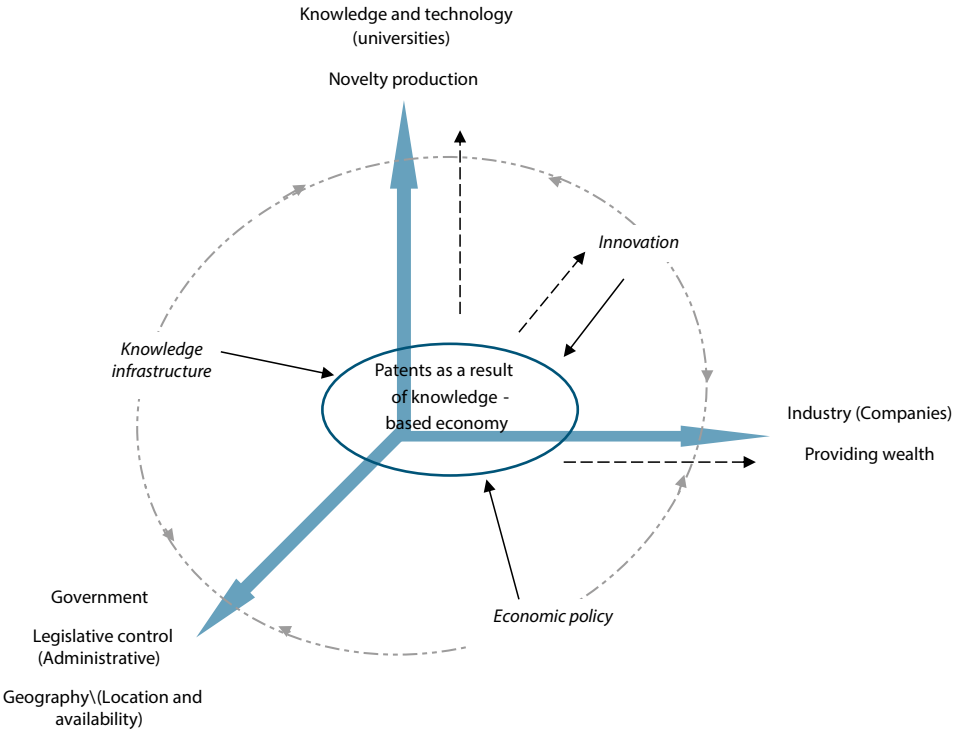

Figure 1. Patents resulting from a knowledge-based economy created on the basis of the triple helix model

Source: Adapted from "The Triple Helix of University – Industry – Government Relations" by L. Leydesdorff, (2013) E. Carayannis and D. Campbell (Eds.), Encyclopedia of Creativity, Innovation, and Entrepreneurship, New York: Springer.

litical system (Carayannis, Campbell, 2010). To analyze sustainability in a *Quintuple Helix* and to make sustainable development determination for progress therefore means that each of the five described subsystems (*helices*) has a special and necessary asset at its disposal, with a social (societal) and academic (scientific) relevance for use (Barth, 2011; Meyer, 2008, Carayannis, 2004).

In summary, the *Quintuple Helix Model* can be described (see Figure 2) as a theoretical and practical model for the exchange of the resource of knowledge, based on five social subsystems with 'capital' at its disposal, in order to generate and promote a sustainable development of society (Carayannis, Campbell, 2010). In this *Cumulative Model of Quintuple Helix*, the resource of knowledge moves through a *circulation of knowledge* from *subsystem-to-subsystem* (Barth, 2011, p. 6).

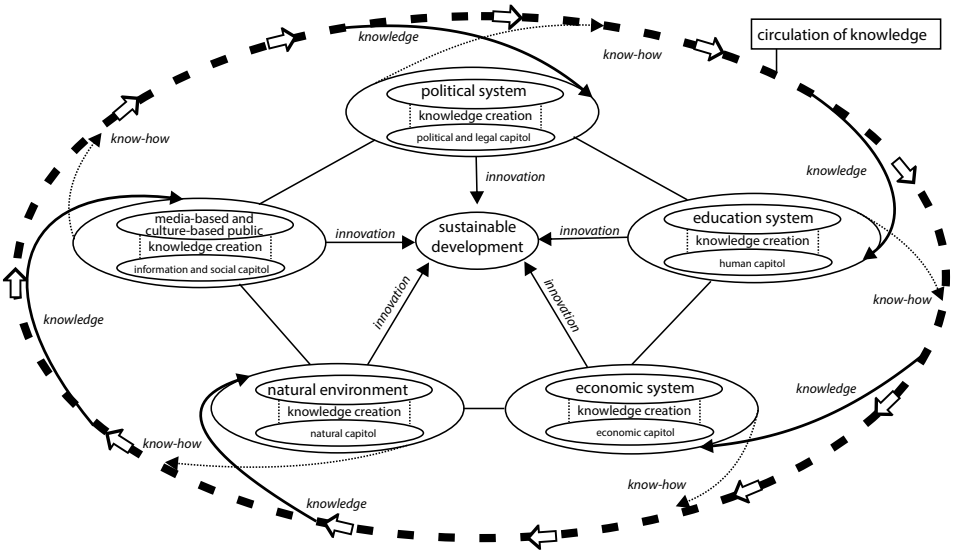

Figure 2. The Quintuple Helix model and its function (functions)

Source: Carayannis, Barth, Campbell, 2012, based on Etzkowitz, Leydesdorff (2000), Carayannis, Campbell (2006; 2009; 2010), and Barth (2011).

This *circulation of knowledge* from subsystem-to-subsystem implies that knowledge has qualities of an *input* and *output* of and for subsystems within a state (nation-state) or between states. If an *input* of knowledge is contributed into one of the five subsystems, then *knowledge creation* takes place (Carayannis, Barth, Campbell, 2012).

This *knowledge creation* aligns with an exchange of basic knowledge and produces new inventions or knowledge as *output*. The *output* of *knowledge creation* of subsystems has two routes: (1) the first route leads to an *output* for the production of innovations for more sustainability in a state (nation-state); (2) the second route leads to an *output* on new know-how back into the *circulation of knowledge*. Through the *circulation of knowledge*, the new *output* of newly created know-how of a subsystem changes into *input* of knowledge for a different subsystem of the *Quintuple Helix*. (Carayannis, Campbell, 2010; Barth, 2011).

Carayannis, Barth and Campbell (2012) emphasise the dominant role of educational system in the quintuple helix model. However, as all helix models presume, effective innovation is based on cooperation among all the entities engaged in innovation process, with dominant role of enterprises, responsible for launching new solutions onto the market. We agree, that a *circulation of knowledge* is kind of regulator in the system, but it is not only the function of universities, because every party in the model is playing a role originally assigned to another type of entity. Moreover, formation of intermediate organizations located in the functional space between the types of actors has high priority in research commercialization, patent rights protection, scientific collaboration, as well as local production agreements, especially in sustainability transitions related to green entrepreneurship and innovations.

Innovation intermediaries support for green innovation and sustainable development

The sustainability-oriented innovation intermediaries that focus on green innovation can be defined as "organizations that assist firms in the eco-innovation process by providing external impulse, motivation, advice and other specific support often by acting as an agent or broker between two or more parties" (Kanda et al., 2015, p. 3). The systematic literature review revealed several pathways by which innovation intermediaries can encourage sustainability. Above all, Kilelu et al. (2011) and Hannon et al. (2014) identified a set of key functions of energy innovation intermediaries in the United Kingdom. The functions included demand articulation (scanning for information/opportunities, foresight through strategic planning, diagnosis through needs/knowledge gap assessment), network building (gate keeping through filtering/selecting collaborators, match making through forming partnerships/market connections), capacity building (organizational development through incubation/support services, training and competence building through management/technical skills/certifications), innovation process management (mediating and arbitrating), knowledge brokering (matching knowledge demand and supply), and institutional support (boundary work between science and practice, institutional change through advocacy, regulation change, and attitudes/practices change). In the context of sustainability-oriented innovation intermediaries, one or more actors within the intermediary would focus on incorporating sustainability principles into these functions in order to encourage and support the creation of businesses and technologies that can act as niche experiments and/or change the regime subsystems.

There are other pathways by which intermediaries can encourage sustainability. For example, some incubators influenced sustainability via the landlord-tenant relationship by requiring tenants to demonstrate specific climate adaptation or mitigation performance, as well as broader environmental, social, economic and governance criteria (Abbate, Coppolino, 2012). In other cases, incubators required prospective tenants to fulfill sustainability focus areas (e.g., sustainable IT, green building, solar and wind energy, energy storage, energy efficiency, smart grid) (Bank, Kanda, 2016). Bank and Kanda's (2016) case studies conducted in Germany, Finland and Sweden outlined the process by which incubators can influence sustainability entrepreneurship through the mechanism of tenant selection by requiring prospective tenants to incorporate sustainability metrics into business plans and goals. They found that some incubators did not fill enough spots and needed to weaken the sustainability criteria to attract more tenants, while other incubators had more applicants than spots and therefore could be more selective regarding the merits of the sustainability ideas. The challenge for incubators attempting to contribute to sustainability is how to gradually influence the incorporation of sustainability principles into the non-sustainability tenant's business plans as they move from incubator to accelerator and eventually graduate to their own office space and growth model.

Kivimaa et al. (2017) found that a university innovation intermediary incubator in Finland did not 'operationally integrate sustainability' into the intermediation process.

Rather, entrepreneurs creating and scaling businesses within that incubator incorporated sustainability on an individual basis. Recommendations for co-creating sustainability with the help of university intermediaries included having a sustainability expert, coordinator, or team to work with the intermediary and its entrepreneurs to ingrain sustainability principles into projects and business plans, using sustainability objectives for the intermediary like requiring a portion of the projects deliver sustainability benefits, requiring environmental management and reporting to the university from the incubator and its occupants, and using lifecycle analysis or other sustainability metrics to evaluate projects and proposals.

Strategies and techniques of innovation intermediaries for sustainability transition

An important finding from the systematic literature review about how sustainability-oriented innovation intermediaries facilitate cross-level interactions is that two processes contribute to the creation and survival of innovations: (1) niche to regime interactions, and (2) regime to niche interactions (Gliedt et al., 2018). Moreover, Kivimaa (2014) identified three techniques employed by innovation intermediaries to contribute to niche development. First, they help articulate expectations and visions, including the application and commercialization of technologies and the advancement of sustainability objectives. Second, they help build social networks by carrying out roles such as gatekeeping and brokering, configuring and aligning interests, managing and finding financial resources, and identifying and managing human capital skills. Third, they instigate learning processes, including knowledge gathering, processing, generation, and combination. Learning processes are also related to the assessment, evaluation, piloting, and prototyping of technology, and investment decisions in emerging businesses.

Additional processes focus on communication, education, training, advice, support, and learning-by-doing. Bush et al. (2017) expanded upon Kivimaa's (2014) framework by adding intermediary activities that facilitate empowering processes to encourage broader diffusion of the technology innovation and the corresponding transformation of the regime. These activities include embedding a new regime with new standards/rules, consulting on policy development as a means of influencing opinion and policy direction, and working to encourage policy change through communication and implementation strategies.

Although these activities fall within the skillset of policy entrepreneurs as regime actors[1], policy entrepreneurs were not discussed in the Bush et al. (2017) study,

[1] Regime actors are "supporters of transition by forming powerful coalitions to push through a reform agenda that fits incumbent regimes interest, or opponents of transition by downplaying the need for transformation" (Fischer, Newig, 2016, p. 13). Intermediaries are defined by the roles that they play, including "providing and distributing necessary information, services, mediation, connecting niche-level activities with regime-level institutions, and diffusing new technologies and practices through the regional level" (Fischer, Newig, 2016, p. 14).

suggesting a need for synthesizing these two areas of literature. Based on findings from case studies, Mattes et al. (2015) built upon the MLP by adding a new intermediary subsystem specifically aimed at encouraging innovation and socio-technical transitions. Mattes et al. (2015) argue that local energy development can be driven by the interactions between the scientific subsystem (e.g., science and education), the political subsystem (e.g., political parties and actors), the public administration subsystem (e.g., municipal and regional administration), the industrial subsystem (e.g., companies compete or cooperate), the financial subsystem (e.g., funding, venture capital, banks), and the civil society subsystem (e.g., NGOs, mobilized citizens). The intermediary subsystem (e.g., labor unions, chambers of commerce, network connectors, new enabling organizations) acts as a key connector between the other subsystems to encourage and accelerate the creation of niche experiments as well as changes to the regime. The co-evolving nature of these regime subsystems and actors that connect the niche to regime are critical for sustainability transitions. Mattes et al. (2015, p. 257) suggests that "change may be triggered, pushed or hindered by either subsystem, and the interaction between them increases the necessity to coordinate".

Therefore, depending on the country, state, or city, sustainability professionals could instigate a transition by mobilizing change from within any of these subsystems; however, it is more likely that a transition will successfully break through and change the regime if coordination occurs between more than one subsystem. For example, competition within the industry and scientific subsystems can drive research and development and innovation, but policy innovation within the political subsystem can help to coordinate and accelerate those innovation processes. Mattes et al. (2015) found that new intermediary organizations were created to encourage and coordinate transitions of the energy system toward sustainability in some cases, while existing organizations such as the chamber of commerce and business networks acted as intermediaries in other cases.

The intermediaries helped to bridge gaps between different cultural norms and industrial, scientific, administration and social subsystem actors in the quintuple helix model. The intermediaries were also able to help overcome bottlenecks like legal challenges and administrative red tape. Klewitz et al. (2012) suggest that innovation intermediaries may be able to strengthen a small and medium sized business' ability to absorb and use new information to create sustainability innovations. The intermediary can provide support to businesses via knowledge gathering, processing, testing, validation and training capacity. The intermediary can also help evaluate the effectiveness of sustainability innovations over time. Klewitz et al. (2012) also suggests that a complex intermediary combining public (local government agency) and private (environmental consultancy) organizations within the regime can act as an external stimulus to get businesses to start thinking about sustainability experiments. This represents a regime to niche function where the intermediary influences and supports sustainability innovation.

On the other hand, Gliedt et al., (2018) examined how sustainability-oriented innovation intermediaries can help to create the conditions to accelerate the timeframe of a sustainability transition by fostering more openings for innovations to break through

from the niche to the regime level. Innovation intermediaries connect the niche to the regime via organizational and institutional networks within and between clusters. As part of making socio-technical system change, the framework identifies how intermediaries work to overcome bottlenecks and gain support for integrated solutions that have economic and sustainability benefits, including improved environmental performance due to technology upgrades (see Table 1.).

Table 1. Strategies of innovation intermediaries for sustainability transition in the quintuple helix model

Strategies	Description	Parties involved*
Proposition 1.	Technology entrepreneurs and champions (niche actors) instigate cross-level revolts by linking environmental behaviour and sustainability goals to organizational change.	Economic and natural subsystems
Proposition 2.	Innovation intermediaries facilitate cross-level revolts by connecting organizations as agents of sustainability to green innovation systems.	Economic, education and natural subsystems
Proposition 3.	Policy entrepreneurs (regime actors) drive cross-level revolts by integrating entrepreneurial actions within innovation intermediaries to broader socio-technical system change.	Political, economic and natural subsystems
Proposition 4.	Policy entrepreneurs (regime actors) provide system memory and stability (remember) to the multi-level system during periods of rapid change and uncertainty.	Political, economic, social (society) and natural subsystems
Proposition 5.	Innovation intermediaries coordinate and integrate their actions with technology entrepreneurs and champions, and policy entrepreneurs, to foster niche creation and regime change activities.	Education (scientific), economic and natural subsystems
Proposition 6.	Policy entrepreneurs (regime actors) work to overcome bottlenecks by aligning ideas and policy mixes with political trends to create integrated solutions during a window of opportunity.	Political, scientific, economic and natural subsystems
Proposition 7.	The extent that organizations as agents of sustainability, green innovation processes, and green economic development strategies, successfully transition the institutions and infrastructure of society to a more sustainable state is associated with the rate of change in propositions one through six.	All party involved, impulse to change can come from any party (quinta-lateral relationships)

* First party mentioned is the leader of change.
Source: own source, modified from Gliedt, Hoicka, Jackson, 2018.

The propositions offer pathways for future research on the relationships between innovation intermediaries, champions and policy entrepreneurs. Given their importance to institutional changes at the regime level that can support niche innovation and diffusion, future research should examine how policy entrepreneurs can contribute to regime change functions (Kivimaa, Kern, 2016) in coordination with niche actors and intermediaries.

Conclusion

The role played by entrepreneurs (business) in helix models is complex. In traditional approach, entrepreneurs created new solutions on their own to profit from innovation

without sharing with others. However, the risk of innovation was lowering profitability and it was the reason to develop the idea of triple helix model with derivate, to support launching innovation by universities and administrations.

Switching to Green Entrepreneurship passes from either being aware of the shift in environmental thinking or being innovative (Brannback, Carsrud, 2015). Modern innovative enterprises treat green entrepreneurship as a key to market success and many researchers associate green entrepreneurship with innovations. If innovation is the essence of entrepreneurship, then green entrepreneurs 'destroy existing conventional production methods, products, market structures and consumption patterns and replace them with superior environmental goods and services. They create the market dynamics of environmental progress' (Schaltegger, 2002)

Moreover, the combination of innovation and green entrepreneurship is vital for creating a new businesses (new wealth, new goods and services), making contribution to job creation or reviving an existing business by exploiting new opportunities (Farinelli et al., 2011). On the other hand, it is a kind of technological innovation that reduces the negative impact of human activities on the environment and can contribute to solving environmental problems such as global warming or loss of biodiversity.

Green entrepreneurship can manifest itself in softer and more radical ways (GREENT, 2016). Softer forms of ecological modernization keep the current economic structures and mechanisms, but at the same time, a higher level of ecological effectiveness is achieved through better technologies. On the other hand, more radical forms of rethinking of the economic paradigm and achieving disruptive innovations exist. Examples of these are the LETS (local exchange trading systems), where goods and services are exchanged using local currencies or without currencies; or community supported agriculture, which enables farmers to receive solidarity funding from the community at the beginning of the growing season in order to guarantee access to fresh and clean food for the members of the community.

Within the quintuple helix model, sustainable development became a core idea, pushing innovators to launch new solutions with support given by universities, administration and society to reduce natural environment degradation. Among seven strategies undertaken by intermediary institutions dedicated to foster innovation processes, the highest synergy is achieved in seventh proposition, based on quinta-lateral relationships.

An important question for researchers and practitioners is to understand how policy entrepreneurs can influence the development of policy mixes that support innovation and green job creation, while guiding the direction of intermediaries, entrepreneurs, administration and universities towards sustainability principles. Innovation intermediaries seem to be necessary to integrate all sides of the quintuple helix model.

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Chapter 8

Crowdsourcing – Foundations and Examples of Use in Marketing

Marcin Lewicki

Abstract: The main purpose of the chapter is to present the foundations of crowdsourcing and possibilities of its application in marketing. The first subchapter focuses on defining the very concept and its essence. Despite the fact that crowdsourcing is relatively well described in the subject literature, many discrepancies were found between the various approaches. Next, the paper discusses individual crowdsourcing models. It is emphasized that there is no compliance in this respect, therefore the number of possible solutions is relatively different. In the third subchapter the areas of crowdsourcing use in marketing are presented. The last part of the chapter refers to presenting the case studies of different crowdsourcing platforms that have been successful in recent years. To achieve the main purpose of the chapter, the desk research method and the case study were used.

Keywords: crowdsourcing, cooperation, consumer behaviour, Internet

Introduction

Crowdsourcing is a term that has been present in the subject literature for over 13 years. Despite this period, the concept is still treated as relatively new, and is a popular subject of many publications in the field of management. While the theoretical basis of this concept should be considered relatively well described, the distinct research gap is related to the optimization and implementation of crowdsourcing platforms in specific areas of the economy. Therefore, the latest publications on crowdsourcing focus

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on these two issues (Van Horn et al., 2018; Daniel et al., 2018; Chawla, Hartline, Sivan, 2019; Clark et al., 2019; Wang et al., 2018). In light of the above, the main purpose of this chapter is to present foundations of the very concept and examples of its use in marketing. In order to fulfil the above-mentioned purpose specific objectives were adopted i.e. defining the concept and its essence (Subchapter 1.), presenting crowdsourcing models (Subchapter 2.), presenting its application in marketing and key success factors (Subchapter 3.) and presenting exemplary solutions of its use (Subchapter 4.). In order to achieve the objectives, desk research and the case study method were used.

Crowdsourcing – definition, history and essence

Crowdsourcing is one of the most frequently defined concepts in the literature in the field of management sciences. Most of these definitions can be grouped into five main categories (Lenart-Gansiniec, 2017):

- an economic approach – crowdsourcing and measurable benefits that can be achieved by the organization in the form of a solved problem, additional knowledge,
- a technological approach – crowdsourcing as an IT tool, channel of communication with the crowd,
- a social approach – crowdsourcing as a way of building social capital, participation, participation, social activation, behaviour and creative work,
- a structural approach – crowdsourcing and processes that compose it,
- a functional approach – application and use of crowdsourcing for a given task.

The term was defined for the first time in 2006 as "the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of an open call. This can take the form of peer-production (when the job is performed collaboratively), but is also often undertaken by sole individuals. The crucial prerequisite is the use of the open call format and the large network of potential laborers." (Howe, 2006). While the above-mentioned definition seems to be the most frequently quoted in numerous publications, it is also worth citing a definition which is one of the most complex: "Crowdsourcing is a type of participative online activity in which an individual, organization, or company with enough means proposes to a group of individuals of varying knowledge, heterogeneity, and number, via a flexible open call, the voluntary undertaking of a task. The undertaking of the task, of variable complexity and modularity, and in which the crowd should participate bringing their work, money, knowledge and/or experience, always entails mutual benefit. The user will receive the satisfaction of a given type of need, be it economic, social recognition, self-esteem, or the development of individual skills, while the crowdsourcer will obtain and utilize to their advantage that what the user has brought to the venture, whose form will depend on the type of activity undertaken." (Estellés-Arolas, González-Ladrón-de-Guevar, 2012, p. 9). This definition is not only the result of one of the widest literature studies on defining crowdsourcing to the

present day but also a relatively successful attempt to create the most integrated definition of this concept. Moreover, based on the definition proposed by Estellés-Arolas and González-Ladrón-de-Guevar, it is possible to name eight characteristics common to any given crowdsourcing initiative (Fig. 1.) that can be used as criteria for filtering individual initiatives to determine whether they are crowdsourcing initiatives.

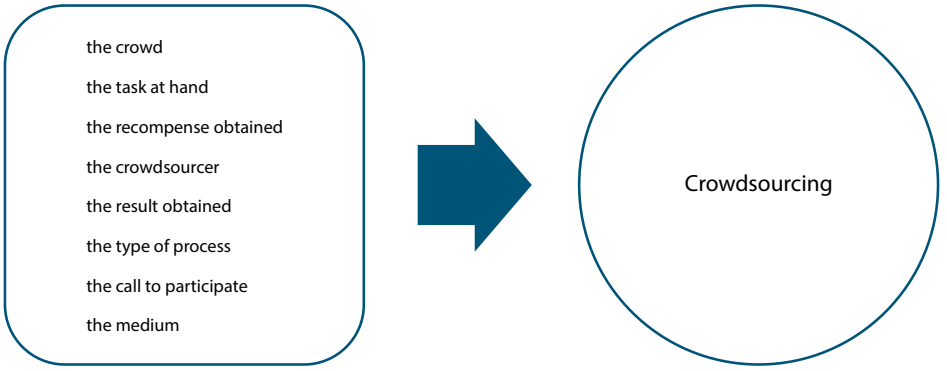

Figure 1. The main characteristics of crowdsourcing initiatives

Source: Reprinted from Towards an integrated crowdsourcing definition, by Estellés-Arolas, E., González-Ladrón-De-Guevara, F. (2012). Journal of Information science, 38(2), 189–200.

Obviously the approach proposed by Estellés-Arolas and González-Ladrón-de-Guevar is not the only attempt to determine the criteria that a crowdsourcing platform should meet. For example, according to a different approach (Hosseini et al. 2014), only four parts should be included in order to constitute the entire crowdsourcing operation. The so-called crowdsourcing pillars include in this case:

1. **The crowd**: the crowd consists of the people who take part in a crowdsourcing activity.
2. **The crowdsourcer**: the crowdsourcer is the entity (a person, a for-profit organization, a non-profit organization, etc.) who seeks the power and wisdom of the crowd for a task at hand.
3. **The crowdsourcing task**: the crowdsourcing task (simply called the task hereinafter) is the activity in which the crowd participates.
4. **The crowdsourcing platform**: the crowdsourcing platform is the system (software or non-software) within which a crowdsourcing task is performed.

Interestingly, the authors of this concept have identified a number of features that correspond to each of the pillars (Tab. 1.) where:

- The crowd is described by the prism of five features i.e.: diversity, unknown-ness, largeness, udefined-ness and suitability,
- The crowdsourcer by the prism of four features i.e.: incentives provision, open call, ethicality provision and privacy provision,

- The crowdsourcing taks by the prism of eight features i.e.: traditional operation, outsourcing task, modularity, complexity, solvability, automation characteristics, user-driven and contribution type,
- The crowdsourcing platform by the prism of four features i.e.: crowd-related interactions, crowdsourcer-related interactions, task-related facilities and platform-related facilities.

These features allow for a detailed description of specific pillars and provide a solid basis for distinguishing individual crowdsourcing initiatives.

Table 1. The four pillars of crowdsourcing and their features

The crowd	The crowdsourcer	The crowdsourced task	The crowdsourcing platform
1. Diversity	**1. Incentives Provision**	**1. Traditional operation**	**1. Crowd-related Interactions**
1.1. Spatial Diversity	1.1. Financial Incentives	1.1. In-house	1.1. Provide Enrolment
1.2. Gender Diversity	1.2. Social Incentives	1.2. Outsourced	1.2. Provide Authentication
1.3. Age Diversity	1.3. Entertainment Incentives	**2. Outsourcing Task**	1.3. Provide Skill Declaration
1.4. Expertise Diversity	**2. Open Call**	**3. Modularity**	1.4. Provide Task Assignment
2. Unknown-ness	3. Ethicality Provision	3.1. Atomic Tasks	1.5. Provide Assistance
2.1. Not Known to Crowdsourcer	3.1. Opt-out Procedure	3.2. Divisible to Micro Tasks	1.6. Provide Result Submission
2.2. Not Known to Each Other	3.2. Feedback to Crowd	4. Complexity	1.7. Coordinate Crowd
3. Largeness	3.3. No Harm to Crowd	4.1. Simple Tasks	1.8. Supervise Crowd
3.1. Number Fulfils the Task	**4. Privacy Provision**	4.2. Complex Tasks	1.9. Provide Feedback Loops
3.2. Number Not Abundant		**5. Solvability**	2. Crowdsourcer-related Interactions
4. Undefined-ness		5.1. Simple for Humans	2.1. Provide Enrolment
5. Suitability		5.2. Complex for Computers	2.2. Provide Authentication
5.1. Competence		**6. Automation Characteristics**	2.3. Provide Task Broadcast
5.2. Collaboration		6.1. Difficult to Automate	2.4. Provide Assistance
5.3. Volunteering		6.2. Expensive to Automate	2.5. Provide Time Negotiation
5.4. Motivation		**7. User-driven**	2.6. Provide Price Negotiation
5.4.1. Mental Satisfaction		7.1. Problem Solving	2.7. Provide Result Verification
5.4.2. Self-Esteem		7.2. Innovation	2.8. Provide Feedback Loops
5.4.3. Personal Skill Development		7.3.Co-creation	**3. Task-related Facilities**

5.4.4. Knowledge Sharing	**8. Contribution Type**	3.1. Aggregate Results
5.4.5. Love of Community	8.1. Individual Contribution	3.2. Hide Results from Others
	8.2. Collaborative Contribution	3.3. Store History of Completed Tasks
		3.4. Provide Quality Threshold
		3.5. Provide Quantity Threshold
		4. Platform-related Facilities
		4.1. Online Environment
		4.2. Manage Platform Misuse
		4.3. Provide Ease of Use
		4.4. Provide Attraction
		4.5. Provide Interaction
		4.6. Provide Payment Mechanism

Note: Reprinted from The four pillars of crowdsourcing and their features, by Hosseini, M., Phalp, K., Taylor, J., Ali, R. (2014), In 2014 IEEE Eighth International Conference on Research Challenges in Information Science (RCIS) (pp. 1–12). IEEE.

Despite the multitude of approaches to defining crowdsourcing and its features, undoubtedly, the Internet could be named the main enabling factor for this concept because companies were able to access potentially unlimited number of people with very little effort (Ghezzi et al., 2018).

Nevertheless it should be also noted that the concept of using the crowd to carry out tasks was present in the economy much earlier i.e. at least since 1714 when the British government launched the Longitude Prize and offered a monetary reward to anyone who could develop a method for tracking a ship's longitudinal position. Then it was continued in subsequent years as part of other projects. (Figure 2.)

Obviously, the history of crowdsourcing does not end in 2006, on the contrary, it was at the beginning of 2006 that a sudden increase in the number of possible solutions based on this concept could be observed.

Crowdsourcing models

In the case of models used in crowdsourcing, similarly to the situation related to defining this concept, it is possible to point to many different approaches. The classification criteria adopted under particular approaches lead to a situation in which the exact number of potential solutions that can be described as crowdsourcing is difficult to determine. For example, based on such dimensions as the outsourcing area, communi-

ty user role, level of collaboration, and type and level of managerial control systems it is possible to develop nine distinct crowdsourcing models (Saxton, Oh, Kishore, 2013):

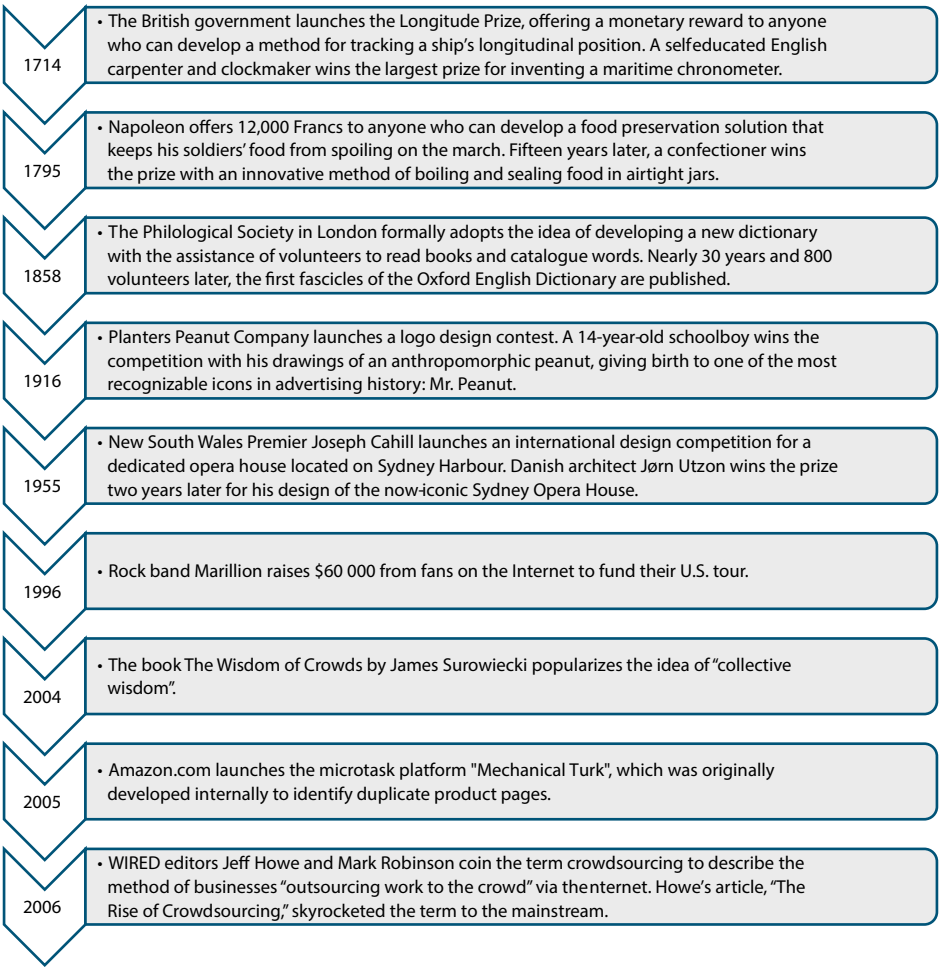

Figure 2. The history of crowdsourcing

Source: Author developed (2019) from topcoder.com, Howe (2006) and web.archive.com

1. **Intermediary Model** embeds major business and control processes in its web platform. In the model, web users serve as a virtual work force that follows the process consisting of three steps i.e. (1) Find -> (2) Finish -> (3) Earn through the web. They search through the lists of tasks posted by a given crowdsourcer, choose and finish the tasks they feel qualified to accomplish, and earn monetary rewards. In the meantime, as an intermediary, the crowdsourcer is actively involved in the various stages of documentation and working processes to facilitate communication

and address intellectual property and copyright issues. In this model, R&D problem-solving activity is outsourced to the online community, and community users accomplish tasks by playing the role of innovative problem solvers such as scientists, researchers, and engineers.

2. **Citizen Media Production Model** generates revenue through user-generated news, TV programs, or commercials, and shares profits with citizen reporters or media producers. In this model, the crowdsourcing media website is not a supply chain to resell the paper-based news to online users after processing them into digital format; instead, the crowdsourcing web space is a collaborative media content production platform, where heterogeneous users create or directly post news content from their perspectives. In the citizen media model its users are no longer passive consumers. They are active producers of the news and earn profits for the media content they contribute. At the same time, the crowdsourcer is involved in the collaborative media production process by addressing the issues of copyright, intellectual property, and quality control, utilizing sophisticated managerial control systems.
3. **Collaborative Software Development Model** embeds into a web platform sophisticated software development processes, from idea selection to software development and sales. The online community serves as a source in the area from business idea initiation through software design to product development and sales. While community members provide different product ideas, the crowdsourcing company conducts market research with the selected ideas, facilitates the product development process, and shares profits from the successful product with involved project members. In this model, the processes of product design, decision making, market research, marketing, and software development are outsourced to online users, who perform the roles of web designer, programmer, project manager, and even marketer.
4. **Digital Goods Sales Model** is mainly used by the royalty-free stock photo crowdsourcing sites and is a solution in which the website is a platform to source in digital goods (mostly pictures) from community users around the world. Approved community users upload and sell their digital pictures through the company-provided web platform, and they are rewarded based on the download count of their goods. To become a member, community users not only have to pass the quality-review process but comply with rigorous copyright policies. In the digital goods sales model, photo tagging, and numerous quality-control processes are outsourced to community users. The company is involved in the production process by providing market demand information and policies to address potential copyright and intellectual property issues.
5. **Product Design Model** allows to manufacture consumer products (e.g., T-shirts, mugs, shoes, calendars, and so on) out of designs submitted by online community members. The crowdsourcer outsources a given product design to online users through an ongoing open call for design submissions. Once a design is submitted, community members begin voting, scoring and commenting about the design. The results are presented to the community on a regular basis and based on established

criteria (like voting scores, comments, and the "I'd buy it" count) the crowdsourcer picks a certain number of designs from which to manufacture products, and rewards the selected designers in a certain way (with coupons, credit points, using a monetary reward etc.). The crowdsourcer can also introduce rewards to community members for additional activities such as the promotion of selected products in the pictures posted on the website.

6. **Peer-to-Peer Social Financing Model** bypasses traditional banks and financial institutions by directly connecting lenders and borrowers. Through the website interface, lenders and borrowers negotiate interest rates directly with each other, and lenders make the individual loan decisions and use their own funds to make the loans. In the peer-to-peer social financing model, web users thus play the role of both banker and borrower, and the lending decision-making and funding processes are effectively outsourced to a geographically dispersed crowd of virtual lenders.
7. **Consumer Report Model** sources in consumer reviews or essays on products, local contractors or healthcare professionals from online community users by using review quality-control measures. The crowdsourcer in this model motivates consumers to provide high-quality product reviews through various incentives (for example differentiates mediocre reviewers from high-quality "category lead" or "advisor" reviews, with different recognition and reward scales). In this model, the review process is outsourced to online consumers who, enticed by strategic compensation measures, play the role of consumer reporters.
8. **Knowledge Base Building Model** aggregates human intelligence information or knowledge of specific topics. This model has been demonstrated by "wikis" as an effective knowledge-building method. In this model diverse methods to elicit domain experts' contributions are implemented (such as a rigorous peer-review system to evaluate the competence of membership applicants, who are supposed to submit data; reward schemes to draw quality information from the crowd etc.). In the knowledge-building crowdsourcing model, the information- or knowledge-generation process is outsourced to community users, and diverse types of incentive measures and quality-control mechanisms are utilized to elicit quality knowledge and information that may be latent in the virtual crowd's "brain."
9. **Collaborative Science Project Model** takes advantage of human participation to complement shortcomings of computer algorithms by introducing large-scale, diverse online communities into the machine learning process. In this model, web users play the role of research assistant, distorted text transcriber, search result evaluator, and so on.

On the other hand, it should be emphasized that the vast majority of crowdsourcing models can be grouped according to the criterion of tasks performed by the crowd (Hopkins, 2011, p. 18). On this basis, four groups can be created i.e.:

- **collective intelligence/crowd wisdom** is a model in which the crowd shares its knowledge (from suggestions sourced from the crowdsourcer employees up to open idea jams conducted on the Internet) with the crowdsourcer within a dedicated environment created by the crowdsourcer,

- **crowd creation** is a solution in which the crowdsourcer source not only ideas but also engages the crowd in product/service creation process,
- **crowd voting** is a model used for sorting a given data based on different ratings provided by the crowd and is often used as a supplement to the two models described above,
- **crowdfunding** is a model in which the crowd provides microloans, thus enabling the financing of certain enterprises of the crowdsourcer.

In turn, taking into account the possibility of crowd monetization, eight models can be distinguished (Dawson, Bynghall, 2012):

1. **Media and data** – creation of media, content, and data by crowds,
2. **Marketplaces** – matching buyers and sellers of services financing through mechanisms including bidding and competitions,
3. **Platforms** – software and processes to run crowd works and crowd projects, for use with internal or external crowds,
4. **Crowd services**– services that are delivered fully or partially by crowds,
5. **Crowd ventures** – ventures that are predominantly driven by crowds, including idea selection, development, and commercialization,
6. **Crowd processes** – services that provide value-added processes or aggregation to existing crowds or marketplaces,
7. **Content and product market** – sale of content or products that are created, developed, or selected by crowds,
8. **Non-profit**.

Undoubtedly crowdsourcing models can be classified along many dimensions. According to Doan, Ramakrishnan and Halevy (2011) especially nine dimensions should matter i.e.: nature of collaboration, type of target problem, a solution for the recruitment and maintenance of users; range of possible actions for the user; a solution for combining user input; a solution for the evaluation of the contribution, degree of manual effort, role of human users, and standalone versus piggyback architectures. Possible system solutions for crowdsourcing based on these dimensions are presented in the table 2.

Table 2. A sample of basic crowdsourcing system types on the World-Wide Web

Nature of collaboration	Architecture	The need to recruit users	User activities	Target problem
Explicit	Standalone	Yes	Evaluating – review, vote, tag	Evaluating a collection of items (e.g. products, users)
			Sharing – items, textual knowledge, structural knowledge	Building a (distributed or central) collection of items that can be shared among users.
			Networking	Building social networks.
			Building artefacts – software, textual knowledge bases, structured knowledge bases, systems, others	Building physical artefacts.
			Task execution	Possibly any problem.
Implicit	Standalone	Yes	Heavily diversified – play games with a purpose, bet on prediction markets, use private accounts, solve captchas, buy/sell/auction, play massive multiplayer games	Labelling images, predicting events, rating movies, digitizing written text, building a user community (for purposes such as charging fees, advertising).
	Based on another existing system	No	Heavily diversified – keyword search, buy products, browse Web sites	Spelling correction, epidemic prediction, recommending products, reorganizing a Web site for better access.

Note. Reprinted from Crowdsourcing systems on the world-wide web, by Doan, A., Ramakrishnan, R., Halevy, A., Y. (2011, April). Communications of the ACM, Vol. 54, No. 4, 86–96.

In summary, in the context of crowdsourcing models there is definitely no consensus on how to classify them. As a result, there are many approaches to this subject, which vary in the degree of detail, as well as in terms of the selection criteria and the number of possible solutions created on their basis.

Crowdsourcing application in marketing activities and key success factors

The use of crowdsourcing should correspond to a specific organizational need and desired outcomes. Based on these two dimensions, it is possible to identify four distinctive areas of its application i.e. marketing/branding, productivity, product/service innovation and knowledge capture. In addition, another important factor differentiating each of the areas is the crowd itself, which can be characterized in terms of the following features (Erickson, Petrick, Trauth, 2012):

- **Crowd knowledge** – there is a close relation between the organizational need and the specific types of crowd knowledge (namely: general, situational, product/service, specialized and domain expertise) required to complete the task,

- **Crowd value** – the value the crowd brings to the task may be a result of: diversity, distributed knowledge or sheer numbers,
- **Crowd location** – organizations can target crowds outside the organization (i.e., external crowds), as well as inside the organization (i.e., internal crowds).

A brief description of each of the areas mentioned above in relation to these dimensions is presented in Table 3.

Table 3. Criteria for the differentiation of crowdsourcing areas of use

	Marketing/Branding	Productivity	Product/Service Innovation	Knowledge Capture
Organizational Need	To increase profits and brand affinity by engaging customers to supplement current resources/processes	To reduce time and/or costs by replacing current resources/processes	To gain competitive advantage and increase innovative potential by supplementing current resources/processes	To advance understanding or accuracy by capturing distributed knowledge to create new resources/knowledge
Desired Outcomes	- Creative outputs - Market insights - Increased market exposure	- Completion of routine, time-consuming tasks, or tasks difficult to automate	- Identification of evolutionary and/or revolutionary product/service opportunities	- Accumulation of knowledge in a central location - Additional source of training data to improve automated processes
Ideal Crowd Knowledge	- Product/service - Specialized	- General - Specialized	- Product/service - Specialized - Domain expertise	- Product/service - Situational - Domain expertise
Desired Crowd Value	Diversity			
		Large Numbers		
			Distributed Knowledge	
Preferred Crowd Location			Internal	
	External			

Note. Reprinted from Hanging with the right crowd: Matching crowdsourcing need to crowd characteristics, by Erickson L., Petrick I., Trauth E. (2012).

Focusing on the use of crowdsourcing in marketing, it should be emphasized that in the subject literature there is a relative agreement regarding this problem. According to Whitla (2009) there are three main areas of marketing activities under which crowdsourcing solutions are applied, namely: product development, advertising and promotion, and marketing research.

In the case of product development and design, various forms of crowd use are applicable in which enterprises attempt to (Whitla, 2009):

- get input and advice on their own product development efforts from existing end-users, and experts who may be able to solve a certain scientific or design problem,

- challenge the crowd to design their own products, which the enterprise may then produce on the crowd behalf, sharing the profits,
- use the crowd to create a product, which then becomes part of the company's offer.

In the area of advertising and promotion, two forms of crowd involvement are noteworthy (Whitla, 2009) i.e.:

- the crowd can be used for activities which are time-consuming and labour-intensive-tasks that although laborious cannot easily be computerised,
- the crowd can be used to help create and develop advertising and promotional campaigns.

Finally, using crowdsourcing for marketing research may take such forms as (Whitla, 2009):

- using the crowd to respond to online questionnaires,
- using the crowd to participate in qualitative studies,
- using the crowd to obtain expert knowledge on issues such as future technological developments, environmental trends or legal developments etc.

For comparison, Gatautis and Vitkauskaite (2013) suggest a slightly different approach to the problem and indicate opportunities to apply crowdsourcing for five marketing activities i.e. product management, distribution management, communications management, marketing research and content marketing (Tab. 3.). Nevertheless, all of the marketing activities highlighted in this way could be equally attributed to the areas proposed by Whitla.

Table 3. Opportunities to apply crowdsourcing in marketing activities

Marketing activity	Crowdsourcing deployment opportunities
Product management	Widely accepted crowdsourcing is used to support new ideas and new products development as well as testing of prototypes.
Distribution management	Crowdsourcing especially might be successful in information product distribution, but also crowd labour might be applied for distribution tasks in physical market.
Communications management	Often addressed issue in research as Internet mainly serves as communication channel. Companies can allocate different communication tasks to users through crowdsourcing.
Marketing research	Crowdsourcing enables to get feedback and opinion from the crowd, however engagement and quality assurance issues are critical.
Content marketing	Crowdsourcing can be actively deployed in content marketing activities.

Note. Reprinted from Crowdsourcing application in marketing activities, by Gatautis R., Vitkauskaite E. (2014). Procedia-Social and Behavioral Sciences, 110, 1243–1250.

Finally, it should be noted that regardless of the marketing area in which crowdsourcing will be used, there is a set of factors that will be conducive to the success of the entire initiative (Fig. 3). On the basis of the list of eleven key success factors proposed by

Dawson (2012) in the context of marketing activities, the following should be emphasized (Gatautis, Vitkauskaite, 2013):

- **Contributors breadth** – a large pool of contributors is necessary, as it makes base for crowdsourcing,
- **Contributors quality** – the size of pool might vary, but it is important for a company to have contributors which have expertise in the field and share relevant opinion,
- **Public reputation measures** – enterprise ability to maintain reputation (brand) maintaining capacity to attract most reliable and highest quality contributors,
- **Internal reputation measures** – crowdsourcing is dealing with external companies services, so for a company it is important to select the highest quality service providers, which also require appropriate skills and capacities,

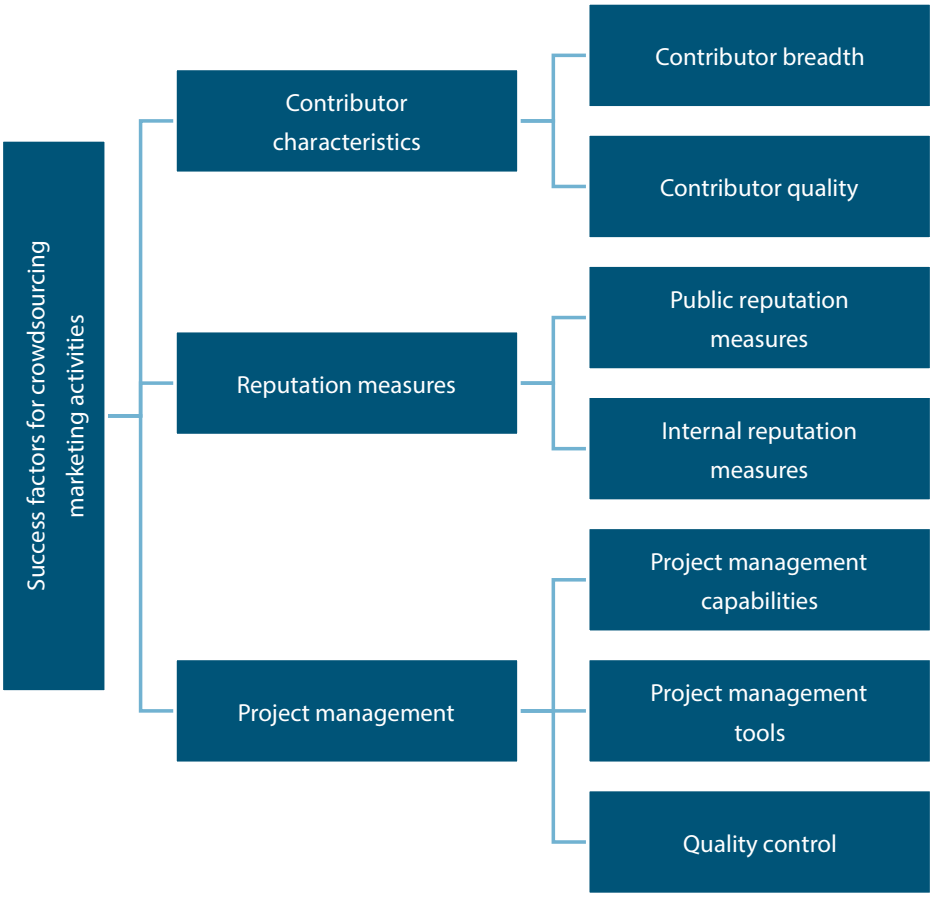

Figure 3. Success factors for crowdsourcing marketing

Source: (Gatautis, Vitkauskaite 2014)

- **Project management capabilities** – crowdsourcing marketing initiatives or certain marketing functions/actions might be treated as a project, so strong management capabilities are required for project implementation,
- **Project management tools** – as the factor above implementation of crowdsourcing will need specific tools and software,
- **Quality control** – the crowdsourcing should lead to high quality outcomes, so appropriate quality control procedures are needed.

Moreover, the main crowdsourcing characteristics mentioned in the first subchapter, as well as its four pillars, can also be explored through the prism of success factors, significantly expanding the list of factors that should be considered when creating any crowdsourcing initiatives.

Crowdsourcing – exemplary solutions

A lot of crowdsourcing initiatives managed to solidify their position in the online environment even before the very definition of this concept appeared in 2006. Some of the oldest that are still functioning include:

- **iStock** (istockphoto.com) – founded in 2000, the platform created the crowdsourced stock industry and became the original source for user-generated stock photos, vectors and illustrations, and video clips. Today it is one of the world's leading stock content marketplaces, offering millions of hand-picked premium images.
- **Threadless** (threadless.com) – founded in 2000, the platform is an online community of artists and an e-commerce website where designs are created by and chosen by an online community. Designs are submitted online and are put to a public vote then the staff reviews the top-scoring designs and based on the average score and community feedback. Designs selected in this way are then printed on clothing and other products, and sold worldwide through the online store and at Threadless retail store in Chicago. Artists whose projects have been selected earn the entire difference between the base price and the sale price of a product. Since the launch over 450,000 designs have been submitted from which over 9,300 have been printed to date.
- **InnoCentive** (innocentive.com) – founded in 2001, the platform is enabling corporations, government, and non-profits across a range of industries to embrace the power of the crowd ever since. Today the company has over 390,000 Solvers from over 190 countries with 60% educated to Master's level or above in its network to help clients to tackle a problem more effectively exploring the vast domain of solution space.
- **Amazon Mechanical Turk** (mturk.com) – founded in 2005, the platform enables companies to harness the collective intelligence, skills, and insights from a global workforce to streamline business processes, augment data collection

and analysis, and accelerate machine learning development and more. Today there is over 100 000 workers available on the platform from over 190 countries.

- **99designs** (99designs.com) – founded in 2008 it operates as freelancer platform for connecting graphic designers and client. Today the platform connects more than 1 million freelancers with their clients, a new design is uploaded every second which resulted in earnings for a global artist's community of over 200 million dollars to date.
- **IndieGoGo** (indiegogo.com) – founded in 2008 is a crowdfunding platform, allowing people to solicit funds for an idea, charity, or start-up business. The company charges a 5% fee on contributions and offers services and resources from key partners to empower entrepreneurs throughout the life of their project. As of today, the platform has raised over 1 billion dollars across all projects over 223 countries and territories.
- **Kickstarter** (kickstarter.com) – founded in 2009, the crowdfunding platform is helping artists, musicians, filmmakers, designers, and other creators find the resources and support they need to make their ideas a reality. Since the launch, 16 million people have backed a project, $4.3 billion has been pledged, and 163,674 projects have been successfully funded to date.
- **IdeaScale** (ideascale.com) – launched in 2009 in tandem with President Barack Obama's Open Government Initiative. As of today it is the largest cloud-based innovation software platform in the world with more than 25,000 customers and 4.5 million users. The software allows organizations to involve the opinions of public and private communities by collecting their ideas and giving users a platform to vote. The ideas are then evaluated, routed, and implemented.

Each of the platforms mentioned above has been successful on the market, and has managed to develop solutions that should serve as a benchmark for future crowdsourcing projects. The vast majority of these platforms inform about the scope of activities undertaken in the very first contact i.e. on the home page, trying to introduce potential clients to the concept of crowdsourcing. In the next step, they try to point out a number of benefits of using this type of solution, which often is followed by a detailed description of how a given platform works (along with a detailed description of its features), both from the perspective of the crowd and crowdsourcer. In order to increase the number of users of a given platform, examples of completed projects or well-known brands that have decided to use crowdsourcing services are often referred to. In some cases (especially crowdfunding platforms), visitors to a given website are provided with very detailed statistics, e.g. regarding the total number of funds accumulated for supported projects or the number of people creating a crowd on a given platform. All of these steps are in line with success factors mentioned in previous chapter. In light of the above, it should not come as a surprise that the majority of new crowdsourcing initiatives make extensive use of years of experience and the solutions developed in this field for these platforms. For example, the GOuep platform which was launched in 2019 (gouep.pl) is an interesting approach to the topic of crowdfunding in higher education, where through a dedicated website, both researchers and students

can submit their projects, which are largely financed from the support of the entire academic community. Another good example may also be the "L'ORÉAL BRANDSTORM 2019" competition (brandstorm.loreal.com). The aim of the Competition was to offer the students a pedagogical and professional experience and the opportunity to innovate within the beauty industry. The participants had to compose a team of three students whose task was to solve specific tasks announced periodically by L'ORÉAL. The whole competition was managed through the use of crowdsourcing platform, where the solution form all participants were gathered.

Despite the existence of many well-established crowdsourcing platforms, the very idea of crowdsourcing can still be considered a relatively fresh one, and should provide further examples of its application in the following years.

Conclusions

Crowdsourcing seems to be an area that is relatively well described in the subject literature. In terms of the theoretical foundations of the concept, there is plenty of sources for crowdsourcing definition, business models, and possible areas of its use or key elements of success. Nevertheless, individual sources relatively often differ in their approaches to this problem. This is particularly evident in the definition of the concept itself, resulting in discrepancies in what should be treated as a crowdsourcing. The situation is similar in the case of crowdsourcing models. On the other hand, the relative compatibility of approaches can be found in the context of possible areas of crowdsourcing application in marketing, as well as in the case of determining the key success factors of crowdsourcing initiatives. Numerous crowdsourcing platforms, many of which have been operating on the market for over 10 years, can and are often used as a benchmark for future initiatives.

It should be noted that crowdsourcing as any form of collaboration has its pros and cons. One of the most important advantage for the crowdsourcer is the fact that it can help to optimize efficiency (especially in the case of repetitive microtasks), reduce costs and at the same time provide solution that responds to actual consumer needs on a much higher level. However, it should also be emphasized that the quality of solutions provided strongly depends on the crowd and if crowd characteristics (such as its knowledge, value and location) does not match a crowdsourcer requirements to solve a given problem, crowdsourcing will simply not work. On the disadvantageous side there are also many control and trust issues such as anonymity of participants or disclosure of solutions to company competitors. Another common problem could be the relatively low level of benefits for the participants for their contributions, which may lead to their exploitation by crowdsourcers (Lewicki, 2016). Nevertheless, some of the described problems are often solved, e.g. Threadless recently decided to increase the level of its contributor's earnings.

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Chapter 9

Financing Innovations

Aleksandra Szulczewska-Remi

Abstract: Much of the literature on entrepreneurial finance relate to challenges associated with financing innovations and financing constraints that many young fast growing companies face. Therefore, the purpose of this chapter was to determinate selected sources of capital available for innovative companies especially startups, at different stages of their development emphasizing their importance for the economy. Based on the literature data spanning 73 research papers, reports and statistical documents, this review sheds new light on advantages and disadvantages of different options for financing innovations and consolidate the knowledge in this field. The findings can provide a practical tool for innovation management because understanding how inventions can be commercialized into an innovative global company through the selection of appropriate sources of financing can be crucial.

Keywords: financing innovations, startups, seed funding, start-up funding, early-stage funding, expansion funding, later-stage funding

Introduction

Much of the literature on finance and innovation relate to the challenges associated with financing research and development as well as financing constraints that many companies face while developing their inventions (Kerr, Nanda, 2014). There are a number of reasons for this situation, however Hall (2010) emphasizes factors such as uncertainty of project outcome and low expected returns from the inability to capture the profits from innovation. Often the two parties, investor and inventor have different

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perceptions and asymmetrical information that very often leads to financial market imperfections (Wilson, Silva, 2013). Innovator may know more about the project than financier and it is often impossible to measure inputs into the innovations not knowing what the output might be. In this case, discrepancy may lead to an increase in agency costs (Kerr, Nanda, 2014). Landström (2017) also argues that the agency problems arise because capital provider cannot be sure on how the entrepreneur will use the capital and that his decisions will actually lead to expected growth of company's value.

Research also underline that young companies like startups at early stage require much more capital than those offered by private investors. This phenomena called "equity gap" is the result of high investment risks and relatively large costs of preparing and monitoring a project. Consequently, entrepreneurs with innovative business ideas have difficulties in raising capital and often fail because they lack the adequate capital and financial control (Nesheim, 2000).

Innovation is a complex process in which scientific, organizational, commercializing and financial activities lead to the development of a new venture. Financing provides the resources necessary to develop new ideas but at the same time engages stakeholders who share risks and benefits. Financing innovations also involves the process of presenting inventions, evaluating them in terms of commercialization, select promising companies and complementing them with managerial and technical support. Finally, financing innovations can provide for a more effective allocation of resources and therefore increase capital productivity and economic growth.

The main objective of this paper is to determinate diverse sources of capital available for innovative companies at different stages of their development. Although the majority of the literature in the field of financing focuses on mature companies, the aim of this review is to concentrate on young and small companies like startups. The order and content of the subchapters have been determined in such a way as to make an overview of the available range of mechanisms to raise funds, starting with the traditional ones through the most innovative financing.

Sources of financing for Startups

The entrepreneurial finance literature investigate diverse spectrum of definitions and classifications of various types of financing sources for newly created enterprises. In most cases scholars group different types of finance as equity and debt but also based on entrepreneurial finance investors characteristics, investment goal, investment approach or investment target (Block et al., 2017). Similarly, many new sources of capital like crowdfunding, mezzanine financing, blended finance, syndicated loans or Initial Coin Offering (ICO) have opened new chapters for entrepreneurial finance.

Based on Organization for Economic Cooperation and Development (OECD) report (2014) there is no agreed definition of innovative financing, therefore existing initiatives are classified as "innovative sourcing" aiming to raise funds for innovation or "innovative spending" which optimise traditional funding sources. Innovative financing for young companies is considered as a financing source used in a new context or incorporate

innovative features that goes beyond traditional finance, generate additional development funds by tapping new funding sources or by engaging new partners (OECD, 2010, World Bank, 2010, United Nations, 2012).

Additionally, the company life cycle and stages of financing were included according to PricewaterhouseCoopers MoneyTree survey definitions applied by many authors like Nesheim (2000), Preston (2007), Wilson and Silva (2013) when classifying different funding sources for startups.

Seed, Start-Up and Early-stage funding

The majority of empirical work on financing innovative startups considers choosing right source of capital so entrepreneurs can research whether an idea, product or service is technically feasible and suitable for the market. Early-stage technology-based ventures' main challenge is to attract external investors who generally prefer to see operational business rather than the invention before investing capital. In the literature on early-stage capitalization process, much attention is paid to the importance of the experience and knowledge of the management team, the attributes of the technology and the characteristics of the market in which they operate (Gompers et al., 2010). It is rare however, that all of these three factors can be combined. Due to the dynamic environment in which startups operate and the fact, that investors can accept the risk in one or two dimensions (for example not fully developed technology but on a highly growing market) much of entrepreneurial finance research rely on exploring how various configurations of these factors affect early-stage financing (Kaplan et al. 2009, Townsend, Busenitz, 2015). According to Wilson and Silva (2013) there are three financing instruments at seed and early-stage financing cycle: 1) equity instruments (bootstrapping, crowdfunding, business angels), 2) grants, loans and guarantees and 3) tax incentives.

Bootstrapping

Launching a startup with modest funds, relying on money from the entrepreneurial team, family and friends is often called bootstrap financing. Entrepreneurs at early stage depend heavily on this insider financing because they need to build their experience and know-how as they go. At the same time bootstrap entrepreneurs focus on reducing costs to improve cash flow through advance payment from customers or delaying payment to suppliers, minimalizing investments or account receivables. Very often they jointly use resources like office space, equipment (Windborg, Landström, 2000), credit cards or other methods like working capital management.

However, contemporary knowledge on this seed financing argue that it is a very important source of capital for a new venture. Robb and Morelix (2016) showed that 63.9% of all sources of startup capital are coming from personal and family savings, while in Asia this share is even higher and will be 73.2%. Most European funders indicates

their own savings (69.1%) followed by support from friends and family (25.1%) as main sources of financing (Kollmann et al. 2015).

The goal of bootstrapping is to maintain ownership, flexibility and independence by reducing external dependencies. This source of finance gives companies that start small to probe the market and adjust their business model, learn from their customers and keep their cost curve below revenue curve once the new venture starts growing (Byers et al., 2015). Waleczek at al. (2017) argue, that owner-finance bootstrapping is a strategic choice rather than a necessity and is independent from the environmental or financial conditions of the new firm. However, some entrepreneurship scholars maintain, that bootstrapping might hinder future investments and that the time spent on implementing marginal savings neglects other more strategic tasks in the firm (Vanacker et al., 2011).

Crowdfunding

Crowdfunding is defined as online money raising from a large number of people. Typically, crowdfunding platform users provide small amounts enabling the project to be realized or a starting venture to develop seed capital as an alternative to traditional venture capital investment (Schwienbacher, Larralde, 2010). In recent years, crowdfunding financing gained a lot of attention due to its spread in creative, social, sports, artistic projects, up to the opportunity of purchasing company shares (equity crowdfunding) or co-acquiring a property (real estate crowdfunding). Crowdfunding gives entrepreneurs the opportunity to test their products or business idea, build a network of clients or active users and promote the company by social media. Usually, those providing funds receive monetary or non-monetary compensation, while platform operator acts as intermediary and receives a fee for transaction.

According to Dietrich and Amrein (2017), crowdfunding can be divided into different segments like "reward-based crowdfunding" often referred to "crowdsupporting" where non-monetary reward receive users support a given campaign. In this case, the compensation takes form of the product or services but funding can also be provided without any measurable consideration in which the focus is on social or altruistic motives (crowddonating). This way, for the seven years in a row Kickstarter funded films were nominated for Oscar winning films like latest "Joe's Violin" nominated for Best Documentary Shorts in 2017 or Oscar nominated animation "Loving Vincent". Sites like Sellaband allow musicians to raise capital to finance the recording and production of an album (Agrawal et al., 2015), while Crowdpac can also be used to raise funds for political campaigns. Pages such as Justgiving or Virgin Money Giving were set up by people who raised money for charity by running the London marathon (Smith et al., 2014).

In more advanced form, crowdfunding is often considered as a practice of Financial Technology (FinTech), especially when consideration is of a monetary nature. Among this form "crowdinvesting" provides funds for a stake in the business, like AngelList, which currently allows only accredited investors (Agrawal et al., 2015) or for interest income that is called "crowdlending". An important part of this financing forms is "invoice trading" that include the disposal of unsettled invoices. Dietrich and Amrein (2017)

point out that such a form of financing can be supported by several investors or only one counterparty.

The rapidly growing interest in this online form of financing results mainly from statistics from Kickstarter, the leading crowdfunding platform in the United States, which has raised USD 3.75 billion in pledge to fund over 146,000 projects (Kickstarter, 2018). University of Cambridge Annual European Alternative Finance Industry Survey report (2018) showed, that the total European online alternative finance market grew by 41% to reach € 7671 million in 2016. Excluding leading United Kingdom, the European market grew 101% from € 1019 million to € 2063 million in 2016. China still hosts the largest crowdfunding market registering USD 102,2 billion in 2015 and 243,48 billion in 2016 (University of Cambridge Asia Pacific Alternative Finance Industry Report 2017). Despite over billions spent by crowdfunding backers, by signing in 2012 the JOBS Act (Jumpstart Our Business Startups Act), US Congress encourage this source of capital for new ventures.

Nevertheless, Mollick (2014) examining the dynamics of crowdfunding found that projects generally succeed by small margins, while social capital and preparedness are associated with an increased chance for a success. Harun et al. (2017) also suggest that numerous fundraising initiatives have failed because of campaigns information asymmetry for potential backers. Due to the novelty of this capital source new research opportunities in this area are opening up especially regarding factors that affect the success of the campaign like the role of family and friends in supporting projects or the effect of social influence (Kuppuswamy, 2018).

Grants and tax incentives

Some new ventures are eligible for government grants at early-stage development, especially based on cutting-edge research, including research conducted at universities. The role of this funding has been wildly discussed by scholars because government play a crucial role as a determinant of innovation capacity. To ensure optimal allocation of resources for innovation, most industrialized countries support private research and development through subsidies or tax incentives. The aim of theses politics is to stimulate investments in innovation especially in highly capital intensive areas like eco-innovations (Szulczewska-Remi, Foltynowicz, 2016).

In many regions such as the European Union, innovation financial support policy has become a key strategic element to create jobs and encourage economic growth. Therefore, European Union actions aimed at bringing innovative ideas into life through the largest EU Research and Innovation programme ever Horizon 2020 (H2020) with the budget of 80 billion Euro and the European Structural and Investment Fund (ESIF) of 110 billion Euro. Parts of H2020 is related to space research, raw materials, and innovation in small and medium-sized enterprises (SMEs), Key Enabling Technologies like industrial biotechnology and nanotechnology, as well as five other priorities areas of the EU's industrial policy like advanced manufacturing, green vehicles, sustainable construction, bio-economy and bio-based products and smart grids (European Commission, 2018).

Most of governmental substitutes for innovation are designed to support company's competitiveness and firm's innovative capabilities. Autant-Bernrd et al. (2013) showed upon empirical results in Europe the role of regional innovation policies in supporting the institutions which generate knowledge. According to Bronzini and Piselli (2016) such programs have significant impact on the number of patent applications especially in smaller firms. They may encourage firms to take more ambitious projects, start R&D collaboration and improve R&D management. Though, Wang (2018) argue that degrees of government intervention vary from directive support by "actively advising industrial policy" and selected areas of industry to "facilitative intervention" by creating positive environment for companies and enhancing conditions for competitive enterprises. He illustrates effective government intervention in Singapore on enhancing innovation especially by big players as compared to less active Hong Kong industry innovation that is mainly created by small local firms as examples. Byers at al. (2015) discuss American grants available to support very early-stage and small-scale business like the Small Business Innovation Research (SBIR) program or Small Business Technology Transfer (SBTT) that effectively support startups' research activities.

Criscuolo et al. (2012) provided some insights into the Regional Selective Assistance programme in the Great Britain showing that government grants to smaller firms in economically disadvantaged areas of Great Britain can increase employment, but they have no impact on productivity. Guan and Yan (2015) argue, that in China all financial initiatives of government were unrelated to the companies' patents. Moreover, Direct Earmarks during China's economic transition in the 1990s affected patents in these enterprises negatively and only tax credits and special loans have helped the Chinese firms to achieve economic success in the last decades.

Fiscal incentives to stimulate business research and development has emerged in popularity in all OECD countries. They allow companies to reduce its tax burden (or other forms of mandatory contributions like social security) depending on the size of R&D. Based on Köhler at al. (2012) research government funding through R&D tax incentives can reach a similar magnitude as direct R&D funding. The main advantage of R&D tax incentives in a government's portfolio of policy instruments is the lack of demarcation for particular areas of the economy, which are treated as preferential in financing, lower selectivity in terms of firms and industries as well as the ease of prediction from the point of view of the company's long-term financial planning. However, this policy creates significant uncertainty of a country budget, complicates tax system and allows firm to deduct the tax payment even if certain research would have been carried out anyway (Köhler at al., 2012).

Overall, government substitutes for companies might have both positive and negative impact on small companies. This however, mainly depends on understanding market needs and adjusting forms of support to such needs. The main advantages of this source of capital are no payback requirement and not giving up equity in the venture. They also give a chance for highly capital-intensive industries, especially young companies like startups, to develop their inventions and mobilise private financing to support the development of these companies in later stages.

Business Angels

The term angel investor originally comes from Broadway, where it was used when describing the people that provided financing for theatrical productions. Today, business angels are individuals, mainly former entrepreneurs who take the risk of new venture and provide capital, knowledge, experience, business skills and networks as new company grows. According to Politis (2008) there are four different value added roles performed by business angels: sounding board/strategic role; supervision role; resource acquisition role; and mentoring role. Angel investors help to define business strategy, evaluate product-market activities, monitor financial performance, coach the entrepreneur, provide financial, legal and marketing know-how. Mason and Harrison (1994) describes business angels as individuals, who invests money in an unquoted business in which there is no family connection. In their later works, they also point out that angels invest locally and in minimum venture capital transaction deals (Mason, Harrison, 2008). Preston (2007) shows that angels typically have a sense of social responsibility and enjoy community involvement, have desire to pass on knowledge, take a role in the entrepreneurial process and are able to tolerate the loss of the whole investment. What is more important, business angels invest their own money with smaller amounts at a time.

Business angels can be distinguished based on their previous investment experience (novices versus experienced), involvement in the new venture management (active versus passive) or by the number of angels (individual versus group investors like syndicates or through a fund (angel fund or public-private partnership)) (United Nations, 2012). One of the most recognized global accredited angel investor network is Keiretsu Forum operating in North America, Europe and Asia who has invested more than USD 750 million in over 1,000 fundings since inception, and backed over 170 companies in 2016 alone (Keiretsu Kapital, 2018).

As per the data, angels are the primary source of outside capital for very young companies and represent the seed and start-up capital in entrepreneurial ventures. Based on the European Trade Association for Business Angles, Seed Funds and Early Stage Market Players (EBAN) (2017), angel investment remains the main financier for European start-ups with 6.7 billion Euros investment in 2016 (growth of 8.2% from 2015), which is only part of the US angel investment (USD 21.3 billion) according to the Center for Venture Research at the University of New Hampshire (2017).

Business angels typically invest between € 25,000 and € 250,000, and up to € 12 million for syndicated angels and angels investing via co-investment funds (EBAN, 2017). For comparison, in China most investments range between UCD 163,425 and USD 817,126 (Wang et al., 2016). In terms of industry, technological (like FinTech, BioTech and MedTech) and ICT sectors play a dominant role in Europe (39% and 36% respectively) followed by healthcare (13%), media (7%), web/e-commerce (6%) and transport/logistics (3%) (EBAN 2017). In the US 20% of investments go to healthcare services/medical devices and equipment, 14% to retail services, 10% to biotech, 8% to industrial/energy and 5% to IT services. Later, in China the technology, media, and telecom

(TMT) sector is dominant (57.1%), followed by energy conservation and environmental protection (34.3%) and biological medicine (20%) (Wang et al. 2016).

The value of business angels for the local economies and entrepreneurship is also supported by national policy initiatives like the National Innovation and Science Agenda in Australia aiming to grow the angel and microfinancing sector. This is followed by regulations introduced by some countries like laws that enable access to crowdsourced equity funding schemes in Australia, Financial Conduct Authority in United Kingdom, Financial Markets Conduct Act in New Zealand or the JOBS Act in the United States (White, Dumay, 2017).

There are some evidence showing that business angels create the informal venture capital market and that angel investors fill the "equity gap" between the money that young companies can raise from internal sources like family members and friends, and the investment venture capitalists may provide (World Bank, 2012). Van Osnabrugge and Robinson (2000) argue, that angels are the largest sources of risk financing, because they offer 80% of seed and startup capital for new high-tech companies. Due to the essence of both sources of financing innovations key differences between them are summarized in Table 1.

Table 1. Key differences between Business Angels and Venture Capital

Key features	Business Angels	Venture Capital
Source of funds	Individuals that invest their own money	Investors who act as limited partners invest others' money
Responsibility	Personal financial responsibility	Limited personal financial responsibility but responsibility to management and shareholders
Investment experience and capacity	Considerable investment experience and investment capacity	Some investment experience and limited investment capacity
Investment stage	Early stage, focus on younger companies	Mostly later stage, larger number of smaller investments
Exit strategy	Less important	Very important
Length of holding period	3–5 years	3–8 years
Ventures' ownership	Create little dilution for the venture	Require larger percentage ownership of the venture
Long-term perspective	Can lack long-term perspective	Enhance venture's reputation and credibility
Control upon investment	Advisory role to the funder and management team	Representation on supervisory boards and chapter voting rights at the general meetings
Rate of return	Modest return	High return on investment

Source: Own study based on Preston (2007), Avdeitchikova et al. (2008), Metrick and Yasuda (2010), Byers et al. (2015).

Initial coin offering (ICO)

Initial coin offerings (ICO), also called token or crowd sales is one of newest fundraising opportunities. In a typical ICO startups might collect capital on a per-to-peer platform in a form of main cryptocurrencies like bitcoins from a number of backers by pre selling "tokens" in order to: 1) give cash flow rights to future earnings; 2) to give access to the project's future product or service; 3) to function as voting ballots for governance over project development/operation; or 4) to function as internal currencies within the project to be developed (Li, Mann, 2018). Despite the possibilities offered by this form of financing (ICO raised over USD 4 billion across over 2000 deals in 2015–2017) exceeding venture capital investments in blockchain technology (Sockin, Xiong, 2018), it raises a lot of controversy, especially in relation to its real economic value.

Expansion and Later-stage funding

Bank finance in innovation

Economists had a long held the view that innovation activities are not likely to be supported by banks and debt (Hall, Lerner, 2010). Conversely there are more and more scientific evidence showing that bank debt is a very important source of external financing for many companies.

Firstly, bank loans eliminate the problem of asymmetrical information between the financing party and the entrepreneur, simply because banks transfer all of the investment risk to the borrower. Therefore, in the event of innovation failure, the loan agreement forces the repayment of the incurred liabilities. Second, banks secure this type of loans with intangible assets such as intellectual property (IP) that potentially become sources of cash flows and therefore serve as an benefit of getting a loan (Mateos-Garcia, 2014). Mann (2014) produces that patents are often used as collateral in such instances. Moreover, he showed that 16% of patents granted by the US Patent and Trademark Office (USPTO) has been pledged as collateral. Robb and Robinson (2014) confirm, that external bank financing is an important source of startup capital, even for companies who don't have any tangible or intangible assets as collateral.

According to Robb and Morelix (2016) entrepreneurs rely on business loans from banks as a second after personal and family savings source of startup capital. In Europe 17.9 percent of young companies use credits and 10.3 percent personal credit cards. Compared to Asia, 18.7 percent of entrepreneurs practice business loans from bank and as much as 17.6 percent personal credit cards.

Mezzanine financing

Mezzanine financing is accessible for companies that have positive cash flows and need additional funds for further growth through expansion, but sometimes management or leverage buyout, acquisition or initial public offering (IPO). Very often mezzanine refers to a hybrid financing between debt and equity capital because that gives

the lending investor the right to purchase companies shares (in the form of attached warrants or a conversion feature) whilst the borrower need to pay interest (in the form of cash interest or payable in kind interest (PIK)). Due to the fact, that equity is the most expensive source of capital that can be diluted during every series of financing e.g. when using external capital like venture capital, mezzanine financing seems to be a promising direction for ventures looking for development capital.

According to Silbernagel and Vaitkunas (2012) mezzanine finance fill the gap between company's debt and equity and that this gap exist because: "1) accounts receivable, inventories and fixed assets are being discounted at greater rates than in the past for fear that their values will not be realized in the future; 2) balance sheets now contain significant intangible assets, and, 3) as a result of defaults and regulatory pressure, banks have placed ceilings on the amount of total debt a company can obtain".

Bean (2008) indicates that mezzanine financing gives a chance for "larger percentage of the purchase price that can be borrowed to spread equity over more properties, resulting in cash flow flexibility and the potential for higher expected rates of return on equity" and it is treated like equity on a company's balance sheet. On the other hands, companies might lose some of its independence by being forced by financing institution to follow its strategy as a consequence of its place on the board of directors.

Interestingly, the importance of mezzanine financing is understood by the European Commission who encourage small and medium enterprises (SMEs) to use this source for capital by providing loan guarantees to banks within Innovation Framework Programme (CIP) operated by European Investment Fund (EIF).

Venture Capital

From all possible sources for financing innovations in startups, venture capital has been the most devoted in terms of publications' number. Major attention is given to the importance of VC as many academics designate their role in overcoming the "valley of death", which represents time when highly potential companies face the shortage of financial resources and the lack of business development knowledge (Metzger, 2016). Many authors also confirm, that venture capital play a crucial role in eliminating asymmetric information problem because due diligence allow them to screen and monitor companies performance (European Investment Fund 2018).

European Private Equity and Venture Capital Association (EVCA) defines venture capital (VC) as "a subset of private equity investments made for the launch, early development, or expansion of a business" (EVCA, 1999). According to American approach, VC is "a cluster of private equity dedicated to finance new venture" (Caselli, Negri 2018). Although by definition, VC favors enterprises at various stages of development, many scholars emphasize the importance of VC funding in expansion and later-stage and claim, that the VC role is more to help the commercialization of innovation rather than to foster its creation (Faria, Barbosa, 2014, Wilson, 2015). Similarly, European Investment Bank (2001) produce, that European VC funds prefer later stage financings, with seed and start-up stages collecting only a small percentage of funds invested.

Bygrave (1999), who investigated Internal Rate of Return (IRR) at different VC investment stages discovered expected IRR to be higher than 60% and higher than 50% at seed and early stage respectively, which seems difficult to meet at this stage of the company development and that might lead many entrepreneurs to look for some other sources of capital. Hirukawa and Ueda (2011) suggest that in the United States patenting activities slow down once firms obtain VC funding. Reiterating this is Engel and Keilbach (2007) as well as Caselli et al. (2009) who produce that companies experience low patenting activities but high sales growth after VC investments.

Venture capital usually invest for a period of 3 to 7 years in securities (shares) of nonlisted companies, that have high potential to grow because VC raise funds from institutional investors and therefore invest large amount into firms. The aim of such funding is to develop new products and technologies, increase companies' working capital, strengthen the company's balance sheet, IPO, share buy backs, mergers or trade sale of the company (Szulczewska-Remi, 2014). The VC primary goal is to increase the market value of the company and satisfactory rate of return (usually 35–40% depending on company's development stage, sector, geographical region etc.). For these reasons, VC takes an active role in company's management and acts as a source for guidance and consultation, business experience, mentoring, legal, financial, tax consultancy and networking.

Despite many general characteristics of VC investments described above, there is long-standing difference in performance between European and US venture capital funds. According to latest statistics of Invest Europe (2018), venture capital fundraising reached € 7.7 billion, only slightly below 2016's record year, when € 8.2 billion was raised. At the same year, annual funding of VC companies based in the US increased 17% over 2016 with total over USD 70 billion (PricewaterhouseCoopers MoneyTree, 2018). Arundale (2017) suggest, that this disparity is as high-growth entrepreneurial companies are supported by public-private or government funding (e.g. EU adopted European Venture Capital Fund).

Conclusions

There is a general agreement on the role of financial support in fostering innovations. The fast-growing literature in this field provide insight to understating the main challenges associated with selecting appropriate sources of financing for new, dynamically growing companies like startups. Therefore the aim of this study was to discuss their importance for the local economy while emphasizing advantages and disadvantages, as summarised in Table 2. To achieve these objectives, this chapter analysed 73 research papers, reports and statistical documents.

Attempts at consolidating literature on financing innovations can provide practical tools for innovation management as understanding how inventions can be commercialized into an innovative global company through the selection of appropriate sources of financing is crucial.

Table 2. Funding options for financing innovations available to startups

Source of funding	Advantages	Disadvantages
Bootstrapping	No dilution or increased risk	Slow startup grow
Crowdfunding	Diversity of funded projects, valuable form of marketing and promotion on social media	Failed projects risk their reputation
Government grants	Funds for very risky technologies	Slow, very limited funding, restrictive
Angel Investors	Early stage investments, mentoring and networking	Small investments, dilution
Initial Coin Offering	Alternative for traditional fundraising with potential to grow	Controversy about its real economic value
Bank loan	No dilution	Increase risk for company owner
Mezzanine	Lower cost of capital as compared to equity cost	Lost some of company's independence and flexibility
Venture Capital	Value added help	Dilution of ownership/control

Source: Authors' own collaboration.

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