

WHETHER OPEN INNOVATION IS A BETTER CHOICE AS A MODEL OF INNOVATION FOR ORGANIZATIONS?*

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Abstract

This study presents a review of innovation models and by taking consideration and examining these models it is aimed to understand whether the model based on open innovation is a better choice among all the other models. For organizations, innovation models generally demonstrate how to work in an innovative point of view. Companies of today's business life are striving to develop their capabilities and their activities to become innovative companies. Many of the organizations try to find the most suitable and effective innovation model for themselves to create a difference in their long-term business life. Success of innovation process of companies basically depends on success of their innovation model. Innovation models started with simple linear models and up to this point, they became complex interactive models. Within these models, the main focus points of open innovation can be explained as interactive processes, knowledge and technology. Open innovation has its own characteristics like as other innovation models. It is important to emphasize that open innovation requires innovative ideas, knowledge from companies, and so managing wide technological relationships. Becoming as a popular phenomenon in innovation studies it is also need to be examined. When all innovation models are evaluated, generally, it can not be said that the open innovation model can be a better choice despite the fact that open innovations create new or modified logics and promote collaboration and openness. Therefore, as a remarkable answer of the problem of this study, strategies of the companies should be analyzed. In other words, strategies of companies play very important role while determining the form of innovation process.

Key Words: Innovation Process, Innovation Models, Open Innovation Model.

1. Introduction

In the highly competitive global environment, policy discussions are interested on how a specific innovation provides an effective solution to maintain, regulate, sustain or strengthen growth of an organization (Tidd, 2006: 2). In today's business life, innovation represents the costs an organization pays for staying in the marketplace (Kline & Rosenberg, 1986: 302). Therefore, effective innovation provides the solution to meet growing demands for creating a sustainable value, which provides theoretical framework to identify and promote the idea of change (Lord-Tarte, 2012: 9). Making innovation is a tremendously crucial strategic characteristic for an organization (Kanbur & Özyer, 2016: 265). It is important to understand the process and management of innovation (Tidd, 2006: 3). At this point innovation models should be learned for creating awareness about innovation process.

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In innovation literature Rothwell (1992) explained five generations of innovation models. Then, Marinova & Phillimore (2003) widen the typology of Rothwell and explained six generations of innovation models. These models can be ordered as (1) First generation—the black box model; (2) Second generation—linear models (including technology push and need pull); (3) Third generation—interactive models (including coupling and integrated models); (4) Fourth generation—systems models (including networks and national innovation systems); (5) Fifth generation—evolutionary models; and (6) Sixth generation—innovative milieu (Marinova & Phillimore, 2003: 45). Existing innovation models in the literature try to explain innovation process according to the main characteristics they emphasize. Each new model has its own characteristics and take consideration the new aspects in innovation literature by not replacing but enriching the older model. Innovation models are related to new scientific discoveries and fundamental researches at close range (Nicolov & Badulescu, 2012: 1071). Ultimately, innovation models show how to work to produce applicable technologies (Marinova & Phillimore, 2003: 44).

In recent years, however, a new wave in the models of innovation has seen to be arisen. Due to the developments in technology, changes in external environment, people moving more freely between organizations by taking their knowledge and expertise with them, the growth in the internet and the pervasiveness of media, information becomes much more widely available than ever before (Hunter & Stephens, 2010: 87). Thus, open innovation come into the scene and may be thought as the last generation in innovation models. Chesbrough (2003a; 2003b; 2003c) introduced open innovation as a model for understanding the process of innovation.

This study firstly explains a review of existing innovation models. Then, open innovation examined in the light of innovation models. Moreover, by taking consideration and examining these innovation models it is aimed to understand whether the model based on open innovation is a better choice among all the other models.

2. A View on Innovation Models

Nowadays technological changes are important for economic and policy discussions because of their socioeconomic nature as they create impact in the form of new products, technologies, activities, institutions such as universities and etc. (Marinova & Phillimore, 2003: 44). Most of the businesses should find the suitable and effective innovation model for making a difference for the long-term business survival. Innovation models try to provide fair representation related to following factors (Godin, 2012): simplifications should make the model is easy-to-use and easy-to-understand; details should enable comparison and explanation or imitation (pragmatic tools); a model should enable measurement and provide a method for evaluating alternatives either frameworks or paradigms; assumptions of the model should be correct with calculated probabilities for given outcomes (predictive); a model provides assessments, measurements and views to help tapping the innovation opportunities; a model promotes innovative thinking and works for sustained growth; helps gaining competitive advantage, and therefore, innovation normally needs change, which is generally challenging.

If any innovation model has the aforementioned characteristics or some of them, it means that the model is strong, but when the answer is no, it shows that the model is

weak. So, success of innovation process is necessary to assure success of the innovation model. Rothwell (1992: 223-224) stated that innovation is best explained by the main factors accepted in systematic and comprehensive innovation studies published in different periods. These factors can be ordered as; creation of effective communication both internally and externally, creating innovation through functional integration among all the departments of an organization, planning and controlling the project, implementing quality control procedures, providing user-needs and having powerful market orientation, creating technical service for customers, attracting and employing talented researchers and managers. Generally, the factors of successful innovation are almost common for all the industries; however, their degree or importance can change depending on the industry. In this section, prevalent innovation models are explained covering many generations. These models started with simple linear models and up to this point, they became complex interactive models.

2.1. First Generation: The Black Box Model

This model was presented by Rosenberg (1982) and it states that only inputs and outputs count, so the innovation process is not so important to make an organization invest in R&D (Research & Development). This model introduced innovation as an important economic activity for individual organizations despite the fact that it does not explain characteristics of R&D. Nevertheless, this model recommends appropriate management practices on appropriate time, which makes some firms outcompete others. Also, this model equates research and development processes. Therefore, spending on R&D in manufacturing, marketing, startup and plant construction is very important to introduce new products and services (Marinova & Phillimore, 2003: 45-46). Previous studies argued that the black box model is complicated, which make it difficult to use for economic analysis as a part of a field of economics known as “new growth theories.” Later studies on innovation took into account various disciplines of social sciences because of the important role they can play in economic development (Karchegani et al., 2013: 573).

2.2. Second Generation: Linear Models

Two models have been presented in this generation, which include; Technology-Push Model and Market-Pull Model. Many authors and scholars have written about linear innovation model for decades but it comes from Vannevar Bush’s article “Science: The Endless Frontier” which appeared in the form of an official publication in the late 1945s and in this study he talked about causal relationship between basic scientific research and socio-economic advancement. However, historic evidence seems nebulous and doesn’t support this case (Godin, 2006: 639; Godin & Lane, 2013: 622). Linear model has been founded on the supposition that the innovative process is an applied science. It is called as “linear” that due to justly-defined set of stages and innovations are presumed to pass those stages and it starts with basic sciences and basic researches and then moves towards development and production and marketing finally (Oliveira, 2014: 131). The main issue is the implied supposition of linear and only one-directional movement of fundamental science research to technology and from technology to economic growth. This single-direction trend is called linear model. Fundamental research is the major impulse beyond more advanced technology that leads

to important economic trends (Caraça et al., 2009: 862). Second stage of linear innovation model is called “market-pull model” which suggests that new ideas can be obtained from a market through R&D and becoming reactive to needs identified during the research process and therefore, sales are added after the production process (Marinova & Phillimore, 2003: 46). Eventually, linear models suggest that innovations are the result of R&D initiated to respond to the market demand (demand-pull innovation) or following a scientific discovery (science-push innovation) (Lord & Tarte, 2012: 11).

However, since 1950s, many important global economic changes effects the usage of linear model due to the changes in managing R&D activities (Trott & Hartmann, 2009: 721). Linear model lays too much emphasis on radical innovation and reduces the value of increasing innovation, which later transforms within some years. Also, the model omits multiple sources of information and takes input from just one point during the innovative process (Lord & Tarte, 2012: 11). In mid-1980s, researchers stopped discussions on linear model (Godin & Lane, 2013). Advances in the internet and telecommunications, globalization, competitiveness and the consequent rise in supply to meet demand highlighted the outdated nature of the earlier linear model and brought the interactive paradigm of innovation to the fore (Marques, 2014: 198).

2.3. Third Generation: Interactive Models

The linear models were considered generally as an oversimplified version representing complex interactions and the process is subdivided into separate stages while each of them interacts with the other. Being as a new generation interactive models overcome weaknesses of previous linear atypical models. Despite that, the coupling model contains feedback loops and essentially, it is a chain link model with finite functional integration. This model focus on integrating R&D and marketing. Interactive models integrate multiple in-house functions considered as interdependent stages. Whereas those models are non-linear having feedback-loops that characterize as a nature of the stages of innovation to reverse the higher degree of cross-functional integration within these firms (Du Preez & Louw, 2008: 547-548).

Moreover, it must be noticed that the chain-link exceeds linear model by focusing on the coupling between the forces of technology and dynamics of the market while it is not acknowledged both for the dimension of organizational and wide organizational settings. Furthermore, many factors affect innovation in the microenvironment and macroenvironment (Caraça et al., 2009: 864). However, Rothwell (1992: 223-228; 1994: 10-11) explained that different factors effective on innovation can be divided into two categories as project execution (tactical) factors and higher level (strategic) factors. Project execution factors which deal mainly with what successful firms do during innovation can be listed as; good communication both internally and externally, understanding innovation as a corporate work, project implementation, planning and emphasis on control procedures, efficiencies in development and high quality production, emphasis on strong market-orientation, having good services for customers, having individuals with key roles (effective technological gatekeepers and product champions) and having talented researchers and managers. Besides, higher level factors which outline the essential pre-conditions for sustained corporate innovation can be listed as; commitment and support of executive managers to innovation and their acceptance of innovation culture, long-term strategies related to innovation, long-term

commitment to major projects, flexibility and responsiveness to change, executive managers's acceptance of risks.

2.4. Fourth Generation: Systems Models

Fourth generation depends on the idea that the innovative development needs cooperation among firms and not just interactions with wide-spectrum internal organizational agents. The operations focus on innovative process in a systematic way. Therefore, firms, which don't have excessive resources for in-house innovative process, should establish cooperation with a network of other organizations (Marinova & Phillimore, 2003: 47). In this context, three key factors divert to innovation can be pointed out as the explosion of technology, technology shortening the traditional product life cycle and globalization of technology (Trott & Hartmann, 2009: 721).

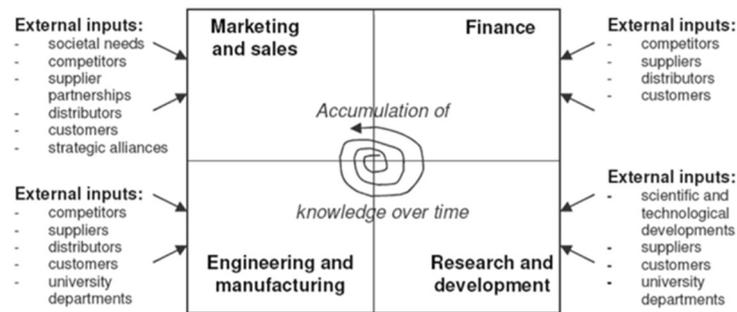


Figure 1. Systems Models in Innovation

According to Du Preez and Louw (2008: 549-550), this model views innovation as a set of parallel activities across functions of an organization. The pressures for innovation result increases in horizontal strategic alliances and collaborative R&D, vertical relationships strategic with suppliers, external relationships for innovative SMEs and parallel integration within the firms. Innovation takes place with the help of both internal and external stakeholders. Therefore, it is important to establish relations and linkages between all of them and they are affected by certain factors including internal factors like structure & strategy of firms and some external ones such as infrastructure & regulations. Ultimately, system models in innovation can be shaped as in Figure 1 (Du Preez & Louw, 2008: 549-550). Actually, system models have been considered as closed networks of innovation. Consequently, the environment for innovation has changed through networks and collaborative efforts and it represents the larger base of views and technologies while open innovations need openness and collaboration (Du Preez & Louw, 2008: 551).

2.5. Fifth Generation: Evolutionary Models

Evolutionary models being as the fifth generation models of innovation explain innovation process depending on some key characteristics. These characteristics can be clarified as; generation of variety (innovations are seen as equivalent to mutations), selection (selection processes act together with variety-generating mechanisms),

reproduction and inheritance (companies are perceived as producing organizations), fitness and adaptation ('survival of the fittest' principle of Darwin is represented to become successful in a given environment), population perspective (variation is an essential component for an evolutionary process), elementary interactions (competition between products or companies) and external environment (Saviotti, 1996; Marinova & Phillimore, 2003: 49). Evolutionary models explain that innovation, by definition, involves change, and decisions are made not only for price. Moreover, in this approach to innovation, the selection process must take into account the decisions and the environment (Nicolov & Badulescu, 2012: 1072).

2.6. Sixth Generation: Innovative Milieux Model

In the innovative milieux model, which was developed by "GREMI authors", it is argued that the firms do not work as innovative agents in isolation but the capacity of an innovation is actually part of a milieu (Moulaert & Sekia, 2003: 291). It is valid for small and medium-sized enterprises, which try to manage R&D despite lack of resources. Therefore, the innovation milieux model helps explaining the success of these firms and is based on the apprenticeship concept, which means generating innovation capacity while the different members of the milieu rely on learning capacity, which enables them to realize changes in their environment and helps them adjust their behavior accordingly to their environment. Also, this model clarifies why certain localities act as breeding grounds for small innovative firms. Furthermore, this model did not mention the links between ecology and innovation (Bergvall-Kåreborn et al., 2009).

3. Closed Innovation Model

Closed innovation model argues the concept of self-reliance in R&D operations and it was acquired or adapted by many leading industrial corporations in the 20th century and it is very important for the firms that adhered to this as their organizational philosophy, so, successful innovation requires control on R&D operations (Chesbrough, 2003b: 36). In the old model of innovation, companies depended on the claim that they should control their innovation processes and that means you must be under control (Elmqvist et al., 2009: 327). Therefore, companies had to produce their own ideas because they were responsible for development, manufacturing, marketing, distribution and services. Advocacy of self-reliance in closed innovation conceptualized as do-it-yourself (Chesbrough, 2003b: 36). Closed innovation model can be shaped as in Figure 2 (Docherty, 2006: 14).

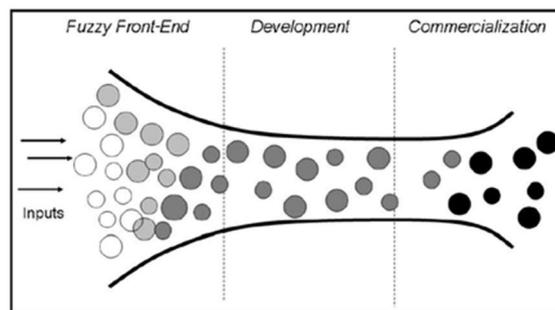


Figure 2. Closed Innovation Model

Innovation, according to “do-it-yourself” concept, means idea generation for organizational development. To provide new ideas for the corporate sector, some tacit rules on development and in-house research are needed, which must assure more R&D investment than the competitors, for which, companies hire smart and highly professional people. These investments enable them to gain more profits and maintain control over intellectual property rights of their innovations, which prevents competitors from exploiting their R&D gains. They can later re-invest profits in more R&D, which in turn leads to the discoveries of additional breaches and this creates a virtuous innovation cycle (Chesbrough, 2003b: 36).

In the end of 20th century closed innovation lost its vigor. Significant increase in numbers and movement of knowledge workers, and the increasing private venture capital availability contributed companies for funding the new companies and marketing ideas that received from the research labs (Chesbrough, 2003b: 36). Disclosure of all the changes in organizations is necessary, which focus on internal and external innovation and they have the ability to create radical innovations and sell new products in large numbers. Thus, possibility exists that the performance of product innovation gradually appear in major companies seeking to innovate in this direction and so are the organizations, which are trying different strategies to create an open challenge. Now the focus has shifted from old closed model of innovation to new opportunities, foreign ideas and new techniques (Inauen & Schenker-Wicki, 2012: 216). This new open innovation requires new cooperation systems between business organizations at the same time while competing against each other (Du Preez & Louw, 2008: 552).

4. Open Innovation Model

Open innovation phenomenon became popular without much evidence or critical analysis and has attracted great attention both from the academicians and users in the industry (Trott & Hartmann, 2009: 715; Marques, 2014: 196). This innovation model considers a complex issue, which includes many opinions and various perspectives which can be examined and investigated as globalization of innovation process, outsourcing of R&D, early integration for suppliers, users of innovation and application of technology and external commercial environment related to technology (Gassman, 2006: 225). It mainly focuses on interactive processes. Thus, knowledge and technology stay in or go out of the business more easily and firms take their major decisions by finding to use which of them to what extent (Inauen & Schenker-Wicki, 2012: 214). Docherty (2006: 13-14), coined the commonly used terms and descriptors about open innovation and these terms defined the core concept of open innovation. According to him, this model has three main phases. During the first phase, a pact is signed by external partners, which helps developing new products and/or services. This model allows peer-to-peer or supplier/clients agreements, which are called “co-development”. The second phase is the definition of co-development, but it contains some other factors (formal networks, consortia), which work together in a stage called “collaborative stage”. Then comes working together as a part of formal legal arrangement between partners/stakeholders in a joint development and/or business initiative and formally negotiate on risks and rewards. This type of arrangement or partnership is called “joint venture”. Moreover, open innovation model can be shaped as in Figure 3 (Docherty, 2006: 14).

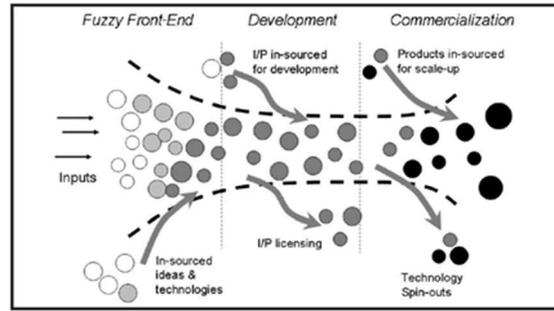


Figure 3. Open Innovation Model

Chesbrough (2003c), in his book on open innovation, has explained the process of joint ventures and he defined the open innovation concept as the utilization of intentional knowledge of inflows and outflows to speed up internal innovative process and developing markets for external use of innovation, respectively. According to Inauen & Schenker-Wicki (2012: 216), open innovation can be classified in two types as “outside-in” or the exploration of technology and “inside-out” or technological exploitation. Where outside-in strategy is based on searching and adopting new ideas and technology from outside the organization, while inside-out strategy is concerned with how marketable can innovation be through foreign aid. Companies might choose a practical inside-out strategy if they have strong development and marketing departments, but if they don’t have a branded product in the target market, they would benefit indirectly from the partnership/s for brand development or through making strategic partnerships to gain a major advantage in the market.

In open innovation model, in order to identify the degree of openness for innovation funnel, Lazzarotti and Manzini (2009: 622-623) suggested many types for the model and divided them into four areas as can be seen in Figure 4, and each area has its own different characteristics. The first type is called closed innovators. This type comprises of the companies that access external knowledge sources such as access to external prototyping services for developing a new product. The second type is specialized collaborators. This type is related to companies willing to work with other partners but it is focusing on their collaborations on a single point in the innovation funnel. The third type is integrated collaborators. This type is related to companies which open their innovation funnel and innovative process of the companies in this type contains contributions from some partners. The fourth type is open innovators. This type is related to companies which manage a wide-spectrum of technological relationships.

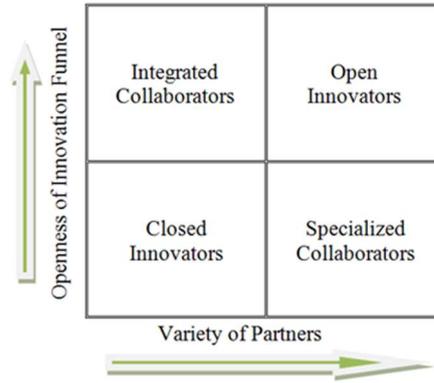


Figure 4. Four Types of Open Innovation

Open innovation paradigm refers to leveraging external technological sources and having innovation for driving the internal growth and bringing unused intellectual property from external sources. In other words, open innovation model assumed that companies should use ideas from market and other external sources for developing internal ideas and advancing their value-creation techniques (Docherty, 2006: 13). Moreover, companies can become value-achievers by means of providing sources for their growth. It is observed that the concept of open-source model has been taken from the term used in software industry, where it is assumed that all the stakeholders gain benefit from the process in the form of a shared outcome through informally structured collaborations (Docherty, 2006: 13). Open innovation have actually emerged in a small innovation practitioners (most of these practitioners placed in high-tech industrial sector) club to discuss, implement and practice innovation on large scale. Concurrently with this, a small group of researchers in management field curious about this research topic in recent times (Gassmann et al., 2010: 213). Emphasis of open innovation is on the R&D activities. Making a comparison between closed and open innovation makes open innovation model more understandable. Thus, for gaining a deeper comprehension, underlying concepts of closed and open innovation compared in Table 1 (Chesbrough, 2003b: 38).

Table 1. Comparison of Closed and Open Innovation

Principles of Closed Innovation	Principles of Open Innovation
<ul style="list-style-type: none"> • To gain profit from R&D, an organization should learn discovering, developing and shipping it by ownself. • If something discovered in the organization by ownself, it will get to the market by the organization at first. • Having the first-mover advantage for commercializing an innovation will make an organization win. 	<ul style="list-style-type: none"> • Significant value can be created by external R&D, conversely, internal R&D is required to request some part of that value. • For gaining profit from something it is not necessary to originate it. • Establishing a well functioning business model is better than having

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| <ul style="list-style-type: none"> • Creating the most useful ideas will make an organization win. • If an organization have full control over its intellectual property, its rivals will not be able to gain profit from its ideas. • Smart people work for an organization. | <p>the first-mover advantage in the market.</p> <ul style="list-style-type: none"> • Making better usage of external and internal ideas will make an organization win. • An organization will be able to gain profit from others usage of its intellectual property and purchase others intellectual property when this intellectual property improves business model of the organization. • All the smart people doesn't work for an organization. |
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Organizations who want to be successful in the epoch of open innovation should leverage their internal ideas outside of their business model while utilizing external ideas to improve their business model (Chesbrough, 2003b: 41). Furthermore, several advantages of open innovation model can be emphasized as capability to leverage R&D, capability reach new technologies and ideas, chance of refocusing some internal resources to find, screen and manage implementation, improving payback on internal R&D by means of sale or license of otherwise unused intellectual property, necessity for internal groups for acting on technology or ideas (using or losing it), capability to hold strategic experiments at lower risk degree with the chance for extending core business and creating new sources of growth, chance for creating highly innovative culture by means of relationships with external innovators (Docherty, 2006: 14). Open innovation calls newer logics, which place concepts of collaboration and openness to its center. Thus, open and agile tools like networks or web communities make open innovation a practical reality (Du Preez & Louw, 2008: 551). Also, open business modeling enables a company to create and capture value. They help creating value by implementing more ideas due to their place in external concepts. They add value by using an organization's assets, position or resources not only for its own operations but also for other organization's operations (Chesbrough, 2007: 22).

On the other side, open innovation models come up against criticism. It seems to be successful in the academic environment and sale of the books related to this topic is higher but it is not accepted as a perfect model (Marques, 2014: 200). In this context, Trott & Hartman (2009) confirmed that the openness might lead to knowledge insecurity and this represents the potential danger while the proposed challenge is striking balance between knowledge exchange and R&D, and to transform the knowledge produced by R&D into commercially viable outcomes. Therefore, information sharing/knowledge loss dilemma takes attention in open innovation model. On the other hand, open innovation model follows a linear path and depending on this linearity the open model is a linear model and this linear statu cause a conceptual complexity (Marques, 2014: 200). Open innovation model does not differentiate between the concepts and processes of innovation and that is the point where it lives conflict between the introduction and commercialization aspects of innovation. Considering these facts, the most appropriate approach to open innovation model is that it should be regarded as a still-in-development model (Marques, 2014: 201).

5. To Choose or Not To Choose Open Innovation

Explanations and discussions about innovation models and especially for open innovation model and also criticisms laid against open innovation demonstrate that when it comes choosing the most appropriate innovative process it should be said that strategies of companies play very important role in deciding the form of innovation model (Marques, 2014: 201). For all that, various researchers tried to understand substantial factors while making decisions between open and closed innovation models. In this respect, many studies addressed capabilities of the companies and their innovation-promoting activities to determine the kind of the chosen model. For example, Robertson and Arundel (2013) explained in their study that companies with in-house R&D capabilities are more capable of attracting both closed and open innovation as compared to the companies without in-house facilities or companies that depends on contracting out R&D operations. So, innovative activities are comparatively common between these companies irrespective of their R&D operations. Moreover, in their study Lazzarotti and Manzini (2009) analyzed different types which a set of companies used for open up innovation process as closed innovators, specialized collaborators, integrated collaborators and open innovators. These outcomes demonstrate that both closed and open forms of innovation are common for companies to initiate and they might represent radical solutions and the model acts as a “mediator” and it makes a reasonable compromise in terms of benefits and costs. Also, according to Gassman (2006: 226-227) who studied cases selected from different papers explained open innovation as an innovation process which has different characteristics and has to be considered through multiple angles. Open source software analysis points out an extreme type of open innovation but it cannot be transferred one to one to an average industrial environment, but it could benefit from some ideas and concepts of open source development. Furthermore, Docherty (2006: 14) argued that open-source business models, collaborative approaches, joint ventures and strategic alliances are on a growth path because successes and survival of companies depends upon them. On the upshot, it should be emphasize once more that strategies of companies play very important role in deciding the form of innovation model, as it must be open or not.

6. Conclusion

Recently, several companies are making efforts to develop their capabilities and their activities to become innovative firms for moving from process-to-product focus and from imitation to innovation. Therefore, the current study provided a review on innovation models from simple models to complex models and later to even more complex models through the overview of the six generations of innovation models and additionally, closed and open innovation models. It should be actually accepted that having a cognition on innovation process can be a complicated process. Due to this, the innovation models generated and explained up to now have been reviewed with focus on R&D approaches, importance of factors, their varying proportions, importance of collaboration and openness, and finally, ideas and technology.

All things considered about innovation models, especially open innovation model, this study suggest that further researches should not be concentrate on the extent to which firms engage in open or closed innovation or the comparison of innovation models. This study takes attention to the fact that how open firms should be to give importance to open innovation as a vital component of their strategies or strategic plans. Despite the criticism that open innovation models have faced so far, it gained unprecedented success. Therefore, the more openness looks as though the best choice for todays' companies. However, it can not be said that it is the exact and most appropriate

innovation model for a company merely on the basis of this study and its review on innovation models. For providing a solution to this question, it is necessary to know whether the firms can study all the choices depending on their strategies to choose this model or they can blend more activities including R&D. Also, it is important to study on innovative firms and the existent literality that how innovation breeds success for them.

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