
Key Issues to Improve Innovation Project Excellence

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Abstract

Nowadays innovation becomes a focal point for corporate success and survival. Thus, in order to be more concurrent and to realize innovation that meets required goals and performance expectations, companies have to achieve excellence in managing the innovation process. Delivering innovations with unique benefits and real value to customers separates winners from losers more often than any other single factor. Therefore, the excellence in innovation projects becomes a necessity, and it implies recognition of all critical success elements that can affect and, in some way, do the harm to the process. There are a lot of factors and issues that can influence innovation project success and excellence. In this paper, we chose some of the critical elements, such as innovation strategy, idea management, innovation portfolio, innovation model, and risk management.

Keywords: innovation, innovation project, innovation strategy, risk management

1. Introduction

Not many words are needed to explain the importance of innovation and, consequently, innovation projects in today's rapidly changing economic environment, where competitive pressures impose companies to continually innovate to sustain profitable growth and business success. In other words, innovation becomes a necessity, not only through new product or service development but also through finding new business models which often implies changing the rules of the game, organizational innovation, through finding a new way to improve the efficiency of production and overall business, process innovation, as well as through implementation of new marketing methods [1].

Studies have shown that those companies who prioritize innovation are also those with the highest increase in turnover. In this regard, the research conducted by European Commission revealed that some 79% of companies that introduced at least one innovation since 2011 experienced increase of their turnover by more than 25% by 2014 [2]. Therefore, innovation gained a status of a key driver and precondition for competitiveness [3, 4], moreover, a key element of modern management and everyday culture.

Having in mind that a huge number of various factors, which potentially influence the innovation project excellence, can be identified in different environments (above all, organizational context and level), this study will be related to those that appear to be the most frequent and the most important. Achieving the project success is always a big challenge, which is even greater in the case of innovation, so the aim will be to overcome the perils and make the success possible. In this paper, we chose some basic elements that have to be included in the innovation process if a company wants to achieve excellence, and that, also, can be recognized in project excellence model presented in Ref. [5]. Those elements are innovation strategy, idea management, innovation portfolio, innovation model, and risk management. Different project excellence models can be found in the literature and practice, and all of them evolve regarding continuous learning and adaptation.

2. The concept of innovation and innovation project

Today, it is commonly accepted concept with a large number of definitions. One of the most cited, giving the widely accepted innovation framework, is presented in *Oslo Manual Guidelines* [1], explaining innovation as an implementation of a new or significantly improved product (good or service), or process, or a new marketing or organizational method. Having this in mind, there are four (conditionally) types of innovation and therefore innovation projects:

1. Product/service innovations.
2. Process innovations.
3. Organizational innovations.
4. Marketing innovations.

Innovation as specific form of change can be defined with respect to various aspects, and the following stand out:

- Drucker defines innovation as the specific tool of entrepreneurship, the means by which they exploit change as an opportunity for different business or a different service.
- Porter observes innovation as a possibility of the company to gain competitive advantage based on innovativeness and ability to realize innovation projects.
- According to Freeman industrial innovation includes technical design, production, 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.

- Rothwell used nature of innovation to define innovation, separating two forms of innovation: radical innovations and incremental innovation. Incremental innovation can be described as series of small improvement to an existing product that usually helps maintain or improve its competitive position over time. On the other side, the result of radical innovation is completely new products/services/processes, and it can be presented as a process in which the direction of the research is known, but the ultimate goal is not.

One innovation is successful if it produces the ability of the company to constantly contribute to the growth, through continuity and adaptation. The essential question is that of the approach to innovation that should be implemented in the firm; organization and its smaller units should be guided through the complex innovation process—from ideas created to sales, revenues, and profits achieved. For instance, a very useful concept is introduced (developed, recognized) by *InnovationLabs* consultants, called Innovation Master Plan, presented in the book with the same name. The *plan* follows the simple structure based on five critically important questions about innovation in the organization [6]:

1. Why innovate—a question about strategic nature of innovation, which explains the linkage between innovation process and intended results based on the innovation.
2. What to innovate—a question about designing and developing innovation portfolio, to prepare many innovation options for a wide range of possible futures.
3. How to innovate—a question about designing the innovation process that is going to identify, create, and develop ideas which are going to become innovations.
4. Who innovates—identifying who is going to participate. It is necessary to identify three roles for achieving broad and consistent innovation results. These roles are (1) innovation leaders, who set policies, expectations, goals, and the tone for the innovation culture; (2) innovation geniuses, who come up with great ideas and insights; and (3) innovation champions, who organize the pursuit of innovation and support those who develop great ideas and turn them into business value.
5. Where to innovate—a question about constitution of infrastructure, support systems, and tools that will be used to enable everyone inside and outside the organization, to participate effectively in the innovation process.

Since innovation means a process from idea to realization, in theory and practice, a growing consensus can be witnessed on innovation being looked at as a project. From the theoretical point of view, both innovation management and project management have evolved over time as two independent disciplines. On the other hand, practice showed just the opposite, namely, the most effective way to manage the lifecycle of innovation process is by using project management. Etymologically, the term project originates from Latin word *projicere* which means to throw something forward. Taking all this into account, the fact that innovations are mainly developed by applying the concept of project management is not surprising at all. Moreover, different authors from the field pointed out that overcoming the difficulties of moving from ideas to value creating can be achieved by using the principles, methods, and techniques of project management. One of the definitions explicating the connection between

innovation and project management identifies innovation projects as the management of a system that transforms inputs into outputs and has a feedback mechanism to ensure that the project output is consistent with its objectives [7].

Therefore, some specific features that distinguish innovation projects compared to conventional ones can be recognized as [8]:

- Conventional projects should have clearly defined objectives. Innovation projects, usually, starts with weakly defined, sometimes ambiguous objectives, which become clearer in the following phases of project. Procedures used are, mostly, experimental or research nature.
- Project teams are comprised of people of different professions (knowledge and skills, etc.), among whom should exist high level of trust.
- Considering the failure as a possible outcome, innovation project teams should with great concern take into consideration risk management.
- The ideas presented in innovation projects should be “sold” to “sponsors.”

Bearing in mind the classification of innovation projects based on criteria of nature (intensity), we can talk about incremental and radical ones, as mentioned earlier. Incremental innovations are the most common forms of innovation in many companies, and on average approximately 80% of all investments in innovation in companies refer to them. This classification can be further developed connecting this types (incremental and radical) to key characteristics, such as project goals and objectives, uncertainties, and industrial sector. Additionally, in this classification imitation is also included, representing a creative effort for development of a product or service. Imitation is positioned before the incremental innovation, since it has the lowest innovative intensity. Innovation projects are executed in various industrial sectors (ranging from low- to high-tech). Speaking of high-tech sectors, the imitation projects involve reverse engineering of advanced technological products. Generally, that was a key element of industrialization strategy of many Southeast Asian economies [9].

High performance in projects and excellent project management has become imperative in today’s business environment. Hence, resources engaged to projects have to be utilized in an effective and efficient manner with the intention of achieving maximum benefit to the stakeholders involved. Therefore, some authors define project success as the satisfaction of all stakeholders. There are a lot of factors and issues that can influence innovation project success. Some of them are mentioned as features of innovation projects. There cannot be generated a universal checklist suitable for any project, and this, also, works out for innovation. They will differ from project to project depending on a number of issues, for example, size, uniqueness, and complexity. At the company level, successful management of innovation project should include some basic elements [8]:

- Innovation strategy and organization.
- Creativity and idea management.
- Innovation portfolio.

- Innovation models.
- Risk management.

3. Creativity in innovation projects

The most successful companies today are those who are the most creative and innovative. Accordingly, innovation and creativity have become critical skills for achieving success in developed economies. To reach this position, leading companies often tend to distance themselves from the competition rather than compete with them (Apple as an example of the blue ocean strategy). In other words, they are able to leverage their own creativity and their innovation capabilities to attain long-term success. The need for creative problem solving becomes a necessity since more and more management problems require creative insights in order to find suitable solutions. Many examples in the practice have shown that companies increase their productivity by stimulating creativity and exploring completely new and unknown territories (3M Company gives to its researchers time to work on projects that they consider important for the company, and 15% of the weekly working time they can devote to such activities [8]). Encouraging the employees' creative thinking and giving them time and resources to explore new areas for innovative ideas are the key to cost-effective business solutions.

One of the definitions that may be considered as the most comprehensive, designates creativity as the production of novel and useful ideas (some would say ideas that have value). An idea is still novel even if someone else already invented it without your knowing or in a different context. And an idea is still useful for your company even if another company has already applied it [10].

Creativity goes hand in hand with innovation. It can be said that there is no innovation without creativity. While creativity is the ability to produce new and useful ideas, innovation is the implementation of that creativity, in the form of new product, service, process, and business model. In other words, every innovation starts with a creative idea and all together represents a part of fuzzy front end of innovation process [10].

Creativity and innovation are used interchangeably. This is reflected in the commonly accepted definition of innovation equaling creativity plus (successful) implementation. Creativity by itself—coming up with new ideas—is not enough. von Stamm [11] in her work gave some examples of great inventors, who were not able to gain the benefits to their effort—X-ray scanner, invented by Electric and Musical Industries (EMI) but General Electric made a commercial success; VCRs which had been invented by Ampex/Sony but were successfully commercialized by Matsushita; or the vacuum cleaner invented by Mr. Spengler but commercialized by Hoover.

In order to be successful and to achieve implementation, companies need processes, procedures, and structures that allow the timely and effective execution of the projects and that allow for good ideas to come to right place.

Idea management systems offer people a perfect outlet to which they can submit their ideas and, therefore, enable for good ideas to come to right place. For companies, it can be a perfect

way to capture and further develop ideas. They should no longer remain in the drawer. These systems can help to recognize the need for ideas and to generate and evaluate them. Ideas could come from different sources—employees, customers, or suppliers. According to the research conducted by Erasmus University Rotterdam, there are three different types of idea management systems (programs): HR idea management systems, R&D idea management systems, and marketing idea management systems. HR idea management systems are used to collect ideas that improve processes and save money for the company. These systems focus on the employees of the company. The ideas that employees submit are often quite small incremental. One such system engages company DHL. The focus is different concerning R&D idea management systems. These systems care very much about the ideas that people submit. The ideas can come from their own staff or from outside people and organizations. Shell uses one of these systems, named “GameChanger.” R&D systems are managed by R&D department and ideas generated are radical. Finally, the focus of marketing idea management systems is on customer. In that way, companies try to engage with customer. Starbucks is using this system. Marketing systems represent very effective marketing and communication tools and result in incremental ideas.

4. The role of innovation strategy

One of the critical points of innovation management excellence refers to the strategic decision-making in the field. These strategic decisions should make balance between companies’ ability and opportunities that exist in the environment so as to achieve long-term business objectives. Innovation strategy should support business strategy, acting as a mediator between the company and its environment in the innovation domain. It should be synchronized with other strategies in the organization, such as technological, marketing, manufacturing, and strategy of intellectual property [8].

Innovation strategy is often a crucial step for new company to join the existing market. As well, the existing organizations are using this strategy as an advantage if they have the ability to recognize this advantage. Innovation strategy is grounded on the business model and technology of the companies. Various companies have confirmed in practice that successful implementation of innovation requests a combination of technological change with the change of business model [12].

Generally, there are three key areas in which innovation strategy is associated with the change of business model (**Figure 1**) [12, 13]:

1. Value proposition—**What** is going to be sold and delivered to the market.
2. Supply chain—**How** is it going to be created and delivered to the market.
3. Target customer—**Who** is going to use it.

The process of developing an innovation strategy, similar to the creation of any good strategy, should start with a clear understanding and articulation of specific objectives related to achieving a sustainable competitive advantage. It should answer the following questions [14]:

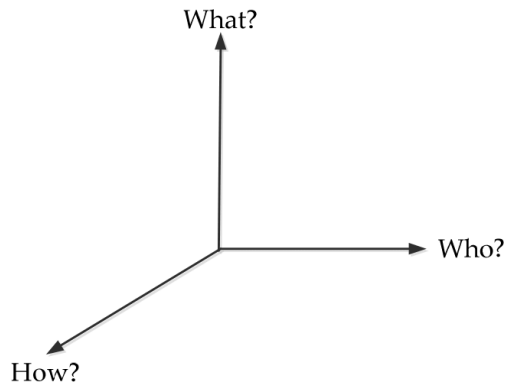


Figure 1. Strategic positioning map [13].

1. How will innovation create value for potential customers?

Innovation can create value in many ways. After choosing what kind of value the innovation will create, it is important to stick to that, because the capabilities required for each are quite different and take time to accumulate. Apple consistently chose to make its products easier to use than competitors' and to provide a seamless experience across its expanding family of products and services.

2. How will the company capture a share of the value its innovations generate?

The big problem for innovations is that they attract imitators as quickly as customers. The intellectual property alone is not enough to block these rivals. It is essential for companies to think of complementary assets, capabilities, products, or services that could prevent customers from deserting to rivals and keep their own position in the ecosystem strong. One of the best ways to preserve the position is to continue to invest in innovation.

3. What types of innovations will allow the company to create and capture value, and what resources should each type receive?

Undoubtedly, technological innovation is a huge creator of economic value and a driver of competitive advantage, but in the past couple of decades, we have witnessed companies like Netflix, Amazon, LinkedIn, and Uber, which power relies on business model innovation. So innovation strategy should specify how the different types of innovation fit into the business strategy and, also, to allocate the resources to each innovation [14].

As already stated, innovation becomes necessity, not only through new product or service development but also through finding new business models which often implies changing the rules of the game [15]. To be successful, a company has to be skillful to break those rules, moreover, to have the ability to strategically redefine its business and play an altogether different game in order to succeed on the long term. Having in mind aforesaid, Markides suggests strategic innovation as a solution for breaking the rules of the game [13]. These new game activities can be performed all over a value chain in one business system [15, 16].

As it can be seen from **Figure 2**, dramatic redesign of the end-to-end value chain architecture can be accomplished improving the efficiency of the end-to-end value chain. For example, IKEA uses standardization by making one type of a product that enables efficient transportation. Dramatic reinvention of the concept of customer value is related to changing the value that customers receive. For example, in addition to selling hardware, IBM moved into supplying total business solutions. Dramatic redefinition of the customer base is related to expanding the size of the market. For example, at a time when computers were used only in corporations and other institutions, Apple made personal computers for individuals.

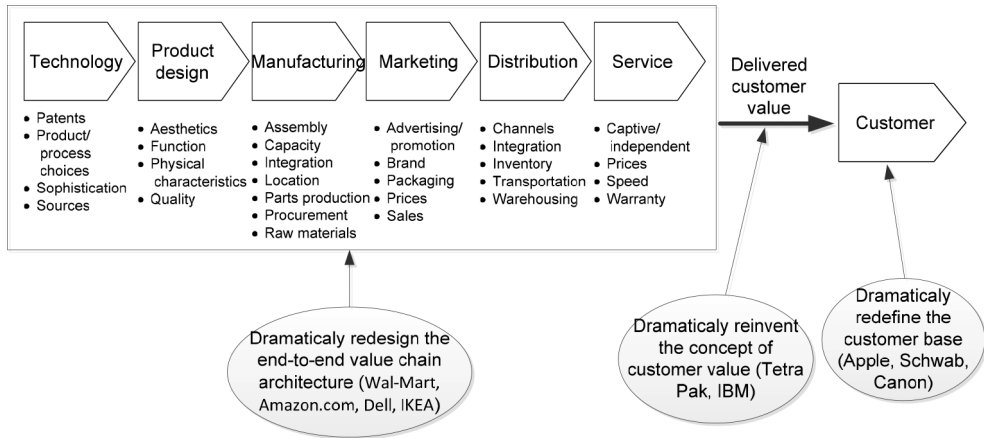


Figure 2. Areas for changing the rules of the game (adapted from Refs. [15, 16]).

Kaplan in his book [17] named the process of changing the game as leapfrogging. In fact, leapfrogging is about creating something completely new or doing something radically different that empowers company to significantly leap forward. If individuals, groups, or organizations prefer to become the new leaders of the future, they have to leapfrog old ways of doing things [17].

Very important factor for defining the innovation strategy for the company is its competence, regarding existing structure and knowledge. Some authors indicate strategy as the architecture that builds competence. The results of empirical research in this area confirmed that the degree and nature of innovativeness are in close relation to the choice of strategy of innovation leader or follower. Companies that choose first strategy mostly develop product innovation, whereas others mostly initiate process innovation [8].

According to innovation matrix presented in Ref. [12], companies focus their resources in selected segments and thus create a portfolio of investments. Depending on the position of investment in the matrix, two types of innovation strategy can be recognized [12]:

- **Playing to win (PTW)**—strategy of innovation leader. Company invests in new technology or business model in order to be ahead of competitors. The leadership position is achieved on the basis of different types of innovation: incremental, semi-radical, and radical (e.g., Amazon.com, Apple).

- Playing not to lose (PNTL)—strategy typically involves more incremental innovations, aiming to maintain the position of the company in the existing environment by moving slowly and with lower risk (e.g., Johnson & Johnson, Hyundai).

Furthermore, strategy of innovation leader and follower can be perceived as proactive and reactive [18]. Proactive is a strategy of innovation leader. Companies seek to predict and anticipate changes in the environment and, thus, to seize the opportunities. Reactive is a strategy of innovation follower. Companies respond to the customers’ demand and needs and to competitors’ activity. As a result of previous typologies of innovation strategies, it can be concluded that it is inherent to innovation leaders to engage PTW strategy and proactive strategy while innovation followers engage PNTL strategy and reactive strategy.

5. Innovation project models

Even though the importance of innovation is recognized by most companies and they spend a lot of money on innovation, many of these initiatives do not generate reasonable profit or competitive advantage. Plenty of research on this topic reveals that the main problem does not lie in the invention part or the generation of innovative ideas, but more in the successful management of the innovation process [19]. Successful innovation demands a rigorous and disciplined stage-by-stage approval process combined with regular measurement of every critical factor, ranging from time and money spent to the success of new products in the market.

Speaking of innovation processes from idea to commercialization, literature proposes a lot of different models. Basically, six generations of models can be found, from simple linear to increasingly complex interactive and network ones [20] up to new concept of open innovation (Table 1).

Generation	Model	Characteristics
First	Technology push	Simple linear sequential process, emphasis on R&D; market is the recipient of the R&D results
Second	Market pull	Simple linear sequential process, emphasis on marketing; the market is the source of new ideas for R&D; R&D has a reactive role
Third	Coupling model	Recognizing interaction between different elements and feedback loops between them, emphasis on integrating R&D and marketing Stage-Gate process
Fourth	Interactive model	Combinations of push and pull models, integration within firm emphasis on external linkages
Fifth	Network model	Emphasis on knowledge accumulation and external linkages, systems integration, and extensive networking
Sixth	Open innovation	Internal and external ideas as well as internal and external paths to market can be combined to advance the development of new technologies

Table 1. Development of innovation models.

Previous table suggests a chronological review of model development, where shifting of models from conventional and unilateral to interactive combination of push and pull models, and contemporary, network models based on knowledge can be clearly noticed.

5.1. Stage-Gate as a linear model

Earlier domination of the linear models is evident, together with evolving of much sophisticated and more realistic models that overcome common weaknesses and limitations of the conventional approach. This can be perceived in development and alignment of the well-known Stage-Gate® model, which, basically, followed a linear template. Stage-Gate models stand for industry standard for excellence in new product/service development. According to several independent research studies, about 80% of leading US companies now use Stage-Gate to drive new products to market. The model enables efficiency improvement and reduction of failure in any case, whether it is launching of new product or technology that could change the competitive image in the market, introduction of new products that could generate additional income for the company, or defense of company's market share by introduction of significantly improved product (**Table 2**). When embraced by organizations, this model generates an organizational culture that includes existence of the new product development process leader, strategic responsibilities definition, high-performance teams, focus on customers and markets, excellent solutions, compliance, discipline, speed, and quality [22].

Benefits [22]	Common errors and fail points [23]
Accelerated speed to market	Gates with no teeth
Increased new product success rates	Hollow decisions at gates
Decreased new product failures	Who are the gatekeepers?
Increased organizational discipline and focus on the right projects	Gatekeepers behaving badly
Fewer errors, waste, and rework within projects	Too much bureaucracy in the idea-to-launch process
Improved alignment across business leaders	Too much reliance on software as a solution
Efficient and effective allocation of scarce resources	Expecting the impossible from a process
Improved visibility of all projects in the pipeline	
Improved cross functional engagement and collaboration	
Improved communication and coordination with external stakeholders	

Table 2. Advantages and disadvantages of Stage-Gate model [21].

The model provides a conceptual and operational roadmap for guiding new product development, from idea to launch. Stage-Gate approach in its core represents a simple model that divides innovation process into distinct stages separated by management decision gates (**Table 3**) [24].

Stages are activities assumed by members of the team in order to collect the information needed for project progress. The stages are cross functional (there is no research and development or marketing stage), and activities are undertaken in parallel to speed up the time to market [24].

Stage	Preliminary investigation	Build business case	Development	Testing and validation	Full production and market launch
Gate	Initial screen	Preliminary approval	Decision on business case (project approval)	Post-development review	Pre-commercialization business analysis

Table 3. Stage-Gate model.

The model is organized so as in front of each stage is a gate. Gates are points where decision is made about whether or not to continue investing in an innovation project. This decision is made by both internal managers and external experts, so-called gatekeepers. The role of the gates is to check whether the project met all the criteria identified in previous gate and to check whether the project meets the criteria for the current phase.

The main elements of every gate are the following [24]:

- Deliverables—results of actions from the previous phase
- Criteria—predefined criteria on which the decision on project are made (what the project is judged against)
- Outputs—results of the decision (go/kill/hold/recycle)

The predefined criteria can be different from qualitative to quantitative, and some of them must meet, while some should meet. Specific criteria are different from gate to gate and become more rigorous with the progress of the project, and some of them can be judged in every gate.

High-level risk taking is one of the innovation project characteristics that have big influence on the innovation process stability. Thus, in order to respond in the right time and manner, it is necessary to carry out risk assessment. So, to achieve stable innovation process of big importance is to carefully choose the right gatekeepers and criteria within the gates.

5.2. The triple A system: adaptive, agile, and accelerated

The original Stage-Gate model was created in the 1980s, based on a thorough study of successful corporations that successfully launched new products to market. This study primarily, practices and lessons learned, provided the foundation for that early stage and gate model. Since then, Stage-Gate is being evolved and incorporated with many new practices. Some companies have also developed their own versions, adjusting it to their need [25]. Stage-Gate process, generally, has a positive impact on the conception, development, and launch of new products [24, 26, 27], but there are also criticisms; it is accused of being too linear, too rigid, and too planned to handle more dynamic projects [28, 29]. The world has changed a lot since the first Stage-Gate system was implemented; the environment in which the companies are doing their job is now different.

Concerning previous, Cooper suggested next generation of idea to launch system, recognized as “Triple A system.” It seems a lot like the traditional process of Stage-Gate, but the details of the process and its function are quite different. There are still stages where work

gets done and gates where decisions are made. Newness is more adaptive and flexible, agile, and accelerated [25].

5.2.1. *Adaptive and flexible*

For the next-generation model, being adaptive means that it incorporates spiral or iterative development to bring something early to the market through a series of build-test-revise iterations with customers. This upgrading is very good for the process since through these iterations the product evolves by adapting to new information gathered from customers. The system is also flexible to the extent that actions for each stage and the deliverables to each gate are unique to each development project, based on the context of the market and the needs of the development process. Gates are flexible, meaning that there are no standard sets or universal criteria for each gate [25].

5.2.2. *Agile*

The next-generation system as well incorporates elements of agile development, the rapid development system firstly introduced by the software industry. Introduction of agile development enables usage of short time-boxed increments, in form of sprints and scrums, in which the deliverable is something that can be demonstrated to stakeholders. This is in direct contrast to non-agile approaches, which led to the extensive delays, cost overruns, and sometimes brutally terminal failure [30]. Equally, the agile systems emphasize moving quickly and nimbly from milestone to milestone and rely on a much leaner system with all waste removed; there are no bureaucracy and no unnecessary activities anywhere in the system [25].

5.2.3. *Accelerated*

The next-generation idea-to-launch system is focused on accelerating the development process. This imposes overlapping of the activities within stages and even stages. The idea of a “stage” is less relevant in this new system. This feature enforces projects in the system to be properly resourced, fully staffed by a dedicated cross functional team for maximum speed to market. Also, fuzzy front end is brought to the forefront, in order to make less fuzzy, so that the project is clearly scoped and key unknowns, risks, and uncertainties identified as early as possible. Here, robust IT support is provided to reduce work, provide better communication, and accelerate the process [25].

5.3. **Connecting the open innovation to Stage-Gate**

The main question in today’s business environment is no longer why innovate, but how to innovate. Consequently, theory and practice recognized that not all good ideas come from inside the firm; neither all good ideas emerged within the particular firm should be commercialized by that same firm [31]. To bridge this gap, open innovation has emerged. Chesbrough coined the term “open innovation” to describe a paradigm that assumes that firms can and should use external ideas as well as internal ideas and internal and external paths to market, as they look to advance their technology [32]. While some think that “open innovation paradigm” is a new concept, there are some authors such as Trott and Hartmann [33] who

claim that this paradigm represents just an old wine in new bottles. They think that this model has been used over the past 40 years within the theory and practice on innovation management.

For the successful implementation of this model, the organization should define the business in a way to use advantage of both internal and external ideas and to build an adequate business model, which will provide greater value for the organization. Since it is easy to access to a lot of external knowledge, companies which have been using Stage-Gate model for their new product/service development make a great effort to empower their model connecting it with open innovation features [34]. Using the open innovation in new product/service development implies its involvement in all of the stages of innovation process.

5.3.1. Ideation or discovery stage

The first stage of the innovation process/project is always generating ideas—ideation—representing the part of fuzzy front end. In this stage, companies go across of their borders looking for external information (ideas for new product/service development) that could be helpful in satisfying customer's needs [35]. A lot of companies such as Starbucks, P&G, and BMW use open ideation through engagement of co-creation, crowdsourcing, and gamification.

5.3.2. Building the business case

This stage implies detailed business case, that is, defined product, business justification, and a detailed action plan for the next stage [24, 26, 36]. By opening up, this stage considers actions such as identification of missing internal capabilities by seeking for potential partners who will provide technological or marketing capabilities to develop and commercialize new product/service [35].

5.3.3. Development stage

The main purpose of this stage is implementation of the business case and development of the first prototype [24, 36]. As to the open Stage-Gate, companies cooperate with suppliers or partners in order to solve the technology and development problems. Moreover, here companies can out-license or sell their internally developed technologies and intellectual property [35].

5.3.4. Launch or commercialization stage

This stage starts with full production and commercial launching of the product and sales. Monitoring of the innovation project and detecting and correcting mistakes are specific actions of the stage [24, 36]. Opening up this stage, the company can out-license already commercialized products if there is a possibility to gain more value elsewhere or to in-license, purchase, an already commercialized product for achieving new growth for the company [35].

Gates and therefore criteria within the gates must also be modified. If some company does not have all the capabilities needed to develop or execute a project, it does not lead to a “kill,” but leads to looking for a partner to handle the missing elements [35].

P&G made an effort to develop and introduce the new version of SIMPL™ [37], the one enforced with open innovation, frequently cited as SIMPL 3.0 [35]. General Electric also engages the open Stage-Gate named “Toll-Gate” for handling an open innovation, both out-bound and inbound [35].

6. Risk assessment in innovation projects

Considering the fact that innovation ventures carry considerable risk that cause more than one half of the individual innovation undertakings to fail, companies have to find the way to succeed in commercial success. By itself, risk can appear in any aspect of innovation project and consequently can result in cost overruns, schedule delays, and even poor quality [38]. Therefore, risk management in innovation projects is an important topic for practitioners and academic scholars, and therefore today it is being increasingly incorporated into business models. According to survey conducted by Murray et al. [38], the majority of participants—managers with extensive project management experience—confirmed that they have used some kind of risk management techniques.

The main purpose of risk management is to improve project performance through systematic identification, appraisal, and management of project-related risk [39]. The risk management process can be considered as a very useful to decision-making regarding the possibility of future events and their impact on established objectives. It includes the application of logical and systematic methods for [40]:

- Communicating and consulting throughout this process.
- Establishing the context for identifying, analyzing, evaluating, and treating risk associated with any activity, process, function, or product.
- Monitoring and reviewing risks.
- Reporting and recording the results appropriately.

Risk assessment is a part of risk management which provides a structured process of risk identification, risk analysis, and risk evaluation. The way in which this process is applied depends not only on the context of the risk management process but also on the methods and techniques used to carry out the risk assessment [40]. Various supporting techniques can be used to improve accuracy and completeness in risk identification, risk analysis, and risk evaluation. Numerous techniques and methods for risk assessment divided by the phases of risk assessment are presented in International Standard 31010 [40].

In literature and practice, it can be found a lot of different risk categories that can affect project objectives and that can be observed for various projects. In this paper we presented one risk categorization proposed by Keizer et al. [41], which is very important since it is related to new product development. These categories of risk are recognized as critical success factors in product innovation projects. Three main risk categories, technology risks, organizational risks, and business risks, and 12 subcategories are identified (**Table 4**). *Technology risks* refer to

product design, manufacturing technology, and intellectual property. *Organizational risks* refer to internal project management and external organizational influences. *Business risks* refer to issues such as the impact of a new product on the company's brand positioning, consumer and trade acceptance, commercial viability, and the potential actions of competitors [41].

	Level 1	Level 2
New product development project risk categories	Technology risks	Product technology risks
		Manufacturing technology risks
		Intellectual property risks
	Organizational risks	Supply chain and sourcing risks
		Screening & appraisal
		Organizational and project management risks
	Business risks	Product family and brand positioning risks
		Consumer acceptance risks
		Trade customer risks
		Competitor risks
		Commercial viability risks
		Public acceptance risks

Table 4. NPD risk categories (adapted from Refs. [41, 42]).

This categorization of new product development risk can be found further decomposed on 142 more project issues, which are, also, recognized as critical factors for successful NPD.

7. Conclusion

Generating a continuous stream of innovation successes is an elusive goal. But the quest goes on, because the goal is so important to business success and excellence. This paper has provided an overview of some of the key factors for achieving innovation project excellence and hence insights into how to win in developing and launching new products. The recognized critical elements are innovation strategy, creativity and idea management, innovation portfolio, innovation model, and risk management.

Innovation strategy is very important for the innovation process and it represents a starting point. The role of the innovation strategy is to make balance between companies' ability and opportunities that exist in the environment so as to achieve long-term business objectives. There are four essential tasks in creating and implementing an innovation strategy. The first is to answer the question "How are we expecting innovation to create value for customers and for our company?" The second is to create a high-level plan for allocating resources to the different kinds of innovation; the third is to manage trade-offs, because every function will naturally want to serve its own interests; only senior leaders can make the choices that are best for the whole company. The final challenge facing senior leadership is recognizing that

innovation strategies must evolve. Like the process of innovation itself, an innovation strategy involves continual experimentation, learning, and adaptation. Without an innovation strategy, different parts of an organization can easily wind up pursuing conflicting priorities—even if there is a clear business strategy [14].

Creativity is also one of the critical factors for companies in achieving long-term success. The need for creative problem solving becomes a necessity since more and more management problems require creative insights in order to find suitable solutions. Stimulating creativity and exploring completely new and unknown territories lead to increasing the productivity of the company. Introduction of idea management systems is closely connected to creativity and consequently ideation. These systems enable an outline for ideas to come to the right place and to be implemented.

One of the most significant factors in achieving innovation project excellence represents implementation of adequate innovation model. Successful innovation project requires a rigorous stage-by-stage process. There are six generations of models that evolve in line with new practices. Today, they are adaptive and flexible, agile, and accelerated and, also, enable the involvement of external knowledge through application of open innovation.

Considering the fact that innovation ventures carry significant risk that causes more than one half of the individual innovation undertakings to fail, companies have to find the way to succeed in commercial success. In order to minimize the risk in innovation projects, companies have to take into account the risk management as one of the most important factors for innovation project success.

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