TOWARDS INTEGRATIVE INNOVATION MODELS

Biljana Stošić and Sonja Išljamović
Dept. of Operations Management, Faculty of Organizational Sciences, University of Belgrade
154 Jove Ilića Street, Belgrade, Serbia

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Abstract: Innovation and innovative competences have long been recognized to be one of the basic competitiveness and long-term profitability factors, from the firm level up to national and global economy level. Having in mind that innovation, generally, represents the process from idea to realization, the paper is concerned with the key elements of innovation process models in today's knowledge-driven economy. Contemporary, network and integrative innovation models should be based on the relation between the firm, strategy and environment i.e. the firm should be linked with the environment by means of strategy, which represents a mediating force - the firm is responding to market requests driven by its strategic concept. Integrative models for 21st century should overcome basic weaknesses of conventional linear technology-push and market-pull approach, taking into account the possibilities of proactive innovation strategy, networking and external linkages of the firm.

1 INTRODUCTION

The increasing importance of knowledge as an economic driver implies a growing influence of innovation and innovativeness, which are proven to be the key determinants of competitiveness and profitability on different economy levels (from enterprise to national economy, and globally). Innovation appears to be the central element of this *new economy*, with domination of information-communication technologies - ICT, as a key strategic dimension bringing completely new methods of communication and business - especially e-business and Internet, (Day, Shoemaker, Gunter, 2004). In other words, today's most developed and technologically advanced economies are actually knowledge-based, with innovation as the key success factor. As for the company level, for innovation leaders (like *Apple*, *Google*, *Toyota*, being ranked as the top three in BCG Innovation Reports since 2007), innovation is the tool that redirects the competitive course of an entire industry. In line with the standard guidelines for collecting and interpreting innovation data, well-known in innovation field as the *Oslo Manual* (OECD, Eurostat, 2005), innovation represents the implementation of a new or significantly improved product (good or service), or process, or a new marketing or organizational method. The knowledge accumulated by the firm is the most significant innovation capability, meaning intellectual capital gained from learning processes and disposed in human resources, procedures, routines (OECD, Eurostat, 2005), and other characteristics of the firm which enables implementation of innovation process from idea to realization.

On the global level, while defining a roadmap to the European Union's innovation policy at the beginning of this century, the European Council emphasized the importance of innovation as the main source of competitiveness and economic growth, and its key role in the European Research Area. In European Commission's Green Paper on Innovation (1995), innovation is defined as the renewal and enlargement of the range of products and services and the associated markets; the establishment of new methods of production, supply and distribution; the introduction of changes in management, work organization, and the working conditions and skills of the workforce. At the enterprise level, successful innovation management includes some basic elements (Stošić, 2007):

- Defining innovation strategy and coordination with other strategies - business, technology, marketing, intellectual property;

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- And development of innovation models from idea to market;
- Management of innovation portfolio (innovation projects);
- Innovation incentives and measurement of innovation performance.

2 INNOVATION TYPOLOGY

There can be found an extensive number of innovation definitions and classifications, having in mind that this concept has evolved significantly over the last decades. In its wider context, it is the process of turning the possibilities into new ideas and putting them into practical use. As a specific form of change, innovation can be defined in various fields, as J. Schumpeter has defined it thus establishing serious innovation theory - basic element of technological progress, and, much later, P. Drucker, as the key element of entrepreneurship, specific *tool of entrepreneurs*, the means which enables them to use the change as an opportunity for different business or service (Drucker, 1985). The same author considers innovativeness not only as the feature of high technology enterprise, but, also, of the lower technology level firms. Innovation that contains new value frequently requests systematic and rational work, well organized and result oriented.

The Republic of Serbia Law on Innovation (2005) defines innovation as a new product, process, technology or service with unique features, produced by application of internal or external research and development results, discoveries and knowledge, throughout own concept, idea or method for its implementation, and placed on the market with an adequate value. According to criterion of novelty degree, innovation can be incremental (small improvements) and radical (completely new product/services etc.); while there also can be found the concept of semi-radical innovation.

In this context, innovation presents both *the process* of transformation the idea into new product/service/process etc., and *the output* of that process, which is highly connected with three functions: research and development (R&D), production and marketing. One of the basic innovation management relations is that of connecting invention, innovation, performances and business success (neither all of inventions lead to successful innovations, nor all of innovations provide business success). Innovation is successful if it results with company's potential to contribute continuously (time aspect) to growth, through stability and adaptation. The key is in using the results of innovations evaluation that will enable company to be ready for responding to challenges of changes. In addition, innovation is the *application of knowledge*, meaning that technological innovation can be accompanied by additional managerial and organizational changes, often referred to as innovations.

According to *Oslo Manual* basic document, which has provided an expanded measurement framework (above all, recognizing the role of linkages between firms in the innovation process and giving more relevance to the service sector - less R&D intensive industries), all these different typologies can be considered as one of four main types, mentioned earlier:

- Product/Service Innovation;
- Process Innovation;
- Marketing Innovation;
- Organizational Innovation.

3 INNOVATION MODELS - FROM LINEAR TO INTEGRATIVE CONCEPT

For a long time, in the area of building innovation models the linear-sequential approach dominated, considering innovation as a series of sequentially established phases without any feedback (so-called waterfall processes). That is evident in one of the well-known innovation model classification, given by Rothwell, with five generations of models developing from linear to integrative - network, Table 1:

Table 1: The chronological development of models of innovation (Bessant, Tidd, 2007, based on Rothwell).

Date	Model	Characteristics
1950/60s	Technology-push	Simple linear process; emphasis on R&D
1970s	Market pull	Simple linear process; emphasis on marketing;
1980s	Coupling model	Integrating R&D and marketing
1980/90s	Interactive model	Combination of push and pull
2000s	Network model	External linkages

The achievement of strategic competitiveness and

the importance of a strategic company performance are formally demonstrated with an *Interactive model*, which, in a certain manner, integrates the positive characteristics of the earlier *Technology - push* and the *Market - pull* models - Figure 1.

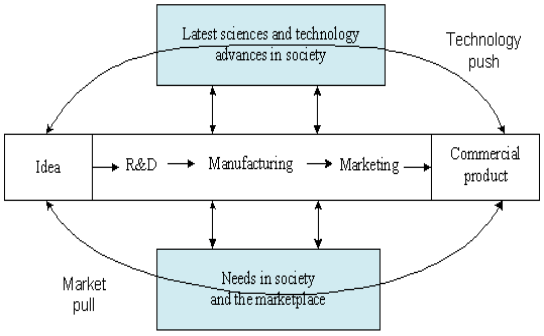

Figure 1: Interactive model of innovation (Trott, 2009).

New innovation management models should start from one of the basic innovation management relations, as in the Kline and Rosenberg *Chain-link model* (Kline, S.J. & Rosenberg, N., 1986), which represents an interaction between a firm's capabilities and market opportunities by mains of *strategy as a mediating forc*e, in order to achieve goals of competitiveness and effectiveness. Integrative models of innovation processes are based on this relation between the firm, strategy and environment – Figure 2.

Figure 2: Strategy as a mediating force (Stošić, 2007).

When it comes to product innovation - new product development (NPD) and introducing it to the marketplace, the most widely-used is the Stage-Gate approach, which brings the roadmap for moving a new product-project from idea to launch.

The actions are taking place in different stages (from evaluation and selection of ideas to profitability analysis at the time of trial production), while the intermediate phases include concept design and specification analysis, system-level design, detailed design, and testing or prototyping (Cooper, 2001). The gates are points of decision-making, so that the project proceeds to the next phase if reviewed positively. Otherwise, it continues or iterates within given phase until it successfully passes the gate - Figure 3.

The road of upgrading the Stage-Gate model is going towards networking and integration. The first step ahead can be noticed in spiral product development process, which differs from the Stage-Gate due to its emphasis on comprehensive iteration, including a series of planned iterations that span several phases of development. On the other side, spiral model keeps the same way of defining regular steps as the Stage-Gate, including concept development, system level design, detailed design, and integration and testing, but also requires managers to evaluate risk early in the project, when costs are still relatively low (Unger, 2008).

Contemporary models start from different perspectives of *innovation networks* that can bring in new concept and new types of companies such as entrepreneur-based networks, sector networks, spiral clusters and technology development consortiums. A network can be defined as a complex, interconnected group or system designed to accomplish innovation project particular tasks; in today's global environment, innovation networks are more than just a way of assembling and deploying knowledge in the complex world. In global business it would be nearly impossible to bring idea successfully to market without network support (Bessant, Tidd, 2008). The network model is more dynamic comparing to conventional ones, including much more interaction between knowledge assets outside the company, reducing risks and making innovation process more successful.

In this context it should be interesting to mention P&G Company as one of frequently offered examples whose innovation strategy was focused on

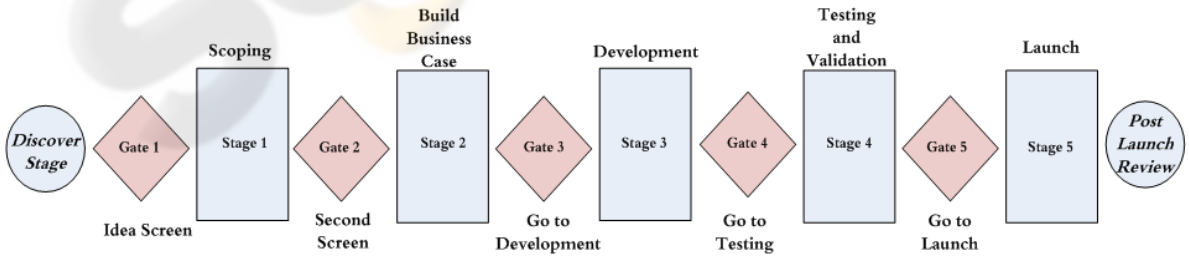

Figure 3: Stage-Gate process (Cooper, 2001).

its internal capabilities and using traditional Stage-Gate model. Using Innovation Diamond and open network innovation model, during the last ten years allowed P&G to increase its pace of innovation reduce costs and to satisfy more consumer demands. (Cooper, Heimberg, 2008).

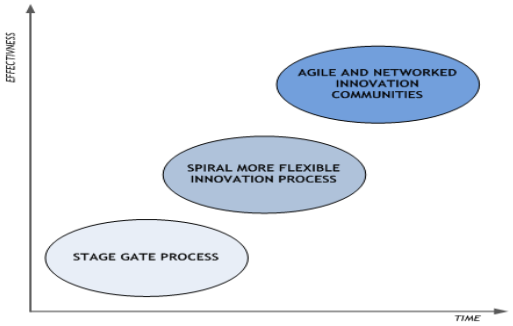

Figure 4: Development of network innovation models (Unger, 2003).

Finally, in a new model of open innovation, a company commercializes both its own ideas and innovations from other firms seeking a way to bring its in-house ideas to market by deploying pathways outside its current businesses (Chesbrough, 2007). Traditional business strategy has guided firms to develop defensible positions against the forces of competition and power in the value chain, implying the importance of constructing barriers to competition, rather than promoting openness. This new concept promotes the principle that the organization should not restrict the knowledge that it uncovers in its research to its internal market pathways, nor should those internal pathways necessarily be constrained to bringing only the company's internal knowledge to market.

4 CONCLUSIONS

This paper gives an overall review of selected innovation models, having in mind that one of the most important questions is that of understanding innovation and its nature. At the company level, innovation should have treatment like many business functions, meaning management process that requires specific tools and principles, which can be used to redefine an industry by employing combination of business model innovation (what is delivered to market, how it is created and to whom is it delivered) as well as technology innovation. At the global level, successful innovation management in the knowledge-driven economy can be considered as a strategic development factor, where innovativeness of the enterprise should provide strategic advantage at all levels - from the company to the national economy as a whole. Selected innovation models which are presented in the paper can be said to mark different periods in managing innovation, with the aim to emphasize the importance of modern network and integrative models that overcome shortcomings of traditionally innovation process views as sequence of separable stages or activities.

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