MASTER'S THESIS

Overcoming firm-level challenges in Open Innovation

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Abstract

The fast changing business environment has influenced the development of the innovation process over the years. Due to a number of factors different innovation processes has emerged and changed the way companies think about innovation. Thus, the purpose of this thesis is to identify the factors that influenced the evolution of the innovation process over the years as well as to present the firm-level challenges of open innovation and how to overcome them. Open innovation has permanently settled in the business environment and its interest is growing. This is why, it is important to deal with the challenges it offers and further facilitate the process within companies. A multiple case study approach from two companies that are clear examples of successful execution of the open innovation process is used to examine how to overcome the identified firm-level challenges. The study consists of two case studies, so the results cannot be of general application. The paper attempts to contribute to the literature about innovation process and open innovation.

Keywords: innovation process; innovation process model; open innovation; firm-level challenges

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1. Introduction

The competition in the business world increases and the development of technologies coupled with the effects of globalisation makes it very difficult for companies to sustain their competitive advantage. Thus, being innovative is one of the fundamentals in doing business nowadays, in fact being innovative is considered as the most important characteristic of success. In order to achieve sustainable and continuous success firms have to innovate, thus they can compete more effectively in the business environment. Innovation is a driver of economic growth, it creates opportunities for new and better jobs and improves our lives. In a period of constant development, technological and social transformation on a global scale, innovation is the answer to the competition companies face. In this context, companies that aim to sustain their competitive advantage should have an innovation process that can actually generate the desired success. The topic of managing innovation is not new and scholars have made and keep on making attempts to explain, develop and facilitate the actions of companies, in order to produce more innovations. Over the years the innovation process has suffered significant changes and moved from simple and linear to more descriptive and complex process.

Before the introduction of the Open Innovation process in the beginning of 21st century, the existing processes were rather "closed" in nature. This means that companies could commercialize products that derive from internal R&D. However, the open innovation process stimulates companies to be more open, to collaborate and interact with the external environment, in order to generate innovations faster, cheaper and to implement them more successfully. There are number of important factors that influenced the improvement and development of the innovation process (Enkel et al., 2009; Chesbrough, 2003).

Open innovation expands the innovation potential of organizations by increasing collaboration with external partners. There is a broad awareness of the advantages of open innovation, thus resulting in one more collaborative and open business environment where even competitors work together in the development of new technologies. Open innovation can add value in many different ways and there is no doubt that the many companies can take advantage of such approach. However, there are number of challenges that must be overcome before getting the benefits.

1.1 Problem Formulation

In the innovation management literature, innovation is described as a process, rather than a single event. It is then important to understand and look at innovation as process, because it shapes the way we try and manage it (Tidd, 2006). However, the innovation process itself has many challenges and uncertainties. Having that in mind, companies that are engaged in innovation activities should be aware of the innovation process and manage all stages with equal respect, in order to succeed.

Over the years have been developed different innovation processes, starting from linear and simple models and moving to more complex models that involve interaction with different actors. In the beginning of the 21st century emerged a new generation innovation process called "Open Innovation" introduced by Henry Chesbrough (2003). It is defined as "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation" (Chesbrough, 2006, p. 1). The literature on innovation management argues that the business world is currently in the open innovation era, where interaction and collaboration which are at the core of the open innovation process are inseparable part of doing business, especially with regards to innovative companies. However, before the emergence of this new approach to innovation, the underlying logic was one of closed and centralized, internal R&D. In order to do create innovation, a company must do everything in-house from tools and material through design and manufacturing to marketing and sales. Even though firms are capable of producing value based entirely on their internal capabilities, most of them reached a point where research produces more inputs, but development phase was rather slow. In fact, research ideas are put "on the shelf", waiting to be further developed (Chesbrough, 2003, pp. 29-33).

The purpose of this thesis will be examine the new approach of companies towards innovation – open innovation model. In order for a company to harvest the benefits of the open innovation, it should first overcome a number of challenges. In every innovation process, companies face different challenges and try to manage and facilitate their activities during the process. Companies of all types endeavor to facilitate their processes, in order to be more effective and respectively successful. Having in mind the increasing globalization and increased competition, companies must innovate more effectively and faster than ever. In this sense, the open

innovation process seems to be the right process in the current business environment, but it is related to many and new challenges for organizations engaged in this type of innovation process.

The above discussion argues that companies willing to be successful in future must be engaged with innovation activities. However, it is crucial to understand the innovation process itself and its challenges in order to execute it in a way that will generate success for those that dare to engage in such activities. Having that in mind, the thesis will aim to answer two research questions. They are as follows:

- **What factors led to the emergence of open innovation process and how it compares to other generations of the innovation processes?**

In order to answer this question, six generations of innovation processes will be examined in depth. Thereafter, the open innovation process will be compared to its precursors in terms of strengths, weaknesses, complexity, time and costs for new product development. This will give a better understanding of the innovation process itself, but also what are the factors that led to move from closed to open innovation process. Moreover, it will provide an explanation why the open innovation model is considered as the one that describes best the innovation process.

- **What are firm-level challenges that companies face in the open innovation process and how to overcome them based on best practices among successful companies?**

In order to have an effective and most importantly successful innovation process, one must first meet the challenges that the process carries. Consequently, the firm-level challenges of the open innovation process are identified in the literature. The identification of the firm-level challenges that companies face in the open innovation process is only the first part of this research question. By using empirical evidence from two companies that successfully execute the open innovation process will provide answer to the second part of the research question - how to overcome these challenges. The identification of initiatives and mechanisms for dealing with these challenges will facilitate and improve the open innovation process within companies that are willing to be or currently engaged in such process.

1.2 Thesis Structure

In the “Introduction” chapter the author discusses the background and problem formulation of the study together with the research questions that this thesis aims to answer. The next chapter is called “Methodology”, where the used research methods are described. In addition, it presents the techniques and actions undertaken for data collection and analysis of the data. Chapter three is dedicated to “Literature review”. In this chapter represents a broad literature review on topics like innovation, innovation processes and open innovation challenges. The literature review of the different generations of innovation processes aims to describe the evolution of the innovation process, which will answer also the first research question. The review of open innovation process and its challenges will provide the answer of the following research question, but will also lay the foundations for the third research question. This very important chapter is the basis of the thesis and serves as a platform in answering two of the three research questions.

Chapter four is where the author presents the case studies that are then analysed in the following fifth chapter. In the fifth chapter is where the author identifies the answer in the last third question. The sixth chapter is where the author draws a concluding remarks and answers the research questions possessed in the beginning. In the last chapter, recommendations will be provided that address the identified challenges and how companies engaged in open innovation can facilitate their processes.

2. Literature Review

The literature review chapter is the basis of this thesis and examines the relevant literature on topics like innovation, types of innovation and innovation process. Six generations of innovation processes are presented together with their historical emergence and description of the processes themselves plus strengths and weaknesses. Furthermore, firm-level challenges in open innovation are presented. In addition, this chapter provides better overview of the examined phenomenon and serves as the basis for the development of the research questions of this thesis.

2.1 Innovation

What is innovation, is a question that has been discussed for a very long time. Even though innovation studies are not new and have started long time ago, there are many and different answers to this question. There exists an extensive literature on the topic that suggests different definitions and approaches. In its broadest sense the term comes from the Latin *innovare*, which means 'to make something new' (Tidd & Bessant, 2009, p. 16). When talking about innovation, we cannot neglect the view of the "father" of innovation studies – Joseph Schumpeter. According to him, innovation is the launch of new or significantly improved product or service, the introduction of new method of production or sales, opening a new market, the identification of new sources of raw material supply or the creation of new industry structure (Sledzik, 2013, p. 90).

However, over the years, other scholars have tried to propose different explanation of the phenomenon. Tidd and Bessant (2009, p. 16) argue that innovation is "a process of turning opportunity into new ideas and of putting this into widely used practice. Thompson (1965 in Baregheh et al. 2009, p. 1325) defines innovation as "the generation, acceptance and implementation of new ideas, processes products or services". According to the UK Department of Trade and Industry, innovation is "the successful exploitation of new ideas" (Adams et al., 2006, p. 22). "Industrial innovation includes the technical, design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) product or the first commercial use of a new (or improved) process or equipment" (Freeman, 1982 in Tidd & Bessant, 2009, p. 16). The last definition that will be provided is also the one that the author

choses to use and understand by the term "innovation" for the purpose of the thesis. According to Trott (2008, p. 14) "innovation is the management of all the activities involved in the process of idea generation, technology development, manufacturing and marketing of a new or improved product, manufacturing process or equipment". This definition gives an example that innovation is complex process that involves a lot of activities and does not finish with an invention.

It is very important to distinguish invention from innovation. While invention is an idea, sketch or a model for a new or improved product, innovation is related to commercial and practical application of the idea. As invention first occurs as an idea for a new product or process, innovation is the first attempt to carry it out into practice. Inventions are often patented, but they do not necessarily lead to technical innovation (Fagerberg et al., 2005, p. 4).

Moreover, Tidd and Bessant (2009, p. 21), propose four dimensions (4Ps model) of the innovation space and they are as follows:

- Product Innovation – changes in the things (products/services) that an organisation offers.
- Process Innovation – changes in the ways in which they are created and delivered.
- Position Innovation – changes in the context in which the products/services are introduced.
- Paradigm Innovation – changes in the underlying mental models which frame what the organisation does.

In addition, innovation can be divided into two categories depending of the level of novelty – incremental and radical. Incremental refers to "do what we do but better", while radical refers to "do something different" (Tidd & Bessant, 2009, p. 23). Table 1 provides some examples of incremental and radical innovations in the 4P space.

Table 1. Innovations mapped on the 4Ps model.

Innovation type	Incremental	Radical
PRODUCT	Windows Vista replacing XP	New to the world software

PROCESS	Improved factory operations efficiency through upgraded equipment	Toyota production system and other 'lean approaches'
POSITION	Banking services targeted at key segments – students, retired people and etc.	Microfinance
PARADIGM	IBM moving from being a machine maker to service and solution company	iTunes platform – a complete system of personalised entertainment

Source (Tidd & Bessant, 2009, pp. 23-25)

2.2 Innovation Process

One of the core competencies that all companies around the world are trying to achieve in this fast changing environment is the ability to successfully manage their innovation process. The importance of the ability to successfully manage the innovation process within an organization, has increased over the past decade. According to Tidd et al. (1997 in Dooley & O'Sullivan, 2001, p. 180) the success of innovation "lies in being able to repeat the trick, to manage the process consistently so that success, whilst never guaranteed, is more likely". Having this in mind, it is important for every organization to have a good understanding of the innovation process itself, but also to be able to manage it equally good from the first to the last phase.

Innovation processes may differ in many aspects according to the economic sector, field of knowledge, type of innovation, historical period and country concentration. Furthermore, the innovation process varies based on the size of the firm, corporate strategy and previous experience within the innovation field. This is based on the fact that there is no firm level innovation process that suits and satisfies the needs of every company. The literature provides many different definitions for innovation process. Here are some of them:

- Innovation process can be characterized as any undertaken actions aiming at the development and implementation of an innovative solution (Kosala, 2015, p. 70);

- The innovation process is the perception of an unsatisfied need, setting the stage following the primary act of insight, critical revision and development (Usher 1954 in Meissner & Kotsemir, 2016, p. 17);
- The innovation process involves the exploration and exploitation of opportunities for new or improved products, processes or services, based either on advance in technical practice or a change in market demand, or a combination of the two (Fagerberg et al., 2005, p. 88);
- Maidique (1980) argues that after the recognition of the invention, immediate actions must be taken for the development of new products followed by market realization and distribution of products and customers;
- The process of innovation occurs in three overlapping phases or subprocesses – idea generation, problem solving and implementation (Utterback, 1971, pp. 77-78).

Innovation involves high uncertainty by nature, due to the fact that it is very difficult to predict its accurate costs and eventual success. Even though in some cases successful implementation of innovative product or service is not the end result, it does not mean that a company has no benefits from the process of innovation. Therefore, it necessarily includes a process of learning through "trial and error" or improved understanding. The learning process however is firm-specific and depends entirely on firm's competencies (Fagerberg et al., 2005, p. 88).

In the following sections, six generations of innovation processes are described and provide examples of the different stages of the process. In addition, they also demonstrate how the understanding of the innovation process and how the approach of companies towards innovation has changed over the years.

2.2.1 Firs Generation Innovation Process: Technology-Push

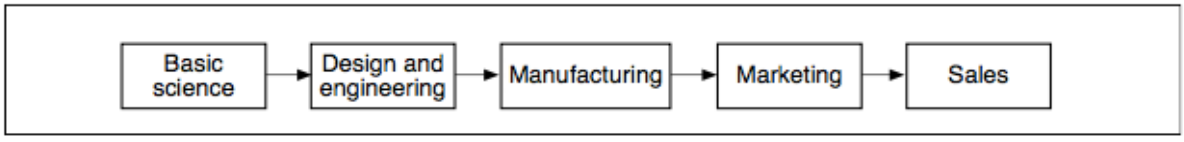
The first theoretical framework developed for understanding the innovation process is the technology-push (linear) innovation process. As the first generation innovation process (1G), technology-push had a big influence in the academic, as well as the economic environment. The precise source of this model is missing, as it has never been documented. The evident for this argument is that several authors that have used, improved and criticized the model over the years did not acknowledged any source (Godin, 2006, p. 640). However, several authors

(Rothwell 1994; Preez et al. 2008; Hobday, 2005; Zizlavsky 2013) argue that the beginning of the technology-push model is around 1950. The scientific research is an obvious source of innovation, as from ancient times people have attempted to explore the knowledge and technological frontiers (Tidd & Bessant, 2009, p. 229).

The first generation model was simple linear model that views innovation as a sequential process that takes place in discrete stages (Preez et al. 2008). The point of departure of technology-push model is a scientific discovery through applied research, moving to technological development and production activities in firms. Consequently, the market was seen as a place that captures the fruits of research and development (Dodgson & Rothwell, 1994, p. 40; Zizlavsky, 2013, p. 3). One of the fundamental beliefs in this generation of innovation process is that "more R&D in, equaled more innovation out" (Dodgson & Rothwell, 1994, p. 40). This model was also used, in order to justify additional R&D investment by both companies and governments with the goal of greater innovation supporting faster and sustainable economic growth (Hobday, 2005, p. 124). Furthermore, technology-push innovations are considered as radical in nature than incremental, which indicates for higher risk and higher failure rates (Souder, 1989, p. 19; Henkel & Jung, 2009, p. 2).

As a technology-driven approach, in this innovation process the emerging technology or the combinations of already existing technologies is the driving force for innovative products. This first generation of innovation process is dedicated to the basic research, which discovers ideas and opportunities realizing the advantages for the final customer. Moving forward in the "technological development" phase, that is the time when designing and prototyping is done. The next phase in this process is "manufacturing", which is analyzed and the most efficient way is chosen. The last two phases are "marketing" and "sales", where attempt is made to promote the product to the market are reach the target group of customers (Momcilovic et al. 2013, p. 3). This innovation process is visualized in Figure 1.

Figure 1. First generation innovation process



Source: Rothwell 1994, p. 8

To sum up the above described innovation process, it is based on the belief that company recognizes the need before the market does, creates the product or service and offers it to the customers.

2.2.2 Second Generation Innovation Process: Demand-Pull

In the second half of 1960 the investment focus started moving in another direction. Due to the growing strategic emphasis on marketing, the perception of the innovation process changed towards demand side factors. This resulted in a new, second generation innovation process – demand-pull (market-pull or need-pull as called sometimes) (Rothwell, 1994, p. 8; Dodgson & Rothwell, 1994, p. 40; Hobday, 2005, p. 124). This model emerged as an alternative explanation to the innovation process and is closely related to the first generation of linear process (Godin, 2013, p. 623).

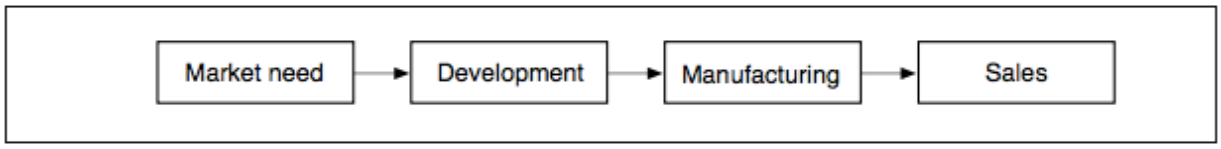
This second generation innovation process is simple and linear in nature, similar to the first generation model. However, as mentioned already the demand-pull model stresses the role of the market place and market research. Due to the increased competition, it became very important to include the customers and their needs and consequently to direct the R&D investments towards those needs (Simsit et al, 2014, p. 693; Zizlavsky, 2013, p. 3; Dodgson & Rothwell, 1994, p. 40). In the need-pull model, the market place is the considered as the main source of ideas, needs and identification of opportunities, who then should be further developed by R&D activities to meet those customer's needs (Hobday, 2005, p. Dodgson & Rothwell, 1994, p. 40).

As innovation is related with high uncertainty, one of the goals of the innovation management process is to reduce the uncertainty. In this second generation model, the attempt to reduce this uncertainty is made by trying to acquire as much information about the market as possible before conducting any R&D activities and thus preventing the failure of the new products and services. According to Freeman (1982, in Hart et al. 1999, p. 22), the main uncertainties are those related to the market or being more specific the understanding of customer's needs. Having this in mind, the approach of the demand-pull innovation process is reasonable and by understanding the needs of the market, innovations have higher chance of success (Cooper 1975; Cooper & Kleinschmidt 1991; Hart et al. 1999). In addition, companies that have adopted

the market-pull innovation process are often more focused on incremental innovation in which they use existing technologies and R&D knowledge (Pikkarainen et al., 2012, p. 5; Henkel & Jung, 2009, p. 2).

According to Tidd and Bessant (2009, p. 233) need-pull innovation is very important at mature stages in industry product life cycles where more than one offering is possible to be chosen and consequently the competition depends very much on differentiation of the needs and attributes of customers. As a customer driven approach, the process begins with identification of market research. After that the information is possessed to the R&D department in the development phase of the process. The final phases include manufacturing and sales to the market Momcilovic et al. 2013, p. 3). The need-pull innovation process is illustrated in Figure 2.

Figure 2. Second generation innovation process



Source: Rothwell, 1994, p. 9

2.2.3 Third Generation Innovation Process: Coupling Model

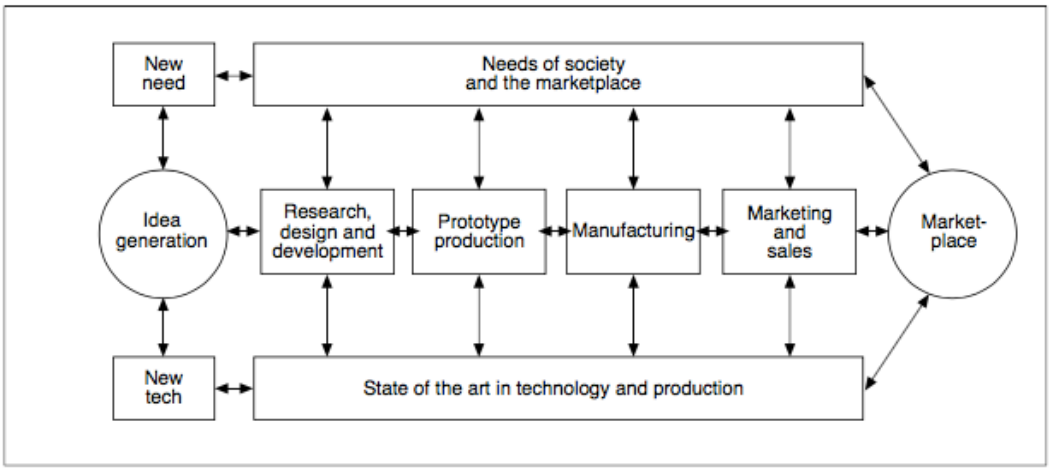
In the early 1970s a new generation of innovation process model emerged – coupling or interactive model. The reason was that the technology-push and demand-pull models of innovation began to be considered as oversimplified, extreme and atypical (Dodgson & Rothwell, 1994, p. 40; Rothwell, 1992, p. 222). During this period with two major oil crises, high rates of inflation and demand saturation, companies were forced to acquire strategies with growing emphasis on scale and experience benefits. Having this in mind, in this particular period is was of great importance for companies to understand the foundations of the successful innovation process and consequently to lower the rate of failures (Rothwell, 1994, p. 9). In addition, empirical studies in the 1970s emerged as criticism of the first and second generation models and showed the need for better understanding of the process itself by providing evidence for more complex and dynamic innovation process (Cooper, 1980; Rothwell, 1976; Szakasits 1974; Utterback 1975).

The coupling model is more representative model of the innovation that combines technology-push and demand-pull models in one. It recognizes the influence of the technological capabilities and market needs within structure of the firm (Simsit et al., 2014, p. 693). In this innovation process model, innovation occurs as a result of the interaction of the science, technology and the marketplace. According to Rothwell and Zegveld (1985, p. 50) the third generation innovation process can be regarded as:

A logically sequential, though not necessarily continuous, process that can be divided into a series of functionally distinct but interacting and interdependent stages. The overall pattern of the innovation process can be thought of as a complex net of communication paths, both intra-organizational and extra-organizational, linking together the various in-house functions and linking the firm to the broader scientific and technological community and to the marketplace. In other words, the process of innovation represents the confluence of technological capabilities and market needs within the framework of the innovating firm.

This interactive innovation process can be described as functionally interacting and interdependent stages, involving complex communication paths and intra- and inter-organisational linkages (Rothwell, 1994, p. 10; Galanakis, 2006, p. 1224; Hobday, 2005, p. 124). After the recognition of demand-pull model and its importance to the successful innovation, it cannot be neglect. However, according to Mowery and Rosenberg (1979), innovation was described as the interaction and coupling of science, technology and the marketplace. In the case of technology-push innovation process, it is obvious that more R&D has not necessarily resulted in more innovation (Rothwell & Zegveld, 1985, p. 50). In addition, demand-pull is not the dominant factor for the most radical innovations, but still an essential and necessary condition (Mowery and Rosenberg, 1979, p. 142). Moreover, when companies overemphasize on market needs this can result in rather incremental technological innovations, rather than radical ones (Hayes & Abernathy, 1980, p. 70; Rothwell & Zegveld, 1985, p. 50). Thus, the third generation model combines technology-push and demand-pull innovation process in one more representative model of the innovation process, where both “push” and “pull” factors are treated with equal importance (Hobday, 2005, p. 124). Figure 3, represents the third generation innovation process.

Figure 3. Third generation innovation process



Source: Rothwell, 1994, p. 10

The overall process of innovation can be considered as a complex set of interaction activities over which knowledge is transferred. In this model the interaction includes both internal and external linkages (Trott, 2008, p. 24). It links the different in-house functions and the firm to the broader scientific and technological space as well as to the marketplace. The emphasis of this innovation process model is on the feedback, where the internal activities are strongly linked to the external knowledge. Even though this model includes feedback loops the dynamics of the model are still very sequential (Neely & Hii, 1998, p. 13; Nicolov & Badulescu, 2012, p. 1072).

As Figure 3 illustrates, in the center of the coupling model are internal activities of R&D, engineering, manufacturing and the last phase of marketing and sales. On the one hand, the model may look linear, but on the other hand the flow of communication is not linear in nature (Trott, 2008, p. 24). The idea generation process in this model depends on three main sources, which is way different than the first and second generation IP. Having this in mind, the three sources for idea generation are as follow: organizational capabilities, needs of the society and the market place and the science and technology base (Trott, 2008, p. 24). After the idea generation process and the discovery of potential opportunities, the process moves to the R&D phase and the consequent internal activities described above. The external links and feedbacks are an integral part of the internal activities throughout the whole innovation process. This allows the organization to adjust and improves the innovative process in a more flexible manner, based on the changes in either the marketplace requirement or in the science and technology base.

According to Rothwell (1994, pp. 10-11), at this period there were many similarities between the results on innovation research, which covered many countries, sectors as well as differences between firms' size. However, there were also differences concerning the rank order of importance of the different factors. These factors can be divided in two groups and they are as follows:

Project execution factors:

- Good internal and external communication
- Treating innovation as a corporate wide task
- Implementing careful planning and project control procedures
- Efficiency in development work and high quality production
- Strong marketing orientation
- Providing a good technical and spares service to customers
- Effective product champions and technological gatekeepers
- High quality, open-minded management
- Attaining cross-project synergies and inter-project learning

Corporate level factors:

- Top management commitment and visible support for innovation
- Long-term corporate strategy with associated technology strategy
- Long-term commitment to major projects
- Corporate flexibility and responsiveness to change
- Top management acceptance of risk
- Innovation-accepting, entrepreneurship-accommodating culture (Rothwell, 1994, pp. 10-11)

2.2.4 Fourth Generation Innovation Process: Integrated Model

One of the reasons why the fourth generation innovation process emerged is that it tries to improve "the lack of functional integration in the linear models" (Preez et al. 2006, p. 6). Thus, the latter half of 1980s was marked with a transition from coupling innovation process model

to integrated model fourth generation (4G) innovation process (Rothwell, 1992, p. 236). In this period of recovery for the economy, companies started focusing on core businesses and core technologies. The importance of global strategy started to disseminate and the number of strategic alliances grew rapidly, including both large and small innovative companies (Rothwell, 1994, p. 11; Contractor and Lorange, 1988; Dodgson, 1993). Based on observations in Japanese automobile companies, the integrated (also called sometimes "parallel") innovation process includes significant functional overlaps between departments and their activities (Hobday, 2005, p. 125; Galanakis 2006, p. 1224).

An additional novel feature of this model is the external integration in terms of alliances and linkages with suppliers, customers, universities and public research agencies in the new product development process (Preez & Louw, 2008, p. 549; Rothwell, 1994, p. 12). As the product lifecycle was constantly getting shorter and shorter, this period was mainly characterized by time-based strategies. This led to the understanding of the importance to shorten the innovation time and thus the process of innovation is seen as simultaneous (parallel) rather than sequential process (Zizlavsky, 2013, p. 3; Rothwell, 1994, p. 12). In the 4G innovation process the activities of the different departments a conducted together, not as the linear models where they follow sequentially. In addition, as mentioned above the new features of this model are integration and parallel development. Having this in mind, companies engaged with the fourth generation innovation process start the integration of suppliers at the early stages, while at the same time integrating the activities of different internal departments (Rothwell, 1994, p. 12; Barbieri & Alvares, 2016, p. 119).

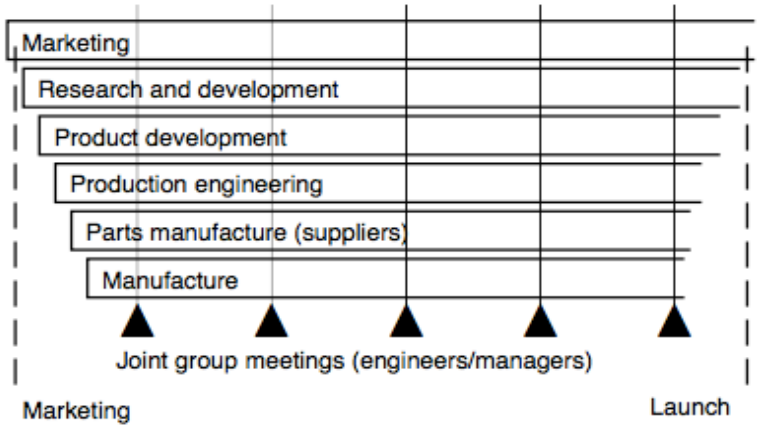
The advantage that Japanese companies had at that period, put them in the position to innovate more rapidly and efficiently. The recognition of the unique advantage of the parallel innovation process over the sequential in terms of saving time led to the development of the 4G model and its consideration as best practice at that time (Rothwell, 1992, p. 236). The organization of the innovation process involves the development of partnerships between companies, suppliers, customers and research agencies. However, these linkages do not stop at the idea generation process, but instead continue throughout the whole innovation process. This allows the innovating organization to receive higher flows of information during all phases, thus contributing to the eventual success of the innovation activities (Alekseevna, 2014, p. 121). Having in mind the higher flows of information, the 4G innovation process promotes a more rapid and cost effective development process (Neely & Hii, 1998, p. 14).

In order for a company to engage in such an integrated innovation process, it must have an open and horizontal management style with emphasis on consultation and participation (Rothwell, 1990, p. 195). Moreover, the success of innovation requires firms to be more open to external cooperation. The external information inputs are important part of the innovation process (Dodgson, 1993, p. 25). However, integration is not only external, but also internal. According to Rothwell (1990, p. 196), is therefore important to consider the role of new technologies in the process of achieving higher degree of integration across a department or the whole organization, in general. Some of the motives for such internal integration are, as follows:

- To obtain greater communicative fluidity with common purpose of sub-functions;
- Improved responsiveness to competition;
- Improved product-delivery schedule and greater market responsiveness through shorter development schedules;
- Improved product quality at lower cost.

According to Dodgson (1993, pp.25-26), establishing partnerships with suppliers provide access to state-of-the-art components. As well as partnering with suppliers, for a firm to be successful in innovation is important to establish links with customers. Customers provide an effective feedback on the requirements of the market and details of the product or service. Furthermore, when companies collaborate with each other or with universities, government and private research laboratories can gain higher competitive advantage and extend their options for innovation (Dodgson, 1993, pp. 25-26; Hobday, 2005, p. 125; Rothwell & Whiston, 1990, p. 195).

Figure 4. Fourth generation innovation process



Source: Rothwell, 1994, p. 12

As illustrated on Figure 4, the fourth generation innovation process starts with marketing activities aiming at identifying the needs of the marketplace. Moving forward in the process it comes the time when the R&D activities are integrated in the process, followed by product development, production engineering and finally suppliers are integrated followed by manufacturing. It is important to note that these activities are performed simultaneously, at the same time all departments work together. As shown on the figure, there are "joint group meetings", where representatives from all the department discuss and take decisions. This allows the decision makers to get better overview of the actions that each department have undertaken prior to the joint group meetings. In addition, this innovation process enables higher flexibility for adjustments and improvements throughout the whole innovation process.

2.2.5 Fifth Generation Innovation Process: System Integration and Networking (SIN)

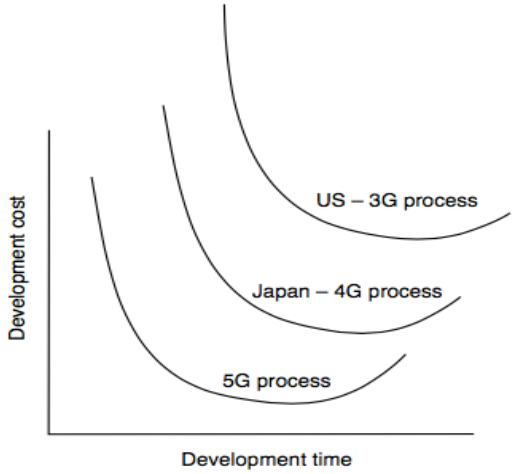
Over the years, a considerable amount of evidence emerged showing that innovation is rather a networking process than a process within a single company. As described in the previous section, the horizontal strategic alliances, interactive R&D activities and vertical relationships became of a great importance for firms and their competitive advantages (Dodgson, 1993, pp. 27-36; Rothwell & Dodgson, 1994, p. 43). In addition, the need for companies to be faster and more efficient in their innovation process has increased as well. During the 1980s and 1990s being "fast innovator" has emerged as very important factor that to some extend determines the competitiveness of companies. This is because, being first to the market carries significant benefits like bigger market share, learning benefits and customer benefits (Rothwell & Dodgson, 1994, p. 43). Having the above discussion in mind, these factors laid the foundation for the improvement of the fourth generation process and led towards the development of a new and improved fifth generation innovation processes.

The fifth generation innovation process (5G) emerged in the 1990s and was called System Integration and Networking (SIN) by Rothwell (1994, p. 15). Generally, the 5G is "a development of 4G in which the technology of technological change is itself changing" (Rothwell, 1992, p. 236; Rothwell and Dodgson, 1994, p. 44; Rothwell, 1994, p. 15). The

system of integration and networking innovation process is one in which, the use of a sophisticated electronic toolkit improves the speed and efficiency of new product development across the whole innovation system which includes internal functions, suppliers, customers and external collaboration. Moreover, the fifth generation represents the electrification of the innovation process (Rothwell & Dodgson, 1994, p. 43; Hobday, 2005, p. 126; Simsit et al. 2104, 694). Some of the major features of the fifth generation innovation process are that in order companies to be more flexible, quick and produce products with higher quality, they need to establish strategic alliances which are assisted by the use of expert systems and integrated Computer Aided Design (CAD) and/or Computer Aided Manufacturing (CAM) systems (Dodgson, 1993, p. 27). The SIN process views innovation not only as cross-functional process, but also as multi-institutional networking process (Rothwell, 1992, p. 237).

The 5G innovation process determines a new more efficient time/cost curve for leading edge innovators. Figure 5 represents the product development time/cost relationship for the third, fourth and fifth generation innovation processes (Rothwell, 1994, p. 15).

Figure 5. Product development time/cost relationship for the 3G, 4G and 5G innovation process



Source: Rothwell, 1994, p. 15

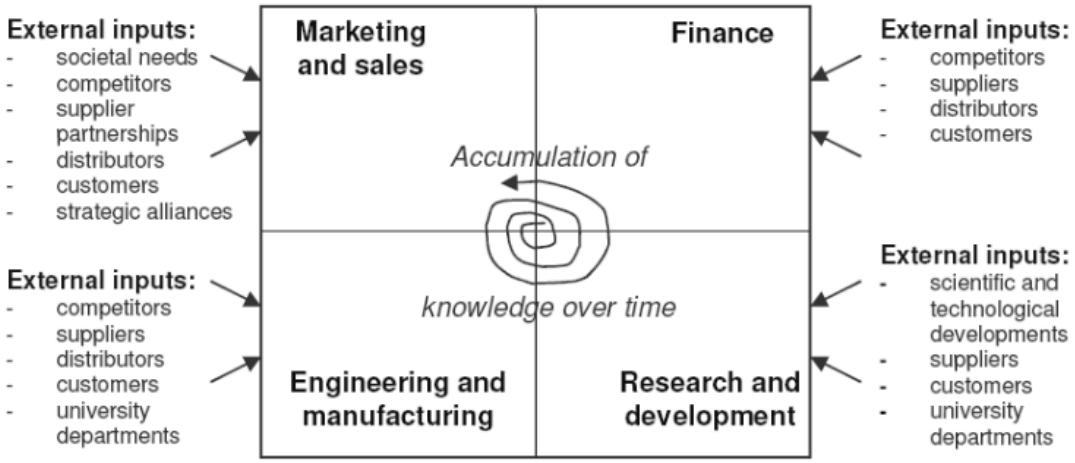
Figure 5 represents the development costs and development time in US companies that have implemented the 3G process, while their Japanese competitors using the 4G parallel development model have cut both costs and time. However, the 5G process has even more benefits for the ones that dare to engage in innovation process. As obvious form the figure, the

fifth generation innovation process assists companies to move towards more efficient time/cost curve (Dodgson & Rothwell, 1994, p. 43).

The fifth generation innovation process puts emphasis on the distributed networking process that requires continuous change and is characterized by a range of external inputs including suppliers, customers, competitors and universities (Rothwell, 1994, p. 22). According to Rothwell, (1994 and Dodgson & Rothwell, 1994) there are a certain number of underlying strategy elements that differentiate the fifth generation innovation process from its precursors. The first one is in the center of this generation innovation process, is the time-based strategy which aim at creating faster and more efficient innovations. The second one is the development focus on quality and other non-price factors, this is due to the fact that companies aim not only at faster product development, but also products with higher quality. The next element is the emphasis on the corporate flexibility and responsiveness. Sometimes, products are inflexible in nature and consequently too expensive to be improved. Thus, the introduction of flexible manufacturing systems will allow companies to overcome this problem. In addition, this will give innovative firms the opportunity to create "family" of designs and products and this way to serve a wide range of customers (Rothwell, 1992, p. 227). The sequential element is the customer focus at the forefront of strategy. As it was described in some of the previous sections, the market and the customers play an important role for success of innovations.

Moving forward, the next strategy element is strategic integration with primary suppliers. Many companies that have established partnerships with suppliers have the benefits to access state-of-the-art components (Dodgson, 1993, p. 25). Strategies for horizontal technological collaboration is the next factor. One of the main goals of the technological collaboration is the improvement of the innovation process and the different technological targets of corporate strategies (Dodgson, 1993, p. 10). Another element of the strategy in the 5G innovation process is the electronic data processing. The electronic tools assist firms in increasing the speed and efficiency of new product development across the whole innovation network (Hobday, 2005, p. 126; Zizlavsky, 2013, p. 4). This is in relation to the first element of the underlying strategy – time-based strategy. The last one is the policy of total quality control. By the name of this element is obvious that the 5G process puts emphasis on higher quality control of all products.

Figure 6. Fifth generation innovation process (SIN)



Source: Preez et al., 2008, p. 7

In the fifth generation innovation process the overall organizational and systems integration is even greater than the fourth generation process. Parallel and integrated development process, early supplier involvement as well as leading-edge users in the product development process enhance the innovation process and cut both costs and time. Moreover, the cross-functional development process is further supported by the establishment of horizontal technological collaboration with partner companies and even competitors where appropriate (Dodgson & Rothwell, 1994, p. 49; Rothwell, 1994, p. 23). However, this model differs from its precursors not only with greater internal and external integration, but also with flatter and more flexible organizational structures. This approach enables companies that have adopted the 5G process to take rapid and more effective decisions. In addition, the process focus on the empowerment of managers at lower levels as well as project leaders and product champions (Dodgson & Rothwell, 1994, p. 49).

Another key feature of the 5G innovation process is its electronification, as described by Rothwell (1994). This includes fully developed internal data bases for example, effective data sharing systems, product development metrics, computer-based heuristics and expert systems. Furthermore, the implementation of CAD systems for electronically assisted product development enhances and aids to the product development process by making it more flexible (Dodgson & Rothwell, 1994, p. 49). The fifth generation of innovation processes involves a massive variety of inputs and actors. As already explained in the above discussion, the main difference between 4G and 5G is the use of sophisticated electronic tools by the latter. The increase of the development speed and efficiency draws mainly from the naturally higher

information processing efficiency of the 5G innovation process among the whole innovation network, as obvious from Figure 6 (Hobday, 2005, p. 126).

2.2.6 Sixth Generation Innovation Process: Open Innovation Model

The continuous attempts to improve the innovation process within companies and more importantly to create a process that is possible to be repeated over time which brings successful innovations to market has been widely recognized as number one goal. However, that is not an easy task and throughout the years the perception of the successful innovation process has changed. Many factors have influenced the development and the understanding of the innovation process. The first of these factors may be the increased mobility of workers and the wide distribution of knowledge. Thus, information is more wide spread and companies have access useful knowledge that previously could not. The second factor that influenced the change in the innovation landscape is the growing of the Venture Capital (VC) markets. This large pool of capital was a real challenge for companies that made a significant commitment to internal R&D. In addition, large companies have left many of the innovative ideas and concepts to be developed in the future. Having the first two factors in mind, the chance that these ideas will be developed internally and not in a start-up outside of the company is very small. Moreover, the capabilities of suppliers are growing together with whole environment. Hence, the suppliers allow companies to move faster and operate on different markets at the same time (Chesbrough, 2003, pp. 34-40). In other words, if a company fails to utilize its technology on time, it may loose its competitive advantage and see someone else taking advantage of the internally developed ideas and concepts.

In the beginning of the 21st century, Henry Chesbrough (2003) introduced the open innovation model. According to Chesbrough (2003, p. 37) in the new model of open innovation, “a company commercializes both its own ideas as well as innovations from other firms and seeks ways to bring its in-house ideas to market by deploying pathways outside its current business”. Another definition of open innovation describes it as “systematically encouraging and exploring a wide range of internal and external sources for innovation opportunities, consciously integrating that exploration with firm capabilities and resources, and broadly exploiting those opportunities through multiple channels” (West & Gallagher, 2006, p. 320). Open innovation is a paradigm that assumes that firms can and should use external ideas as well

as internal ideas and internal paths to market, as they look to advance their technology (Chesbrough, 2006, p. 1). These definitions of open innovation suggest that the boundaries between a company and the environment that surrounds it are porous which allows innovation to move easily around (Chesbrough, 2003, p. 37).

According to Chesbrough (2003, p. 38), who is also a pioneer in the studies of open innovation, the fundamental principles of this innovation process are as follows:

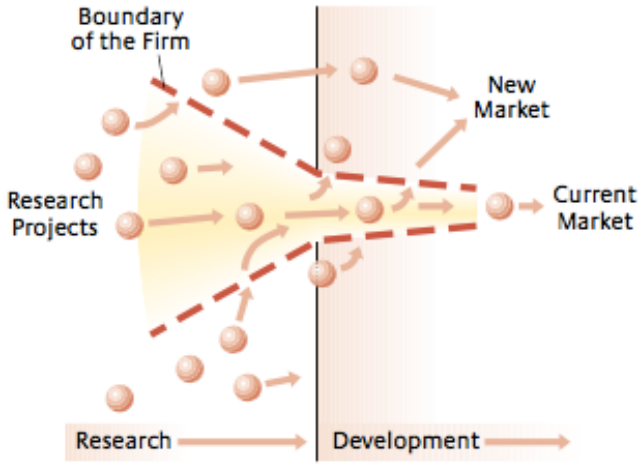
- Not all the smart people work for us;
- External R&D can create a significant value;
- We do not have to originate the research in order to profit from it;
- Building a better business model is better than getting to market first;
- If we make the best use of internal and external ideas, we will win;
- We should profit from others' use of our intellectual property (IP), and we should buy others' IP whenever it advances our own business model.

The literature generally differentiates two types of open innovation – inbound and outbound (Sisodiya et al., 2013, p. 836). Inbound open innovation requires the opening of the innovation process to knowledge exploration. The knowledge exploration refers to the internal use of external knowledge. By contrast, outbound open innovation requires from companies to open their innovation process to knowledge exploitation, meaning the external exploitation of internal knowledge. However, a company may use either inbound or outbound open innovation approach, but also the combination of the two (Huizingh, 2011, p. 4; Enkel et al., 2009, p. 312).

The first and second generations of innovation processes represents purely closed innovation approach, as the company use the internal R&D and its knowledge about the marketplace for the development of innovation activities. However, the open innovation process is exactly the opposite. In this approach, a company takes advantage of both internal and external source of innovations without a fear that if someone else uses its IP, the company will lose. In fact, it is the other way around as companies are not able to take advantage of all their ideas by themselves, so they share and cooperate with their external environment, resulting in higher number of innovative products and services (Nadolna & Swiadek, 2011, p. 170).

On the one hand, in the closed innovation process the projects are launched from the science and technology base of the firm. They move further in the process and are being assessed and some move forward, some are stopped. On the other hand, in open innovation company can launch projects from internal and external technology sources and new technology can enter into the process at different stages. Moreover, a product may go to the market through many different ways as well as through company's channels, but also by using partners' channels (Chesbrough, 2006, pp. 2-3). Figure 7 gives and illustration of the open innovation process.

Figure 7. Sixth generation innovation model – Open innovation model



Source: Chesbrough, 2003, p. 37

As illustrated on Figure 7, the boundaries of the firm are porous and allow external and internal knowledge to move easily around. Since the idea generation phase through the development to commercialization of the new products, the open innovation model allows companies to interact at any time. This interaction gives companies chances to explore more opportunities in different markets. This aims to enhance the likelihood of success for the innovating firm, by reducing the risks and open up new markets in the later phases of the process. In addition, the collaborative activities performed throughout the whole open innovation process are oriented to decrease the time and cost for new product development.

2.3 Firm-Level Challenges in Open Innovation

The advantages and benefits that a company can obtain from the open innovation approach are undeniable. The access to a large knowledge pool is a treasure for every company. However, the success in any innovation process does not come without challenges. Open innovation makes no difference. Our understanding of the open innovation process and how can one succeed with it will be incomplete if we do not meet the organizational level challenges that the process provides. Hence, this section is dedicated to the identification of organizational-level challenges, which is also one of the main goals of the thesis.

2.3.1 Partner Selection

The innovation process itself is hiding a lot of risks and unknown areas for companies. Thus, cooperation in the open innovation paradigm aims at reducing those risks and maximize the benefits for all stake holders (Emden et al., 2006, p. 332). However, this would no be possible, if organizations cannot select the right partners for such collaboration. Due to high fail rate, partner selection is very important part in the initial stages of partnership formation (Wang & Kess, 2006, p. 469; Bierly & Gallagher, 2007, p. 135). Choosing the right partners is the first and one of most crucial challenges that open innovation offers on organizational level as this would determined to a big extend the outcome of the collaboration (Wu et al., 2009, p. 4647).

Leading companies see their partners as an extension of their own processes and the firm in general. What allows them to think in such a way is the fact that they find and select potential partners for establishing strategic alliances very carefully. A strategic alliance can be described as "collaborative efforts between two or more firms in which the firms pool their resources in an effort to achieve mutually compatible goals that they could not achieve easily alone" (Lambe et al., 2002, p. 141; Solesvik & Westhead, 2010, p. 843). The provided definition explicitly illustrates the motives of companies that engage in such strategic partnerships. Furthermore, it enhances the need for selecting the right partners, in order to achieve the initial goals.

In order to facilitate their process of selecting the right partners, companies have developed selection criteria. However, these criteria are not unique, but vary from company to company and respectively from sector to sector. Characteristics of partner are the first and one of the main criteria in choosing the best partners. It includes sub-criteria like unique competencies, compatible management style and strategic fit (Wu et al., 2009, p. 4647; Bierly and Gallagher,

2007, p. 136). The second one is the marketing knowledge of the potential partner firm. Here, companies look to increase the market share, better export opportunities and knowledge regarding local business practices (Wu et al, 2009, p. 4647; Yoon & Song, 2014, p. 1070). Moving forward, the third criteria are intangible assets as patents, trademarks, reputation and previous alliance experience (Solesvik & Westhead, 2010, p. 845; Wu et al, 2009, p. 4647; Yoon & Song, 2014, p. 1070). The fourth one, complementary capabilities including partners owned managerial capabilities, wider market coverage, diverse customer and the quality of the distribution system (Yoon & Song, 2014, p. 1070; Wu et al., 2009, p. 4647). The last criteria is called degree of fitness and its sub-criteria include, organizational culture, willingness to share knowledge and flexibility regarding strategic partners (Yoon & Song, 2014, p. 1070; Solevski & Westhead, 2010, p. 845).

The above discussion addresses the challenge of selecting collaborating partners for the execution of open innovation strategy. In addition, it provides five criteria that could be used in the process of partner selection. The next section described the challenges that intellectual property and trust offer firms engaged in open innovation.

2.3.2 Intellectual Property Rights and Trust

Undoubtedly one of the most critical issue and main concerns of firms involved in open innovation is the protection of their intellectual property rights (IPR) (van de Vrande et al., 2009, p. 424). It is very important to mention that not all ideas can be protected as intellectual property (IP) and many ideas that could be protected, in fact are not (Chesbrough, 2003, pp. 156-157). A broad definition of IP describes it as "something that you cannot touch, but which makes you rich" (Edvinsson & Sullivan, 1996, p. 357). Another more descriptive definition of intellectual property suggests that it is "the subset of ideas that are novel, useful, have been reduced to practice in a tangible form and have been managed according to the law" (Chesbrough, 2003, p. 157). In general, IP encompass a wide range of areas like patents, copyrights, trade secrets and trade marks, which may belong to a single person or a company.

IP represents a key challenge for companies engaging in open innovation process as it requires them to make a shift from knowledge creation, ownership and protection towards knowledge sharing, trading and co-development (Calof et al., 2017, p. 6). The major concerns of the

companies involved are that sharing existing and intended IP may lead to loss of competitiveness and core competencies. This is due to the fact that it could be disseminated to a broader environment and reach unwanted audience (Parida et al., 2012, p. 379; Calof et al., 2017, p. 6). Having this in mind, the development of agreements for collaboration and fair ownership of IPR is a quite challenging, but a necessary task. Additionally, if the collaboration involves companies with different size, for example a large corporation and SME, this leads to uneven balance of power and consequently adds to the complexity of the open innovation process (Parida et al., 2012, p. 380). The collaboration and co-development in open innovation are supposed to bring new intellectual property, which opens up another problem that companies could face. How this new IP will be effectively shared between the stakeholders? This question further emphasis on the challenge of fair IP agreement between firms (Calof et al., 2017, p. 6).

The development of fair agreement is definitely a big challenge, but it is only one part of the general IP issue. What is considered to be even more critical issue is whether companies feel save to share knowledge and co-develop innovative products (Parida et al., 2012, p. 380). If one or both sides do not share the full information required, then the collaboration is not effective and rather harmful for both parties. Mutual commitment and trust are very delicate topic, but at the same time crucial in open innovation. Trust can facilitate the interaction, can provide the basis for sharing risk and strengthens the cooperation between two or more parties. This argument suggests that the trust component is of great importance for the smooth running of the open innovation process (Latusek-Jurczak & Prystupa-Rzadca, 2014, p. 48). Hence, another challenge that firms face in the execution of open innovation process is how to encourage a collaborative environment based on mutual commitment and trust (Parida et al., 2012, p. 380). Accroding to Bogers (2011, p. 96), a possible solution to this problem is the establishment of collaborative trust by repeatedly collaborating with the same partners. In addition, creating groups that gather internal and external partners working on the same problems is another way to build trust and relationship in the open innovation process.

The establishment of trust for secure sharing of IP is a challenging task for companies operating in the open innovation paradigm. However, this is not the only obstacle on the road to successful execution of collaborative efforts with partners. In the next section, will be presented the challenges that companies face in creating and maintaining open innovation culture.

2.3.3 Open Innovation Culture

In order to be able to operate in the open innovation paradigm, organizations have to maintain an open culture. In general, the term corporate culture lacks consensus about its definition in the literature. However, there is a broad agreement that culture constitutes of "groups that share or hold certain things in common" (Herzog & Leker, 2010, p. 324). These things are usually "values, norms, attitudes and behavior patterns that form the core identity of an organization or of its sub-units" (Deshpande and Webster, 1989, p. 4; Herzog & Leker, 2010, p. 324). Having that in mind, the organizational culture has a big impact on the innovation performance. One of the major obstacles that companies face in maintaining such open innovation culture is the so called not-invented-here (NIH) syndrome (Chesbrough & Crowther, 2006, p. pp. 234-235; van de Vrande et al., 2009, p. 427). It is critical for the successful execution of the open innovation process to overcome NIH syndrome, as companies need to interact and acquire external knowledge and competencies throughout the process (Herzog & Leker, 2010, p. 327).

When firms engage in open innovation process it requires them to make major shift not only in their core processes, but also in the mind set and attitude of its employees. Harnessing external technology for innovation requires a fundamental change in employee thinking (Witzeman et al., 2006, p. 27). As described earlier, one of the main characteristics of open innovation is the acquisition of external knowledge and technology during the innovation process. This means that organizations as well as individual employees need to be open towards external knowledge (Herzog & Leker, 2010, p. 327). Hence, the acquisition of external knowledge and technologies may be unsuccessful process if employees refuse the external intervention in already established practices and processes for executing projects.

The negative attitude to the external partnership and refusal to accept that person outside of the company can produce valuable information has been termed not-invented-here syndrome (Katz & Allen, 1982, p. 7). The NIH syndrome is described as "a negative biased, invalid, generalizing and rigid attitude of individuals or groups to externally developed technology, which may lead to economically detrimental neglect or suboptimal use of external technology" (Bakar, 2015, p. 6). One very narrow definition describes NIH as opposed to "invented-here", which might be used only in settings where actual inventive activities take place. In a broader approach, the term encompasses all individuals, group and institutions that are confronted with

external knowledge and with its potential absorption (Lichtenhaler & Ernst, 2006, p. 369). One of the major concerns that companies suffering from the not-invented-here syndrome face is that when a certain technology was not developed in-house, the firm cannot be sure about the quality and potential benefits of this particular technology (Chesbrough, 2003, p. 30). The cultural and organizational issues that occur when one company starts collaboration with another are the main barriers to successful implementation of the open innovation strategy (Herzog & Keler, 2010, p. 328; Katz & Allen, 1982, p. 13). The inappropriate evaluation and ignorance of external competencies may be harmful for the innovation process. A consequence of the unsuccessful utilization of external knowledge may cause inflexibility and prevent the implementation of successful innovation (Lichtenhaler & Ernst, 2006, p. 376).

Not-invented-here syndrome may occur within a company for several reasons. The lack of experience of employees with external knowledge or such a negative experience may cause a big resistance. Moreover, dysfunctional intra-organizational communication and inappropriate organizational structure that inhibits effective communication are also part of the reasons for the NIH syndrome (Hussinger & Wastyn, 2011, p. 6). Furthermore, inappropriate incentive systems and false pride may play an important role in stimulating rejection of external knowledge, causing the NIH syndrome (Lichtenhaler & Ernst, 2006, p. 372; Hussinger & Wastyn, 2011, p. 6; Bakar, 2015, p. 6).

As sourcing knowledge and technologies from external sources is one of the fundamentals in the open innovation process, companies facing the NIH syndrome need to pay big attention to this problem and how eventually may overcome this obstacle. The establishment and maintenance of open culture is vital to accept external ideas, knowledge and technologies, but also to overcome the NIH syndrome (West & Gallagher, 2006, p. 21). Furthermore, the untimely elimination of the not-invented-here syndrome may weaken another key aspect of the open innovation process – the absorptive capacity.

2.3.4 Absorptive Capacity

Nowadays, more and more companies open up their boundaries and engage in open innovation. This strategy aims at enhancing the innovation capabilities and competitive advantage of companies (Huang & Rice, 2009, p. 202). In order to improve their performance and benefit

from their open innovation activities, organizations need to explore and exploit in more effective manner external knowledge and technologies. One of the two main activities in open innovation is the acquisition of external knowledge and competencies that are then integrated in internal processes and procedures. As described above, this is the main purpose of in-bound open innovation (Naqshbandi, 2016, p. 2258). As the main role of in-bound open innovation is sourcing and acquiring knowledge, organizations with stronger abilities to absorb externally developed knowledge and technologies, in fact benefit more from open innovation. In addition, absorptive capacity plays important role in the creation of new knowledge by combining existing and new knowledge and helps in its implementation to existing routines and their improvement (Naqshbandi, 2016, p. 2259). The absorptive capacity is vital in explaining, why some companies are better than others in capturing and creating value through collaboration with innovative companies. Consequently, absorptive capacity and in-bound OI are linked to each other (Vanhaverberke et al., 2008, p. 2; Naqshbandi, 2016, p. 2260).

According to Cohen and Levinthal (1990, p. 128) absorptive capacity is "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends", which is critical factor for its innovative capabilities. Respectively, absorptive capacity is important for the successful execution of the innovation process. Absorptive capacity does not only include acquisition and assimilation of information, but also the ability to exploit it (Cohen & Levinthal, 1990, p. 131). By acquiring external knowledge and incorporating it into the existing knowledge pool, firms could experience the full potential of the openness of its boundaries. However, this will not be possible, if the acquiring organization lacks prior knowledge that will help to understand the absorbed knowledge (Lichtenhaler & Lichtenhaler, 2009, p. 1319). This suggests that organizations that engage in open innovation should not depend only on external knowledge, but also keep and stimulate in-house R&D activities and development of competencies (Vanhaverberke et al., 2008, p. 3). Moreover, absorptive capacity is important for utilizing and disseminating internal knowledge, as well.

Innovative companies have to understand that there is a strong relationship between innovation success, own R&D, collaborative R&D and external technology acquisition. Having that in mind, both internal and external knowledge are complements and cannot exist separately in the open innovation process (Vanhaverberke et al., 2008, p. 3). Therefore, firms need to integrate both in the innovation process, in order to capture the positive outcomes of their innovation efforts (Cassiman & Veugelers, 2006, p. 80).

The above discussion highlights the crucial role and importance of strong absorptive capacity for firms operating in open innovation process. It represents a big challenge that must be overcome, in order to reach a point where open innovation could produce successful innovations and further enhance the competitive advantage for organizations by exploiting external knowledge and technologies.

2.4 Road to open innovation

As the first research question of this thesis is entirely theoretically based, this section serves the purpose to provide its answer. The first research question once again is – "What factors led to the emergence of open innovation process and how it compares to the other generations of innovation processes?". There will be discussed the number of factors that influenced the emergence of open innovation process and how it compares to other generations of innovation processes.

Overall, all innovation processes are effective in some way and may still be in use under one or another form. However, over time their effectiveness in terms of producing innovations have lower down due to a number of factors that will be discussed in this section. These factors emerged over time influenced by the changing global and business environment. Moreover, these factors changed organizations' perception about a successful innovation process and led to the development of six generations of innovation processes.
As a first factor is possible to mention the desire of companies to lower the failure rate and to produce more and more successful innovations. For example, in the first generation innovation process the main focus was on internal R&D activities. These internal efforts have led to major discoveries that would eventually lead to new products and services. However, this did not happen every time and lots of resources were wasted. This also reflects the return on investments of the innovation activities, which in fact is low if an idea stays on the shelf and waits for the right time to come. Having this in mind, most of the companies investing in innovation produce many ideas and discoveries that stay on the shelf.

This leads to the second factor which is the time for development of innovation. If in the period of the first and second generation innovation processes there was plenty of time and room for

development, with the advancement of time this has changed. The creation of successful innovation nowadays is way more complex than it used to be. Having this is mind, it requires companies to make a long term commitment in order to accomplish a successful innovation. This led to the development of global strategies, which in fact started a number of strategic alliances including small and large innovative firms. Being fast in the innovation process has emerged as a very important factor. This is also one of the goals of every new innovation process. For instance, Figure 5 (p. 23) represents time/cost relationship for three generations of innovation processes. As evident from the figure with every new generation, the time and costs for development are lower.

The third factor that influence the development of open innovation process is the availability and mobility of knowledge workers. This allows knowledge to move much more easily around, giving the opportunity of companies to hire experts from different companies. This increases the competitive advantage of companies allowing them to acquire knowledge and skills that they need. This availability of knowledge workers, have put many companies in jeopardy, as the knowledge of one can be very easily accessed by others.

Another factor that has to deal with the development of open innovation is the growing venture capital market. As mentioned earlier, ideas sitting on the shelf is no longer a good idea. Large companies have a lot of skilled workers developing innovations within their internal R&D labs. However, when the gap between research and development is getting bigger, the work of the people that the develop new concepts looses its value. Having that in mind, the growing venture capital allows individual people to start their own companies, where they can further develop the concepts and get much bigger rewards of their work. This indicates to companies that they should not leave ideas on the shelf, instead these ideas should be developed and there are two main reasons for that. First, if ideas stay long on the shelf, they may go out of the company and consequently to loose competitive advantage. Second, the more ideas are developed the more return on investment one would have and would expand its business.

The above described third and fourth factors (availability and of workers and growing venture capital) lead to another very important factor that to a big extend influenced the emergence of open innovation. It is the the external options for ideas developed internally. The product life cycle has become shorter over time and in combination with the growing external options, ideas can no longer wait to be developed. This indicates that companies have to open up their

innovation process and include external partners in their innovation process. Thus, they will produce innovations faster, but will also develop all ideas generated internally resulting in less ideas sitting on the shelf.

Last but not least, the increased capabilities of external suppliers are another factor that contributed to the new innovation process. As mentioned earlier, the growing number of knowledge workers and venture capital opened up a lot of opportunities for the development of innovations outside of big companies' laboratories. This resulted in many new companies with strong capabilities and knowledge base. In fact, this created a lot of options for companies to collaborate and co-develop together, bringing new products to the marker faster and serving different segments of clients.

The above described factors show why the development of open innovation process was needed. These factors did not emerge over night. They are the result of the changing business environment over the years from the first generation of innovation process till now. The combination of these factors over the years have contributed to the development of open innovation process, which is becoming more and more preferred strategy by companies in all sectors. These factors have contributed to the erosion of "The golden age of internal R&D" (Chesbrough, 2003, p. 29) and contributed to the creation of totally new approach towards innovation. However, it is very important to note that the purpose of the thesis is not argue that open innovation process is the best approach towards innovation. The purpose in fact, is to provide information why open innovation is preferred strategy nowadays and what led to its development. Any of the different process still exist under one or another form.

After describing the factors that influenced the development of open innovation process, it is time to see how it compares to other generations of innovation processes, which is the second goal of the first research question. As mentioned earlier the it will be the discussed how open innovation process compares to its precursors in terms of strengths, weaknesses, complexity, time and costs. All of the innovation processes described in the thesis encompass academic knowledge and best practices of the time they were used. However, they all have advantages and disadvantages. which allows to make a comparison between them.

The first and the second generation innovation processes have been widely criticized about their simplicity. On the one hand, the technology-push model did not pay attention the market and is

mainly focused on radical innovations. On the other hand, market-pull model did not focus on technology research and looked for incremental innovations. Both processes do not include any interactions with external sources, which leads to longer research and development phase as well the use of only existing markets. In addition, based entirely on internal capabilities requires companies to invest significant amount of resources, which then may not lead to the desired results.

The coupling innovation process (third generation) is the combination of the first two generations of innovation process. It is not a linear process and includes feedbacks between the different phases. In addition, its focus is on both radical and incremental innovations. However, it also relies entirely on the internal capabilities, which leads to longer period for development and the investment of valuable resources. The next fourth generation is marked with a significant change in the process. Compared to its precursors, all of the phases in this innovation process are conducted in parallel, by doing this companies aim to cut the time for development. Moving forward, the fifth generation innovation process is one that puts big emphasis on the use of technological instruments to facilitate the whole process. Using advanced technologies, firms benefit from creating new products faster and are able to improve them much faster, based on customer requirements. In addition, in this process companies interact with external sources. Referring back to Figure 5, it is obvious that the features of the fifth generation innovation process put it in a position where time and costs for development and much lower than its precursors.

The last one, open innovation process has emerged in the beginning of the 21th century. It is one that encourage networking, openness and collaboration with external partners. Companies that operate in this paradigm can benefit from external R&D as well as sharing their own IP. In addition, they can use external paths to market and co-develop with outside companies. In fact, companies engaged in open innovation are faster innovators. This is due to the fact that they can integrate external partners in any of the phases of the innovation process. Furthermore, the open innovation process allows companies to co-develop with others from the very beginning, meaning that the time/cost curve presented in Figure 5 is even lower than the fifth generation innovation process. Having that in mind, organizations engaged in open innovation save much more time and resources, compared to companies that develop everything internally. Moreover, by sharing/selling or co-developing with others companies leave less ideas on the shelf and

benefit from higher return on investment from internal R&D. This is something that cannot be argued for non of the previously described five generations of innovation process.

However, open innovation has some disadvantages, for example the sharing of IP may lead to lose of competitive advantage. This is an issue that would be examined later on. In the previously discussed models non of them include sharing or selling of IP, as this asset is kept in secret for as long as possible. This has its advantages and disadvantages, but taking the perspective of companies that invest numerous resources in innovation is rather disadvantageous. This is due to the fact that in most cases the development of one innovation may be used in more than one market.

In conclusion, the open innovation process has strong foundations for being preferred strategy from companies in today's business environment. Taking into consideration the above described factors, the faster time for development of innovation, the lower costs of innovation activities and the opportunity to operate on different markets makes the open innovation process widely spread around the world. However, there is no one size fits all innovation process. A successful innovation process is different for every company and depends on the organizational context. Having in mind the ever growing body of literature about innovation, the academic and business environment may face a new generation of innovation process in the future. Even though, some scholars like Preez et al. (2008), talk about seventh generation of innovation process, it may be argued that it is too early for that. Open innovation has permanently settled down in the business environment and there are no signs for the emergence of new innovation process, yet. In fact, many companies have just discovered the benefits of open innovation process. The growing number of acquisitions, partnerships and technological collaborations supports the above argument that the world is currently in open innovation era and will stay in it for a long time.

3. Methodology

This chapter aims to present the methodological choices made for the purposes of the present work. It will be discussed the research approach chosen by the author, as well as the research design. In addition, the data collection, data analysis techniques used in the paper are described. Lastly, the steps taken to ensure high validity and reliability of the findings are discussed.

3.1 Research Approach

To provide a better understanding of the thesis, the research approach should be defined. There are two main approaches that explain the relationship between theory and research identified in the literature – deductive and inductive. On one hand deductive approach starts with existing theory followed by the exploration of the empirical world later. On the other hand, inductive approach starts with as less as possible preconceptions, thus allowing theory to emerge from data (O'Reilly, 2012, p. 2). To say it in other words, while the former moves from theory to data, the later moves from data to theory (Bryman & Bell, 2016, p. 21). However, there is also a third approach called abductive. This approach combines the deductive and inductive as it moves back and forth between theory and data (Saunders et al., 2016, p. 148).

The approach taken for the purpose of this thesis is deductive. This is due to the fact that at first the relevant literature on innovation processes and firm-level challenges in open innovation was revised. Followed by the discovery of empirical evidence on how two companies managed successfully to overcome the presented challenges in the literature. Hence, moving from theory to data confirms the use of deductive approach.

3.2 Research Design

The research design is the logical sequence that connects the empirical data to a study's initial research questions and to its conclusions (Yin, 2014, p. 28). Therefore, in the following sections will be presented the used strategy. The research design of the thesis is based entirely on qualitative case study methodology.

3.3.1 Case Study Strategy

Conducting a research through case studies contributes to our knowledge of individual, group, organization, social, political and related phenomenon. Case studies give the opportunity to researchers to retain the holistic and meaningful characteristics of real-life phenomenon (Yin, 2009, p. 4). Case study strategy has the capacity to generate insights for a particular phenomenon leading to rich, empirical descriptions (Saunders et al., 2016, p. 185). Yin (2009, pp. 27-34), highlights five components of research design as especially important:

- Study questions – the research question should start with "why" or "how". The main goal of the thesis is to answer "how" question that would provide explanation of how firm-level challenges can be overcome;
- Study propositions – each proposition put emphasis on something that should be examined within the scope of the research. The main proposition in the thesis is that taking certain actions would help companies to overcome the identified firm-level challenges;
- Unit of analysis – is related to defining the problem of what the "case" is. A clear definition would allow the researcher to identify relevant information, scope and boundaries for data collection and analysis. Unit of analysis for this paper are firm-level challenges that companies face in open innovation process;
- Linking data to propositions – is related to the way that data will match the initial propositions and topic of the research. The collected data would be used to build explanation about the observed phenomenon;
- Criteria for interpreting a study's findings – refers to the identification and addressing rival explanations

3.3.2 Multiple Case Study

For the purpose of this thesis is chosen to use multiple embedded case studies (Yin, 2009, p. 47). Using multiple case studies allows the researcher to arrive with more powerful conclusions than the ones that will arise from single (Yin, 2009, p. 61). Moreover, the evidence from multiple case studies is considered more compelling and the overall study is then more robust (Yin, 2009, p. 53; Bengtsson, 1999, p. 3). Even though using multiple case studies, it does not

eliminate the need to choose between holistic or embedded study. While the former has a single unit of analysis, the later has multiple units of analysis (Yin, 2009, p. 46). Having that in mind, as mentioned earlier for the purpose of the thesis is used embedded multiple case study. This is due to the fact that there are multiple units of analysis - "firm-level challenges in open innovation process", which are examined in the context of two different companies. Each of the case studies was chosen carefully so that they produce literal replication (Yin, 2009, p. 54).

3.3 Research Method

For the purpose of the thesis, qualitative research method is chosen as more appropriate. This is due to the fact that the observed phenomenon is rather difficult to measure quantitatively. One brief distinction between the two methods is that qualitative research tends to be concerned with words, while quantitative with numbers (Bryman, 2012, p. 380). Qualitative method represents "a wide variety of data collection methods" and any type of research that arrived to conclusions without any statistical procedures or other means of quantifications (Kuada, 2012, p. 93). Having in mind, the above description of the qualitative research method, it is considered as more appropriate for the observed phenomenon.

3.4.1 Data Collection

In this section will be presented data collection techniques and methods used to collect relevant data and to provide a justification of the chosen methods, thus providing better understanding for the reader. The beginning of this section will present some criteria that the author followed for the development of the research question, followed by description of the data selection and collection techniques and methods used.

The development of research question is one of the first steps when starting a research. Having that in mind, they have some characteristics proposed by Bryman, (2012) that the author took into consideration while developing the research questions for the thesis. Firstly, the research questions are made as clear and possible, in order to be intelligible. Secondly, they have to be researchable, meaning that the research questions would allow a research to be conducted on them. Another characteristic is that research questions should have established relationship with theory and research. Both research questions are based on wide body of literature allowing to

generate conclusions that would contribute to existing literature, but also provide some empirical evidence on the observed phenomenon. Moreover, if having more than one research questions in a research, they should be linked to each other, as is the case in this thesis. Lastly, the research question should be able to make an original contribution, even if it is small (Bryman, 2014, p. 90).

Moving forward to the literature review, which is on of the most important parts in every research. Firstly, the research should be positioned on the existing body of literature and contribute to previously done research. Secondly, it helps the researcher to identify issues and provides justification for the research (Kuada, 2012, p. 40). In addition, the literature review allows researchers to get a better overview of what is known about the research area and what are the relevant theories and concepts (Bryman, 2012, p. 98). The literature review approach taken for this thesis is narrative review (Bryman, 2012, p. 110). Narrative review consists of the examination of theory and previous research related to the phenomenon of study. Furthermore, the narrative review serves as a background and it provides information of what is known about the field of interest (Bryman, 2016, p. 90). Another important thing to note is that the literature review helped the researcher to narrow down the research question, as well.

Whether a researcher chooses a systematic or narrative approach towards the literature review, the use of key words for searching online databases of articles is crucial and most common method (Bryman, 2012, p. 118). The use of key words was followed by snowballing sampling, described by Vogt (1999, in Atkinson & Flint, 2001) as "one subject gives the researcher the name of another subject, who in turn provides the name of a third, and so on". The articles used in this thesis are the most recent ones when possible, in order to get the most recent knowledge on the researched topic, as suggested by Kuada (2012, p. 68). However, having in mind that six innovation processes were examined some of which emerged around the second half of the past century, it was difficult to find recent articles discussing them. Even though, it was made an attempt to following the suggestion of Kuada (2012) throughout the whole literature review.

3.4.2 Data Analysis

According to Yin (2003, p. 109) data analysis can be described as "examining, categorizing, tabulating, testing, or otherwise recombining both quantitative and qualitative evidence to

address the initial propositions of a study". There are four main analytical strategies – relying on theoretical propositions, case descriptions, use of both qualitative and quantitative data and rival explanations. The author used the first one – relying on theoretical propositions as most appropriate for the purpose of the thesis. The propositions help to focus the attention to certain data and to ignore other data (Yin, 2014, p. 130). In addition to the analytical strategy, the analytic technique used as described by Yin (2014, p. 141) is explanation building. This technique is preferred by the author as the purpose of the second research question is to provide an explanation of "how something happened" (Yin, 2014, p. 141).

In order to provide an empirical evidence, for the analysis part was used secondary data. Secondary data analysis represents "any further analysis of an existing dataset which presents interpretations, conclusions or knowledge additional to, or different from, those presented in the first report on the inquiry as a whole and its main results". In addition, this allowed the author to present the analysis throughout the report of the case studies (Yin, 2004, p. 15).

3.4 Validity and Reliability

Validity and reliability are very important part of any research as they ensure that the correct methods were applied and judge the quality of research. Yin (2009, pp. 40-45), discussed four tests to ensure higher quality of the research design, as well as tactics to deal with them. The first one is called construct validity. In order to reach construct validity were used multiple sources of evidence for both case studies. The second one is internal validity. One of the ways to deal with it is by explanation building as suggested by Yin (2009, p. 43), which is also the used analytic technique for the purpose of the thesis. Moving forward, the next one is external validity. This is related to problem of whether the findings of the study are generalizable beyond the current study. In order to reach higher external validity a multiple case study design was chosen. Finally, regarding the reliability of the study is followed case study protocol.

4. Data Gathering and Analysis

The previous two chapters discussed the relevant literature on the topics of interest in the thesis and the methodological approach. Moving forward, this chapter is dedicated to the companies that will be used to provide empirical evidence for overcoming the firm-level challenges in open innovation. The chapter starts with companies' historical development, followed by the changes in the innovation process and their efforts to overcome the firm-level challenges presented earlier. Table 2 presents these challenges together with possible solutions provided by the literature review chapter.

Table 2. Firm-level challenges and consequences of not overcoming them

Firm-Level Challenges of Open Innovation	Consequences of not overcoming them
Partner Selection	Wasting valuable resource in a collaboration that would not produce innovations.
Intellectual Property Rights and Trust	Loss of competitiveness; Incomplete collaborative process; Incomplete exploration of external knowledge and expertise.
Open Innovation Culture	Unmotivated employees; Refusal to further develop concepts; Prevention the successful implementation of innovations
Absorptive Capacity	Inability to identify, acquire, disseminate and apply external knowledge.

Source: Own representation

4.1 Procter & Gamble Historical Overview

Procter and Gamble (P&G) is known as one of the world's largest and most profitable consumer goods company in the world. The company operates in many countries around the globe and have sales over $ 40 billion dollars and near 100,000 employees (Dodgson et al., 2006, p. 337).

In 1837, William Procter a candle maker and James Gamble a soap maker officially signed a partnership agreement and formalized their business in Cincinnati, Ohio, USA. By 1848 P&G net sales are $37,000. However, steady growth of the company ensures growth in sales as well and by 1859, sales reach $1,000,000 and has 80 employees working in the company. One of these 80 employees at that time with artistic aspirations sketched a cluster of stars on a crate of candles. Later, a circle was drawn around the stars and with an image of the man-in-the-moon. This became the unofficial trademark of the company for P&G's products and customers refused to buy products that were missing the sign. In 1850, the company officially adopts the Moon and Stars as official trademark (www.pg.com).

Over the years, P&G expands its product portfolio by introducing new brands and products. All new products are based on the deep understanding of customer needs and the fact that the company introduced the market research. As well as introducing innovative products, the company was capable of introducing them on an innovative way to the market. Over the years, the sons of the founders took over the business and continued expanding the firm by inventing new products and raising capital for growing. "Honest Grade, Honest Weight" is stamped on all Procter and Gamble products. Over the years P&G quickly gained reputation for selling quality products and being company that is build on ethics. In the center of the company's center purpose and values always has been providing customers with high quality products. (www.pg.com).

Over time, the company has made many strategic movements and created a great advantage by being one of the companies that knows its customers best. Along the way P&G has grown through many acquisitions and product developments which led to the expansion of its portfolio to become one of the most complex. Nowadays, its portfolio of products includes 23 brands with annual sales of $1 billion to more than $10 billion and 14 with sales of $500 million to $1 billion – many of these with billion-dollar potential (Agafitei & Avasilcai, 2015, p. 3 A).

4.1.1 Changes in the Innovation Process of Procter and Gamble

P&G operates in an extremely competitive and mature global market, hence in order to sustain its competitive advantage it should constantly search for new, innovative ideas and products.

The company reached a point when realized that to meet its sales targets the innovation rate had to increase significantly. Moreover, the management team of P&G recognized that R&D, innovation and technology development costs increased faster than sales growth (Dodgson, 2006, p. 337). The world's innovation landscape was changing, but the innovation model of the company did not change since 1980 when it moved from centralized approach to a globally networked internal model. In addition, the factors discussed earlier further enhanced the need to change the innovation strategy of P&G. By 2000 for P&G was clear that invent-it-ourselves model was not capable of sustaining high levels of growth (Huston & Sakkab, 2006, p. 2). In other words, it was time for change.

P&G's executives took a crucial decision to change their R&D to "C&D" - connect and develop (Sakkab, 2002, p. 39; Dodgson et al., 2006, p. 337; Huston & Sakkba, 2006, p 3; Panduwawala et al., 2009). This, however, does not mean that the company will leave behind the "R" in R&D. It is the other way around. The company has to connect its own technologies in a better way and improve its connections to technological developments outside P&G (Sakkab, 2002, p. 39). Adopting the open innovation strategy at the company does not aim to replace its 7,500 researchers and support staff, but to leverage their efforts in finding and developing innovative products. The goal of C&D is to produce half of the innovations, ideas for new products and technologies internally and the other half to come from external sources and connections (Huston & Sakkab, 2006, p. 2).

C&D had a great success and managed to bring the company back, on top position. In 2006, 35% of P&G's new products had elements that originated from external sources, moving up from 15%. Furthermore, the company improved different aspects of the innovations like product cost, design and marketing. The productivity of R&D increased by nearly 60%, the cost of innovation has fallen and the success of innovation activities has doubled (Huston & Sakkab, 2006, p. 3). As mentioned above, in the 2000 the company's stoke collapsed, but P&G managed to double its share price and create portfolio of brands and products estimated on 23 billion.

However, success in innovation does not come overnight (Dodgson et al., 2006, p. 343). It takes a lot of efforts, organizational changes and different challenges that have to be overcome before being successful innovator. The following section will describe the actions undertaken by Procter and Gamble, in order to overcome several of the challenges that open innovation paradigm offers that were discussed earlier.

4.1.2 Open Innovation Challenges within Procter and Gamble

The recognition that most of the solutions to the problems of P&G are the expertise of external sources was the first step towards the development of C&D (Dodgson et al., 2006, p. 337). Having that in mind, the company had way more complex problems and challenges to overcome before reaching a point where the changes in the innovation process would generate success. In the following section will be described the actions P&G have undertaken to overcome firm-level challenges as described in the literature review chapter.

After recognizing the need of engaging in open innovation and tapping external sources' expertise, one of the first challenge that companies face is related to the choice of right partners. Choosing the right partners is crucial step towards the successful execution of open innovation process. In order for C&D to work in the desired way, P&G had to first identify what their needs are and "where to play" (Huston & Sakkab, 2006, p. 3). If a company does not have a clearly determined targets, this would result in loads of ideas that may not be useful to accomplish the desired outcomes and waste of valuable resources (Huston & Sakkab, 2006, p. 3). According to Huston and Sakkab (2006), who are respectively Vice President and Senior Vice President of R&D at P&G, in their article reported that the company established criteria for creating a partnership. For example, they were looking for ideas that have some degree of success already. They needed to see a prototype, technology or consumer interest, but also ideas and products that would benefit from the application of P&G technology, marketing, distribution or any other capabilities (Huston & Sakkab, 2006, p. 3).

Furthermore, the company focuses its search in three environments (Huston & Sakkab, 2006, p. 3). The first one is consumer needs, where top ten needs are identified once a year. These needs are further developed into science problems that have to be solved (Huston & Sakkab, 2006, p. 4). An example to illustrate the way it works is P&G's struggles to find products that clean effectively using cold water. Hence, the company is searching for chemistry and biotechnology solutions, which allow products to work very good at low temperatures (Huston & Sakkab, 2006, p. 4). The second one is called adjacencies. These are new products and concepts that could help Procter and Gamble to take advantage of current brand equity. The third way the company narrows its search is by "technology game boards" (Huston & Sakkab, 2006, p. 4). The purpose of these technology game boards it to evaluate how technologies from

one area could affect products in other categories. This facilitates the company's process of evaluating which technologies they need to better compete on the market. Moreover, it provides information about the technologies they already hold and which of these is possible to license, sell or further develop with partners (Huston & Sakkab, 2006, p. 4).

However, having only well formulated criteria is not enough to reach the best of world's offerings. P&G knew that and created a tool to discover not only technologies and products that are successful, but ones that will compliment their own knowledge and capabilities. They call their network located around the whole world "Technology Entrepreneurs" (Sakkab, 2002, p. 41). These people are experts in every business unit's needs and technologies and help P&G connect with external innovation sources (Sakkab, 2002, p. 41; Dodgson et al., 2006, p. 339; Huston & Sakkab, 2006, p. 4). By using the most sophisticated search and information visualisation tools, they can look into billions of pages on the web (Sakkab, 2002, p. 41; Dodgson et al., 2006, p. 339). P&G has more than 8,000 people working in R&D departments of the company, but the world has more than 2 million researches. Hence, the technology entrepreneurs allow the company to find "needle in the haystack" and link it to the needs of the business units (Dodgson et al., 2006, p. 339; Sakkab, 2002, p. 41). Until 2006, they have identified more than 10,000 products, product ideas and promising technologies (Huston & Sakkab, 2006, p. 5; Dodgson et al., 2006, p. 339).

Before the establishment of C&D, the company was rather protective about its intellectual property. In 1999, P&G was using only 10% of its technologies for the portfolio of products at that time (Dodgson et al., 2006, p. 338; Sakkab, 2002, p. 43; Panduwawala et al., 2009, p. 7). That is why, one of the main goals of C&D was to make a significant changes of the way IP is managed within the company. This resulted in a new strategy, where the company aims to achieve innovation through external collaboration in at least 50% of the cases (Dodgson et al., 2006, p. 338). However, this does not mean that P&G will only acquire external knowledge and technologies, but will license out its patents as well. The company realized that it could profit more if they share their technologies and co-develop them with other companies, instead of keeping them "on the shelf" (Sakkab, 2002, p. 43; Panduwawala, 2009, p. 7). P&G made a shift from being "protective" to "proactive" (Sakkab, 2002, p. 43; Agafitei & Avasilcai, 2015, p. 5).

In order to achieve these goals, P&G created a Technology Acquisition Group (TAG) (Sakkab, 2002, p. 42; Dodgson, 2006, p. 338). TAG is just one aspect of company's new licensing

attitude. As well as soliciting external IP, the company actively licenses or donates technologies through TAG, aiming to increase the returns of investments from internal R&D (Sakkab, 2002, p. 43; Dodgson et al., 2006, p. 338). However, achieving these goals and the successful realization of TAG, requires a significant degree of trust from inside-out and vice versa.

Creating an image of a trusted company and being reliable partner in collaboration is not an easy task. Over the years, P&G has built an image of company that strongly relies on its connections and pays respect to its partner companies. As the company has a strong desire to maintain its leading position on the global market, its connections are growing constantly. Hence, the challenge of creating trust within new connections, in order to get the most of a collaboration stays. Since, the company created C&D strategy, it has undertaken several initiatives to improve trust between partners and makes sure there is a win-win collaboration.

The Master Collaboration Agreement of P&G is designed to be fair to all parties in company's collaboration activities from the very beginning (Sakkab, 2002, p. 42). Within this agreement, the conditions for how P&G and its partners will operate together on different projects are defined. In addition, it allows multiple partners to share information and work together. Moreover, it defines IP and exclusivity rights within a broad framework of principles. This allows both parties to skip the months of difficult negotiations typical for any joint development projects (Sakkab, 2002, p. 42).

As described earlier the establishment of trust between partners is not an easy task, but it is important in the open innovation process. Trying to build a strong relationship with its partners, P&G participates in joint technology developments where suppliers and external researchers are allowed to work in the company's own laboratories. At the same time P&G's staff also joins partners in their facilities in the process of co-creation. This type of collaboration goes beyond the typical joint technology development projects and contributes to the development of trust, but also the creation of a good image to all participants in the projects (Huston & Sakkab, 2006, p. 5; Sakkab, 2002, p. 42). Furthermore, P&G's top management team conducts so called "top-to-top" meetings, thus interacting with executives of their external partners (Huston & Sakkab, 2006, p. 5). The purpose of these meetings, as well as shared-staff arrangement is to improve relationships, increase the flows of ideas and deepen the knowledge of each others capabilities (Huston & Sakkab, 2006, p. 5).

Another event that showed to the world how open P&G is its willingness to find and establish partnerships based on trust and commitment was *Innovation 2000* (Sakkab, 2002, p. 44). At this event, P&G was not only searching for external sources of information, but also showcased its most promising technologies (Dodgson et al., 2006, p. 338). This further enhances the position that company has and created many more opportunities for the future. To be exact, after the end of the third day of the forum, the company had around 2,200 new ideas for products and new applications of its existing technologies (Dodgson et al., 2006, p. 338).

Before adopting C&D strategy, P&G was deeply centralized and and its innovation process was internally focused (Huston & Sakkab, 2006, p. 7). In order to generate the desired success of C&D, significant changes hat to be made in the company's culture. As evident from the above mentioned initiatives and collaborative activities of P&G, the company generates a big amount of ideas and propositions for new products and processes development. However, if these ideas are not supported internally, the hunting outside will not pay off (Huston & Sakkab, 2006, p. 7). This requires a radical change in the mindset of employees and the organizational culture. Today the company works on a "proudly found elsewhere" culture (Panduwawala et al., 2009, p. 6), and managed to go beyond the "not-invented-here" syndrome. Such a shift requires deep cultural changes that does not happen over night and may take decades (Dodgson et al., 2006, p. 338).

In order to maintain a successful open innovation approach, P&G was involved not only in opening company's doors for ideas from outside, but was actively promoting internal ideas (Huston & Sakkab, 2006, p. 7). The company makes sure that wherever the solution comes from (internally or externally) and reach successfully the market, rewards for the employees involved in the process are the same. By doing so, P&G's intention is employees to get recognition for the speed of development, instead of putting emphasis on where innovations come from (Huston & Sakkab, 2006, p. 7). The rewards structure within P&G has two main goals. The first is to make sure that the best ideas no matter where they come from, will reach the marketplace. The second is to keep on stimulating the change of employees' mind-set and the organizational culture. At the beginning of C&D, employees were anxious that the new strategy of the company may eliminate jobs or that P&G will loose its innovation capabilities. Yet, the company not only did not eliminate jobs, but with the growing objectives it needed employees to be even more involved and to develop new skills (Huston & Sakkab, 2006, p. 7).

P&G was becoming more and more open towards external capabilities, but did not stop innovating from within. In order to support their internal innovation capabilities, the company has created "Corporate Innovation Fund" (Panduwawala et al., 2009, p. 6). This illustrates the changes the company has made and its desire to pursue opportunities coming from outside, but also allowing its own employees to develop innovations (Dodgson et al., 2006, p. 338).

The open innovation approach suggests that companies operating in this paradigm will have access to a big pool of knowledge. In the case of P&G, this pool of external knowledge is quite big and it is very difficult to absorb all the knowledge. The company has undertaken some initiatives in this direction, in order to get as much as possible from its partnerships around the world, but also the whole organization in general.

The technological advances have enabled the Connect and Develop project to assist the company in the creation, transfer and utilization of knowledge across the organizational boundaries (Dodgson et al., 2006, p. 338). To facilitate this process, P&G created the internal website "InnovationNet" (Sakkab, 2002, p. 40). One of the main function of InnovationNet is to allow employees to locate and maintain employee knowledge. Taking this into account, it provides the users of the website with the ability to take immediate actions (Panduwawala et al., 2009, p. 6). This provides P&G with one of the most important qualities when working with innovation – the ability to accelerate innovation. In addition, InnovationNet allows employees across the globe to communicate, collaborate with colleagues and cross-fertilize their expert knowledge in different fields. It also helps employees to get access to external databases, which further enhances the importance of InnovationNet.

Within P&G there are also 20 Communities of Practice (CoP). These communities are supported by the senior R&D management of the company. They are considered as a critical force for the creation of knowledge and new skills that will ensure company's continuous growth. Some of the activities of CoP include problem solving through via email conferences, knowledge sharing via live seminars, active searching for internal and external expertise and tools for diffusion throughout the organization. Communities of Practice within P&G play crucial role in the identification, development and deployment of new research methodology and technology connections (Sakkab, 2002, p. 41).

4.2 LEGO Historical Overview

LEGO is famous Danish company that was founded in 1932 by Ole Kirk Kristiansen. The company was established in Billund, Denmark and its headquarters are still there. The name "LEGO" is an abbreviation from two Danish words - "leg godt", meaning "play well". It is a family owned business and has been passed from father to son and currently owned by the grandchild of the founder – Kjeld Kirk Kristiansen. The company has witnessed a significant grow from a small carpenter's workshop to one of the world's biggest manufacturers of toys (www.lego.com). The first product offering of the company was wooden toys for children. The founder of the company invented the plastic bricks in 1949 and in 1957 the stud-in-tube system for connecting them (Hatch & Schultz, 2010, p. 596).

By 1959 the LEGO stopped making wooden toys and focused entirely on plastic bricks and related products. The company made significant innovations at that time resulting in over 50 elements in the LEGO toy system by 1988. In 1968, the company opened a theme park, which shows miniature towns with different features made entirely from Lego bricks. The park attracted over 600,000 visitors in the first year of its opening (Tidd & Bessant, 2013, p. 1).

The growth of the company continued throughout the the later years of the 20th century. There was no surprise when Lego was named "toy of the century" in 1999. However, by the late 1990s the company started facing difficulties. New competitors emerged with low cost, but good enough quality products. In addition to that, the company's supply chains were long and expensive, at some points with 11,000 contractors. The product range of the company became very complex with many product ranges. Having in mind these circumstances, the company started loosing market share and the crisis peaked around 2003 with loss of $240 million and fears of bankrupt. The tradition family management ended in 2004. With the change of the CEO and the injection of $178 million from the family allowed the company to take a new and more successful direction. Some of the changes made by the new CEO include cost-cutting in areas like supply chain and factory location, together with product development strategy. The applied changes have brought the company back on track and in 2006 and 2007 the company reported its best-ever financial performance.

By 2016, LEGO has over 18,000 employees from 70 different nationalities. In addition, the company opened its own factory in Jiaxing, China. In December 2016, the company also announced that CEO Jørgen Vig Knudstorp will hand over the position to Bali Padda, COO (lego.com). The changes made within LEGO seem to be radical, but successful, so the following sections will look at the open innovation activities made by the company, which have major impact of the recovery and growth of the company.

4.2.1 Changes in the Innovation Process of LEGO

The growing world competition and different circumstance put LEGO in position that required the company to change the way it thinks and operates on their markets. It was time to innovate the way it interacts with its customers and in general they way it innovates. Being successful on the market depends to a big extend on how well one satisfies customer's needs. The financial loses that the company encountered, changed the direction of the company and stimulated significant changed in the way it operates (Terzieva, 2012, p. 37).

The business and innovation activities within LEGO have been organized traditionally within the firm. Having core competencies in the manufacturing process, as well as the creation of various themes and scenes that are sold as pre-packaged play sets, the company could not think of acquiring external knowledge (Grandori, 2013, p. 368). However, the nomination of a new CEO that had the difficult task to bring the company back as world leader in the toy industry, came with a new strategy towards innovation.

LEGO chose to open up its innovation process and to include its customers and fans more and more in the process. That was a crucial decision that helped the company to achieve a sustainable growth over time. For a company like LEGO, the involvement of customers is the most important source of innovative ideas. This move by the management team not only saved the company from bankruptcy, but opened new opportunities, projects, lines of toys and most importantly the desired growth. LEGO is one the first companies that managed to successfully implement various innovation open innovation practices within its core business (Terzieva, 2012, pp. 37-39; Grandori, 2013, p. 368). In the following section will be described several of the open innovation initiative that the company has undertaken over the years, making the company world leader again.

4.2.2 Open Innovation Challenges within LEGO

As described in the previous section, the crisis that LEGO faced was good enough indicator for changes in the way the company operates. The company moved from internally oriented to a company that opened its front door to users and fans of the company to participate in the innovation process. This led to significant growth of the company and below will be described some of the initiatives undertaken by executives within LEGO.

In 1998, LEGO released a brick-based robotics kit called LEGO Mindstorms, designed primarily for children. The kit had 727 parts and children were able to create and program the robots to perform different tasks (Terzieva, 2012, p. 38; Grandori, 2013, p. 369). The product was very successful, but the company soon realized that the Mindstorms kit is used by adult enthusiasts to enrich their knowledge about robots. A student from Stanford University, reverse engineered the kit and released in internet all of his findings including the software for the operations of the robot (Grandori, 2013, p. 369). Over time, Lego discovered that a growing number of users were "hacking" Mindstorms' software and were developing different applications and extensions to the original code created by the company (Tidd & Bessant, 2013, p. 4; Schlagwein & Børn-Andersen, 2014, p. 763).

At that moment within LEGO there were different opinions on what should the company do with the current situation (Grandori, 2013). At the beginning, normally the first reaction of LEGO was to undertake legal action (Schlagwein & Børn-Andersen, 2014, p. 763). Even though the company felt in danger and its intellectual property was spreading around very fast, LEGO decided not to take legal action. Soon, the executives realized that fans and users had improved the system, for free. By adopting the open innovation approach and realizing one of its main principles "not all the smart guys work for us", the company took a crucial decision. LEGO started cooperation with its users and developed new, improved products with more sales and popularity. This decision saved LEGO many resources in the innovation process and created brand new image for the company. In addition, the company managed to discover that its products are used not only by kids, but also mature people uncovering how big the LEGO community is. This community as will be described later is a major partner of the company in the new approach towards innovation. According to LEGO's CEO (in O'Connell, 2009), openness is big part of the strategic agenda:

The LEGO community…is one of the company's core assets. While we have 120 designers on staff, we potentially have probably 120,000 volunteer designers we can access outside the company to helps us invent.

The next generation of Mindstorms was developed by user-designed parts (Terzieva, 2012, p. 38). LEGO invited a small group of users in Denmark, which were chosen based on their leading roles on fan-run LEGO forums. Even though, this group had to pay their flights to Denmark, they were really enthusiastic about the idea. The reward, except the credits for their participation in the development of Mindstorms was a pack of LEGO bricks. The company considers their participation very valuable for the development of the second generation Mindstorms (Schlagwein & Bjørn-Andersen). Participants provided rapid feedback to LEGO's R&D team on a different technical and market issues. In addition, they suggested new feature that would make the user experience of the new product outstanding (Grandori, 2013, p. 370). This initiative aims to reduce the internal skepticism towards the open innovation process that companies face throughout the process and to encourage employees to get over the not-invented-here syndrome.

Turning now to the protection of intellectual property, in general, big and successful companies are rather protective in regards to their intellectual property. However, the management of LEGO did not allow IP protection to stop the development of Mindstorms, it actually opened up company's doors for "hackers" and everyone that is willing to further develop the product. Since then, LEGO opened its innovation process in the idea generation and implementation phase and the communication with customers is supported by formal and informal platforms. This allowed the company to spread ideas and upgrades faster, developing an efficient innovation process. However, LEGO has established a successful framework for its innovation. The company becomes an owner of any created IP, but the person or group that came up with the idea is compensated by monetary reward. Hence, both parties of the open innovation project are satisfied (Terzieva, 2012, pp. 39-44). Furthermore, the new products have features and upgrades that the actual users of the products want, thus resulting in higher satisfaction and more sales for LEGO. The company takes advantage of the curiosity of its customers and fans allowing them to co-develop new products with LEGO's employees. This approach seems to produce innovative products for the company without harming corporate's image or raising up any IP issues.

Not only employees on the R&D department meet with customers or passionate people about LEGO. In order to encourage more open culture within the company, managers also participate in meetings with customers, like the annual BrickFest held in USA. Face-to-face meeting allow people to share their creations and techniques, while managers at LEGO have the opportunity to learn more about what customers like about LEGO and their ideas for new products. At BrickFest in 2005, even LEGO's CEO Knudstorp participated. After the event a significant number of new people were encouraged to share their product ideas and co-develop with LEGO employees (Hatch & Scultz, 2010, pp. 597-598). These initiatives from LEGO's executives and its employees in general develop high levels of trust between the company and its customers. Moreover, as evident they encourage more and more people to participate in the innovation process and expand the LEGO community.

After the crisis the LEGO Group faced, the corporate culture had to be changed, having new number one priority: "making money for the company". That was the first step towards changing the culture within the company. The adopted new strategy of LEGO included more user centricity and engagement within the innovation process. Part of the new strategy were new organizational structures that would support the new approach towards innovation. For instance, LEGO created open innovation department specifically to develop and execute the open innovation strategy. In addition, new business group was established, in order to explore new business opportunities. Change in the mind-set of top management team was also required, which helped to overcome the internal inertia towards open innovation and to overcome the not-invented-here syndrome (Schwagwein & Bjørn-Andersen, 2014, p. 763; Terzieva, 2012, p. 37). Facing the increased competition, LEGO's executives realized that cannot continue to innovate internally and through open innovation its products will improve and satisfy more and more customers around the world (Terzieva, 2012, p. 38).

The collaboration that LEGO established with its customers has proved their valuable contribution to the projects. As well as presenting market needs, customer involvement is a big source of knowledge for company's staff. The establishment of systematic process for generating information from customers and fans of the company is not enough for the process of knowledge acquisition (Terzieva, 2012, p. 39; Schlagwein & Bjørn-Andersen, 2014, p. 767). The information that is acquired from LEGO is systematically channeled and passed to the right people within the company. This ensures the flow of valuable knowledge and information around the company.

Another improvement in LEGO's behavior is its communication with customers. As they have big impact on the innovation process, the improved communication enhances the trust between them and the company. For instance, after taking decision whether to implement ideas or not, the company communicates its decisions to the customers, and sometimes explains why some of the ideas are not further developed. By providing feedback, the company encourages and motivates people to be more involved and creative (Schlagwein & Bjørn-Andersen, 2014, p. 767). To further enhance the knowledge and competence transfer process, the company created LEGO Ambassador program. Since it started in 2005, the company has recruited around 50 dedicated users to work for short periods. The purpose of LEGO Ambassadors is to work together with LEGO employees in all areas that concerns the LEGO community worldwide. This strongly developed relationship, had a big impact over the years and it contributed to the co-creation of several innovative products, much dialogue on the current position of the company and the changes in the structure (Hatch & Schultz, 2010, p. 598).

In order to further enhance the learning process within the company, LEGO's executives established LEGO Spirit program (Hatch & Schultz, 2008, p. 146). This program encourages employees as well as managers to tell their stories about how they execute LEGO values. There are different themes and topics that participants may talk about. For instance, some of them are living LEGO values, consumer and brand focus, leadership, developing professional skills and business drive. This initiative allowed employees of LEGO to share their knowledge and experience, but also disseminates useful information for people in different departments and where they may focus their efforts more. Thus, the culture of LEGO became more open and one that supports knowledge sharing within (Hatch & Schultz, 2008, p. 146).

The LEGO Group does not only cooperate with its customers and fans in the process of generating ideas for new products and series of toy bricks. The collaboration between LEGO and NASA for joint development of innovative educational materials and/or activities is a clear example of that. This partnership creates benefits for both parties with no doubts. On one hand, NASA is able to generate new incentives and support the educational programs of the organization. On the other hand, LEGO managed to create whole new commercial line called "LEGO Space City". This new product features real-life vehicles and rockets that NASA is using (www.nasa.gov; www.lego.com). Thus by opening its boundaries, both companies managed to generate innovative ideas and new intellectual property that would benefit all

stakeholders. NASA further improved the educational process for students up to 18 and inspired many of them to participate in the development of new concepts. LEGO on the other side, managed to create a new line that brought many sales around the world.

5. Discussion and Recommendations

This thesis has begun with broad literature review in order to follow the changes in the innovation process and to understand the factors that led to the emergence of open innovation process. Open innovation process, also called from some researchers the sixth generation innovation process is becoming more and more preferred strategy for pursuing innovation nowadays. As described earlier, number of factors have influenced its emergence and for the current state of the business environment in many industries it seems to be the best approach. However, once again it is important to note that the purpose of this thesis is not to argue that open innovation process is the best approach towards innovation. In fact, the purpose is to compare it to other processes and present the main firm-level challenges that it can propose and to provide insights on how to deal with them.

The fast changing business environment requires from companies to be flexible and most importantly innovative, in order to survive. This in turn requires an innovation process that would ensure the successful introduction of new products and services that satisfy the changing needs of customers. Thus, following the evolution of the innovation process provides information for the changes of the process itself, the reasons for this changes and what we may expect in the future even though it is difficult to predict. As mentioned earlier, there is no a unique innovation process that would make the perfect fit for every company and its business environment. Hence, the findings of the first research question – the factors that influenced the evolution of the innovation process and how open innovation process compares to its precursors provide useful information for several reasons. The generated conclusions would assist in the process of understanding, designing and choosing course of action on problems related to the innovation process within companies. In addition, the different features, strengths and weaknesses of the different generations of innovation processes would assist in the development of the optimal innovation process.

The findings of the second research question are as important and useful as the first one. The identified firm-level challenges from the literature review chapter were also supported by both case studies of Procter & Gamble and LEGO. The results have further strengthened the theoretical proposition that these challenges exist and provide empirical evidence in support of

this argument. Taking this into consideration, the proposed challenges are real and if not managed carefully, they may be rather destructive for the open innovation process.

Partner selection

Regarding the first challenge of partner selection, both companies have slightly different approaches. For instance, in the case of P&G, the company has established criteria for selecting partners from the very beginning, as well as wide network of people that would facilitate this process called Technology Entrepreneurs. This wide network of people assists P&G to more easily find and establish partnerships. In the case of LEGO with Mindstorms kit, the cooperation started rather naturally. This is due to the fact that LEGO did not look for partners or any help from its customers on first place. However, soon after realizing the benefits of this co-creation with its customers and fan base, LEGO also established criteria for choosing the right people that would bring most value in the innovation process. These actions from both companies indicate that first it is important to know what are the needs of the business and then to engage in the process of searching and selecting partners. Moreover, the selection criteria will differ from industry to industry as well as depending on the goals that a collaboration aims to achieve.

Intellectual property and Trust

Moving forward to the challenge of managing intellectual property rights and trust in collaboration, the findings are not surprising. Even though as described in the literature review chapter the management of IP and development of trust is quite challenging, both companies show that it is possible to overcome this challenge and satisfy the interests of all parties. On one hand, P&G has undertaken several initiatives to deal with this challenge. First, the company has designed Master Collaboration Agreement, which aims to define IP and exclusive rights within the collaboration. In addition, the TAG Group of P&G helps the company to both acquire external IP and to out license its own. Moreover, in order to maintain high level of trust the company's executives have "top-to-top" meetings with executives of its partners. Furthermore, the joint technology projects where staff from P&G and its partners visit each others facilities further enhance the trust and sharing of intellectual property.

On the other hand, LEGO in comparison becomes owner of any created IP within its collaborations. However, the company compensates the person or the group that has come up with the ideas and helped to further develop the concepts. Even though the approach towards

intellectual property of both companies is slightly different, in their attempts to develop trust with their partners and to maintain an image of a trusted company they have some similarities. Similarly, to P&G, LEGO executives also meet with partners of the company (in this case customers). To illustrate that, the perfect example is the BrinkFest where the CEO of LEGO met customers and fans. These meetings with executives and employees then encouraged more and more people to join the co-development process with LEGO's employees.

Some may argue that due to their size both companies take advantage when participate is such partnerships. In fact, both companies are engaged in inbound and also outbound open innovation. Having that in mind, they not only acquire external knowledge, but share their own. In addition, in both cases when in collaboration all parties of the agreement are satisfied and both companies did not face any IP issues. Furthermore, P&G as well as LEGO have created an image of companies that strongly rely on their relationships with the external environment over the years. This further facilitates the process of establishing agreements and taking most of the open innovation process.

Open Innovation Culture

The change in the corporate culture when a company enters the open innovation paradigm presents a big challenge for executives. However, the analysis of both case studies show that making the transition and maintaining open innovation culture is possible. P&G has designed a reward structure that promotes both internal and external ideas which constantly stimulates good results no matter the source of ideas. Even though P&G's goal is half of the innovations to come from outside, this does not mean that internal ideas would not be promoted as well. In fact, there is Corporate Innovation Fund allowing internally developed ideas to reach the marketplace. By doing this it is believed that employees would overcome the not-invented-here syndrome and would also support the external cooperation. The main goal of P&G in the open innovation process is to improve the speed of development, instead of focusing on where the innovation arises. In this case, the appropriate reward structure as well as the Corporate Innovation Fund have facilitated the transition and the company has successfully introduced numerous innovative products throughout the years.

In the case of LEGO, the company created a whole new department that has the purpose to develop and execute the open innovation strategy. Dysfunctional organizational communication as described earlier may cause the not-invented-here syndrome. Thus, the

changes in the organizational structure of the company aimed to improve the communication within the company and to stimulate the acceptance of the new strategy. Another way that LEGO's executives used to improve the communication and to disseminate knowledge and competencies around is the LEGO Spirit program. This initiative allows employees to share their knowledge, experience and ideas with their colleagues from different departments, thus further enhancing the opening of the corporate culture in LEGO. Regarding this challenge, the LEGO case confirms that with a good intra-organizational communication the not-invented-here syndrome may be overcome and open innovation culture may take its place.

Even though the focus of action is slightly different, both cases successfully made the transition to open innovation culture. P&G focused more on improving the incentive system within the company, in order to encourage employees to be more active no matter where the ideas for innovation come from. In comparison, the focus of LEGO was to improve the communication within the company, which in fact is also a successful approach.

Absorptive Capacity

Being able to recognize, acquire and assimilate the external knowledge is one of the main activities when companies are engaged in open innovation. This is also the main purpose of the absorptive capacity. However, this is not an easy thing to do especially in large companies. Even though, both case studies are good examples of how can improve the absorptive capacity, which in turn will pay off in the future. For instance, P&G created internal website "Innovation Net". Its purpose is to maintain employee knowledge, which allows everyone in the company to have access to needed information immediately. Moreover, it allows employees to communicate with each other on different topics and solve problems together from long distance. To further enhance the absorptive capacity P&G has established Communities of Practice within the company. Their goal is to create new knowledge and skills that would enhance the innovation process. Furthermore, they search for internal and external expertise and try to diffuse them around the whole company.

LEGO in comparison, established LEGO Ambassador program. Through this program the company recruit users that work for short periods within LEGO trying to share their knowledge with employees of the company. These users work together with LEGO staff in all areas trying to improve the experience of the whole LEGO community around the world. In addition, joint

development projects with organizations like NASA and others provide a great experience for the employees of the company and enhance the knowledge acquisition and utilization process.

The actions of both companies suggest that in order to enhance the absorptive capacity and to enhance the learning process within the company there are different approaches that could lead to success. On one hand, P&G depends more on internal capabilities to acquire, create and disseminate the knowledge and expertise needed for the proper execution of the open innovation process. On the other hand, LEGO works closely with advanced users and customers to transfer their knowledge directly within the company. Moreover, projects as the one with NASA also help in the process of acquisition and dissemination of knowledge within LEGO.

5.1 Recommendations

The findings of the analysis discussed in the previous section lead to some recommendations that can be provided. First, in order to select the right partners, companies have to identify the areas that they need to improve in first place. This would facilitate the process and would give information where to search for partners. Moreover, it is important to have selection criteria as described both in the literature review and the analysis of the both case studies. Second, when designing IPR agreements it is important to be designed in a fare way for both parties. This would shorten the period for establishing partnership and would save much time and resources. In addition, "top-to-top" meetings as well as joint development projects enhance the trust in cooperation and create a good image for the company. More precisely it would ensure a good cooperation and would provide environment for secure sharing of intellectual property.

In order to overcome the not-invented-here syndrome, companies have to adjust their reward and recognition systems. This would ensure the internal support for external ideas. To further ensure the change of the culture is required also improvement in the intra-organizational communication. Finally, one good way to enhance the absorptive capacity is to allow employees from the companies to work together in either's facilities. This would boost the transfer of knowledge and competencies from one company to another. Moreover, in order to be able to more easily absorb the new knowledge, companies should also keep on investing in internal R&D and improvement of staff's competencies.

6. Conclusion

The growing interest in open innovation, the need for companies to design an optimal innovation process and to execute it in a way that would produce innovations were the primary incentives behind this thesis. The innovation process has come a long way and has suffered many changes over the years. With its evolution the innovation process has slowly moved over years from closed to open, meaning that collaboration is important part of it nowadays. The fact that innovation is considered of great importance for growth and survival for a very long time, puts even more pressure on companies to be successful innovators. Throughout the years the complexity of innovations has increased. Having that in mind, companies need to adapt and implement innovation processes that would ensure stronger innovation capabilities.

Hence, this thesis has investigated the evolution of the innovation process as well as firm level challenges in open innovation process. The factors that influenced the evolution of the innovation process have emerged over time and serve to explain the changes in the process itself. Taken together, these factors form the basis for the future development of the innovation process. Moreover, the strengths and weaknesses of the different innovation processes would assist in the process of designing and improving companies' innovation processes.

The last generation innovation process – open innovation process, has made a significant impact over the business environment since its emergence. That is also why it is becoming more and more widespread. The two case studies have confirmed the existence of the presented firm-level challenges and provided some insights of how they could be overcome. In addition to that, they allowed the author to address recommendations that could assist managers and people related to the execution of the innovation process within companies. The provided recommendations derive from the literature as well as from both case studies of Procter & Gamble and LEGO.

In conclusion, this thesis has achieved its initial goals, to identify the factors that influenced the evolution of the innovation process and to compare the last generation (open innovation process) to its precursors, thus providing explanation of why more companies engage in it. Moreover, there were identified the firm-level challenges as well as how they may be overcome

by using empirical evidence from two companies that successfully execute the open innovation process.

6.1 Limitations

The following section presents the limitations that occurred during the writing of this study.

One of main limitations is concerned with the lack of chance to interview any employees from both companies. This would ensure more empirical evidence and would allow the author to address the researched problems directly to people that have been part of the companies during the period of establishing the strategy and dealing with its challenges. A discussion with people from the top management of both companies would bring more accurate explanation of how they faced the presented challenges.

As another limitation is considered the lack of case study that failed due to unsuccessful management of these challenges. On one hand, this would strengthen the argument that these challenges are real and attention should be paid to them. On the other hand, it would illustrate actions that do not lead to successfully overcoming of the challenges.

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