
Possibilities Of Opening Up the Stage-Gate Model

Professor Biljana STOŠIĆ PhD

Radul MILUTINOVIĆ

University of Belgrade, Faculty of Organizational Sciences,

ABSTRACT

The paper presents basic elements of the Stage-Gate and Open innovation models, and possible connection of these two, resulting in what is frequently called an "Open Stage-Gate" model. This connection is based on opening up the new product development process and integration of the open innovation principles with the Stage-Gate concept, facilitating the import and export of information and technologies. Having in mind that the Stage Gate has originally been classified as the third generation model of innovation, the paper is dealing with the capabilities for applying the sixth generation Open innovation principles in today's improved and much more flexible phases and gates of the Stage Gate. Lots of innovative companies are actually using both models in their NPD practice, looking for the most appropriate means of opening up the well-known closed innovation, especially in the domain of ideation through co-creation.

Keywords: Innovation, Models, Stage-Gate, Open innovation

INTRODUCTION

The need for lean, rapid and profitable new product/service development has never been more evident. In today's business world, product life cycle is getting shorter, the competition is getting tougher, users are becoming more demanding, and therefore companies that do not innovate are losing pace with competition and slowly deteriorate.

A growing number of authors and leaders from different branches identified innovation as a key driver for achieving long-term success and profitability (<http://www.prod-dev.com/stage-gate.php>). Most of today's companies with great concern talk about improvement of their innovation performance in order to deliver sustainable growth and significant competitive differentiation (<http://www.sopheon.com/industry-innovation/>). However, it must be kept in mind that gaining competitive advantage by offering new product/service is not easy - in fact, it is estimated that about 46% of the funds, which company invests in the development and launch of new products/

services is related to unsuccessful projects (<http://www.prod-dev.com/stage-gate.php>).

Having this in mind, the world's leading companies have revised their processes of product/service innovation, including critical success factors discovered through research of best practice, through introduction of the Stage-Gate new product/service development process. Based on various independent studies, which were conducted by leading consulting companies in the field of innovation management, it was concluded that 70-85% of the leading companies in the U.S. use model Stage-Gate for managing the entire process from idea generation to launching of new product/service to market (<http://www.prod-dev.com/stage-gate.php>).

Starting from this point, the paper is organized in three main sections, first related to linear models of new product/service development, describing the development of innovation models through generations and the Stage-Gate model as a main representative of the third one; second related to open innovation model, its features and advantages; and third related to possible connection of previously mentioned models, discussing the ways of embedding the main principles of open innovation in the Stage-Gate model.

2. LINEAR MODELS AND STAGE-GATE

Innovation is identified as a key driver for strengthening of competitiveness, so that fostering innovation has become one of the key priorities in every company that strives to be the leader in the field. Globally, innovation appears to be the central element of today's knowledge-driven economy, with domination of information-communications technologies - ICT, as a key strategic dimension bringing completely new ways of communication and business. 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 in 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 from an idea to a successful product in the market (du Preez, Louw, 2008). Having that in mind, successful innovation demands a rigorous process for managing innovation, including a 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.

When it comes to innovation processes from idea to commercialized product/service, literature proposes a lot of different models and frameworks.

Basically, six generations of models can be found, from simple linear to increasingly complex interactive and network ones (Rothwell, 1992), up to new concept of open innovation (Table 1).

DEVELOPMENT OF INNOVATION MODELS (ADOPTED FROM (DU PREEZ, 1992))

Table 1

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

One of the most important elements of this classification is chronological review of models development, where shifting of models from conventional, unilateral, facing the own R&D solutions, via one-sided market orientation, to interactive combination of push and pull models, and contemporary, network models based on knowledge can be clearly noticed (Stošić, 2013).

The first and second generation models are linear models pulled either by market needs or pushed by technology and science. Coupling model as the third generation model recognizes the influence of technological capabilities and market needs within the company's framework. Even though the coupling approach encompasses feedback loops it is essentially a sequential model.

Cooper's Stage-Gate model, which is in the focus of this research, can be looked at as the main representative of this generation. This model divides the product innovation process into series of stages – set of parallel activities, and gates - decision points between the stages. The fourth generation innovation process model, known as interactive model, observes the innovation process as parallel activities across organizational functions. The fifth generation or network models are the influenced by external environment and effective communication with external environment. The sixth generation of innovation models is open innovation models, which can also be seen as network models, but instead of being only focused on internal idea generation and development, internal and external ideas and paths to market can be combined to advance the innovation process (du Preez, Louw, 2008).

Having in mind the aim of this study, the following text will be describing the Stage-Gate model, Open innovation model and possibilities of their connecting i.e. the opening up of Stage Gate model.

Stage-Gate® is a trademark of R.G. Cooper & Associates Consultants Inc., a member company of the Product Development Institute. It stands for industry standard for excellence in new product/service development. This advanced, widely applied and recognized process, skillfully integrates a number of practices in an easy to understand recipe for success. It is characterized by a structure that engages users at all levels and functions, and consequently allows making good and effective decisions regarding further project extension, and impacts on quality and speed of innovation project execution.

The current Stage-Gate is a third-generation process, which incorporates six Fs (Cooper, 1994):

- Flexibility,
- Fuzzy,
- Fluidity,
- Focus,
- Facilitation,
- Forever green.

The first three Fs makes the process less rigid, enabling it to be scaled to various size projects and enabling stages to be overlapped and approved conditionally. “Focus” means that the process is connected to a strategy. “Facilitation” refers to specific role gate keeper, who ensures that the process is properly guided. As a final point, “forever green” suggests the continuous improvement of the process. Generally, these six Fs enables a more sophisticated process, but they also encourage more abuse of the process (Cooper, 1994).

Using the Stage-Gate model improves efficiency and reduces the risk of failure, regardless whether it is launching of new product or technology that could change the competitive image in the market, or 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 (http://www.stage-gate.com/resources_stage-gate_full.php).

Stage-Gate model is a business process for value creation that is designed for quick and profitable transformation of company's best ideas into new products/services. Model as such 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.

It follows that the Stage-Gate model provides a conceptual and operational roadmap for driving new product development, from idea to launch, i.e., blueprint for managing the process of product/service innovation, aimed at increasing efficiency and effectiveness. Stage-Gate approach decomposes innovation process in a set of phases that comprise a set of planned, multi-functional and parallel activities. At the entrance to each stage is a gate, which role is quality control and decision-making Go/Kill/Hold/Recycle to the process (Cooper, 2011).

Phases are activities undertaken by members of the team owning to gathering the information they need for project progress toward the gate. The phases are cross-functional and activities are undertaken in parallel to speed up the time to market. In order to provide risk management, parallel activities within a particular phase must be designed in a way to gather important information - technical, market, financial, operational (Stošić, 2013).

The model is structured in that way that in front of each stage is a gate, or decision point. The decision about whether an innovation project is going to pass certain gates perform, combined, both internal managers and external experts, so-called gatekeepers. Gates have a dual role. First, to check whether the project met all the criteria identified in previous gate and second, to check whether the project meets the criteria for the current phase.

Every gate includes following (Stošić, 2013):

- Elements that represents deliverables – results of actions from the previous phase;
- Criteria on which the decision on project are made;
- Outputs, representing the results of the decision (Go/Kill/Hold/Recycle).

There are many different predefined qualitative and quantitative criteria based on which the assessment of innovation project is made in every gate. Such criteria have to give answer on the following questions:

- Are the milestones connected to technology met?
- Does the project perform in accordance with time and budget?
- Could innovation concept reach potential benefits for end-users?
- Does the innovation concept coincide with pre-set goals and strategy?

Specific criteria are different from gate to gate and become more rigorous as the project approaches the development stage.

One of the innovation project characteristics is high risk level which to a large extent affects the innovation process stability and depends on the process stage. Consequently, it is useful to execute risk identification in a more precise and efficient way in order to respond in the right time and manner. This is the reason why it is important to choose the right gatekeepers and criteria within the gates to implement the project in line with planned. Different findings on SG benefits and weaknesses are summarized in Table 2.

ADVANTAGES AND DISADVANTAGES OF STAGE-GATE MODEL

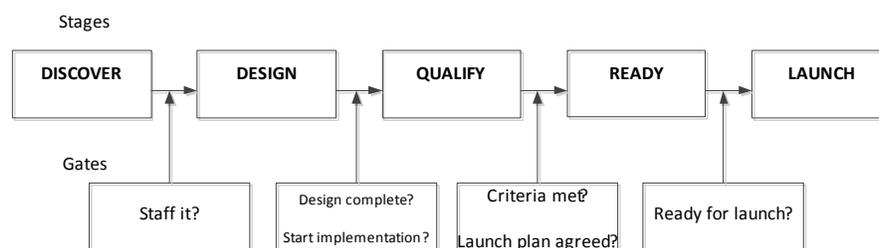
Table 2

Benefits (http://www.stage-gate.com/resources_stage-gate_full.php)	Common Errors and Fail-Points (Cooper, 2008)
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 re-work 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	

P&G is one of the companies which can be seen as a good example of applying the Stage-Gate model. It introduced the SIMPL™ model which consists of four main stages, where stages represent a set of current best practices in the form of key activities, and also clearly defined deliverables for project team (Figure 1). There are also four gates or decisions points in the model, which are comprised of a team recommendation and a management decision (Cooper & Mills, 2005).

P&G'S SIMPL™ PROCESS - AN IDEA-TO-LAUNCH STAGE-GATE® MODEL (ADOPTED FROM (COOPER & MILLS, 2005))

Figure 1



OPEN INNOVATION AS A NEW PARADIGM

In today's intensely competitive environment the main question is no longer why to innovate, but how to innovate. Bearing that in mind, innovation theory 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 (Gabel & Chesbrough, 2011).

Based on aforementioned, Henry Chesbrough coined the term "open innovation" to describe a paradigm that assumes that firms can and should use external ideas together with internal ones, and internal and external course to market, when trying to make progress of their technology (Chesbrough, Vanhaverbeke and West, 2006). While Chesbrough (2003, 2006) partly admits the rich source of antecedents to the 'open innovation paradigm', there are some authors such as Trott and Hartmann (2009) who claim this paradigm to represent just an old wine in new bottles, meaning redesign and redefinition of ideas and notions recognized within the literature in the field for some time.

The model of open innovation is based on the movement of ideas across organizational boundaries. Valuable ideas can be generated externally

(outside the organization) and internally (within the organization), which also refers to the output of the innovation process, i.e. placement of innovations to the market.

On the other side, the conventional internal model of closed innovation is based on the principle of control for the success of innovation and innovation projects. The organization needs to generate and control their own ideas in the same way as the functions units - production, marketing, finance. The main features of both models are shown in the Table 3.

One of the factors that led to abandoning the concept of the closed innovation is the mobility and accessibility of knowledge due to ICT. Therefore, employees' fluctuation is encouraging knowledge transmission, resulting in a higher throughput of knowledge between the organizations. This has changed the logic of modern innovation processes and models, growing from closed to open ones, through well-known principles given in Table 3.

FEATURES OF OPEN AND CLOSED INNOVATION MODEL (CHESBROUGH, 2003)

Table 3

Closed Innovation Principles	Open Innovation Principles
The smart people in the field work for us.	If we create the most and the best ideas in the industry, we will win.
To profit from R&D, we must discover it, develop it, and ship it ourselves.	External R&D can create significant value: internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to the market first.	We don't have to originate the research to profit from it.
The company that gets an innovation to the market first will win.	Building a better business model is better than getting to the market first.
If we create the most and the best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
If we create the most and the best ideas in the industry, we will win.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our business model.

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 which can be improved through internal R&D, and to build an adequate business model which will provide greater value for the organization.

Key Factors to Implementing "Open Innovation" (Docherty, 2006):

- Broaden your view (where you look and your ability to see what's there);

-
- Create alignment across the innovation ecosystem;
 - Adapt an approach for your organization's tolerance for risk;
 - Put the focus on learning, not just results.

Many of the market leaders such as GE, Cisco, Adobe, Nokia, P&G, Spalding, Starbucks, successfully use the model of open innovation in order to improve their products/services, reduce the cost of R&D, solve technical problems and accelerate time to market (Stošić, 2013).

P&G has institutionalized its Connect and Develop program to ensure external ideas have access to the organization and that internal intellectual property is marketed to the outside. Aiming to speed and simplifying external innovation connections, P&G's Connect and Develop program launched a new website, linking innovators directly to top company needs, and P&G business leaders directly to external innovation submissions. In the spirit of C+D, the web site was developed in collaboration with several external partners, which brought new innovative technology to the back-end of the site, enabling user submissions to directly feed into the business category leaders. This will allow P&G to review needs more quickly and more efficiently for strategic fit or scalability across the business. (<http://www.pgconnectdevelop.com/home/stories/cdstories/-20130207-pg-connectdevelop-launches-new-open-innovation-website.html>)

POSSIBILITIES OF CONNECTING THE STAGE-GATE AND OPEN INNOVATION MODEL

Concerning the market needs and treat that internal R&D isn't the engine of innovation anymore, left companies no options but to adapt their business if they want to stay competitive and not to miss opportunities any longer. Referring to that and the fact that a lot of external knowledge is now accessible, companies which have been using Stage-Gate model for their new product/service development make a great effort to improve their model, broadening it with open innovation features (Grolund, Ronneberg & Frishammar, 2010). It assumes accommodation of flowing the new ideas, intellectual property, technology or even fully developed products from external sources.

Companies which have moved to open innovation, also have to modify their Stage-Gate process, and consequently to modify their business model, making it more flexible in order to enable proper surrounding for networks of partners, alliances and outsourced-vendors. One of the best examples of Open innovation Stage-Gate model usage is company P&G, which released

SIMPL 3.0 version Stage-Gate system, designed to handle external ideas, technologies, and even fully developed products (Cooper & Edgett, 2008).

Using the open innovation in new product/service development implies its involvement in all three aspects of the innovation process, including ideation, development, and commercialization (Figure 2).

Ideation or Discovery stage: The first phase of the innovation process/project is always generating ideas - in the literature also known as ideation. The beginning of generating ideas process is always associated with the identification and understanding that somewhere there is a gap, i.e. new product characteristics, new elements of the business improvement process technology, a completely new business model (Cooper & Edgett, 2005; Cooper, 2011; Kahn, 2013; Stošić, 2013). This is the stage in which companies go across their borders looking for external information that could be helpful in satisfying customer's needs, when it comes to ideas for new product/service development (http://www.stage-gate.com/resources_stagegate_openinnovation.php). Many companies such as Starbucks, P&G and BMW are using open ideation or co-creation, offering the possibility to customers to share their ideas by giving them problems the company is facing with or just giving them possibility to propose some new idea over the companies' sites.

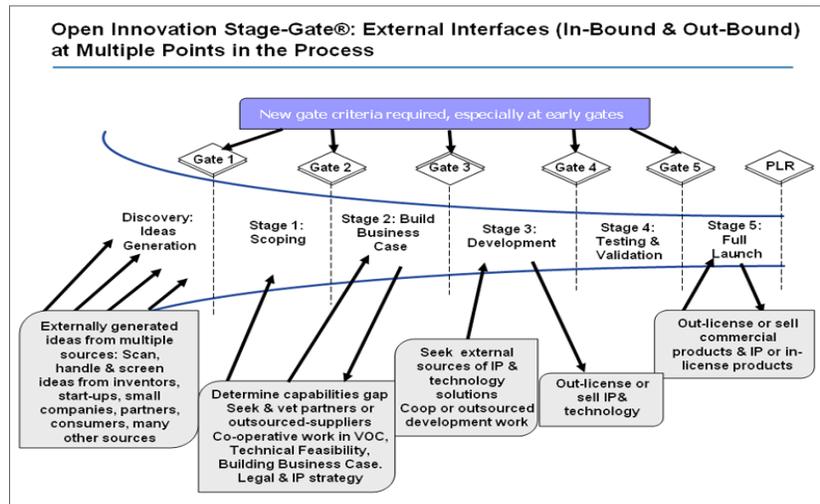
Building the Business Case: Implies detailed market research, consumers' needs and desires, stakeholder analysis, concept testing, detailed financial and business analysis. As a result of the stage, a business case is obtained, i.e., defined the product/service, business justification and a detailed action plan for the next stage (Cooper & Edgett, 2005; Cooper, 2011; Kahn, 2013; Stošić, 2013). Concerning open Stage-Gate, this stage includes actions such as identification of missing internal capabilities, seeking for potential partners who will provide technological or marketing capabilities to develop and commercialize new product/service, developing an intellectual property strategy (http://www.stage-gate.com/resources_stage-gate_openinnovation.php).

Development stage: Within this stage comes to implementation of the action plan and development of new product or service. It is necessary to carry out various tests within the company's laboratory in order to confirm that the product meets all the requirements (Cooper & Edgett, 2005; Cooper, 2011; Kahn, 2013; Stošić, 2013). Concerning the open Stage-Gate system, companies cooperate with suppliers or partners trying to solve technology and development problems and also try to get external innovations which have already been commercialized. Furthermore, companies can out-license or sell their internally developed technologies and intellectual property (http://www.stage-gate.com/resources_stage-gate_openinnovation.php).

OPEN INNOVATION STAGE-GATE MODEL

(http://www.stage-gate.com/resources_stage-gate_openinnovation.php)

Figure 2



Launch or commercialization stage: Start of full production and commercial launching of the product and its sales. Within this stage monitoring of the innovation project is carried out, as well as detecting and correcting mistakes (Cooper & Edgett, 2005; Cooper, 2011; Kahn, 2013; Stošić, 2013). On the other side, the open Stage-Gate system should enable the company to sell or out-license already commercialized products if there is a possibility to gain more value elsewhere; or to in-license – purchase an already commercialized products for achieving new growth for the company (http://www.stage-gate.com/resources_stage-gate_openinnovation.php).

Speaking about gates and criteria they include, they must also be modified in the open Stage-Gate system. In this case, not having all the capabilities to develop or execute a project doesn't lead to a "Kill", but leads to seeking a partner to handle the missing elements. These modified criteria must be introduced, dealing with partner or supplier selection and their capabilities (http://www.stage-gate.com/resources_stage-gate_openinnovation.php).

Having been a leader in Open innovation model employment, P&G also made an effort to develop and introduce the open Stage-Gate model, frequently cited as SIMPL 3.0. This is the version of a Stage-Gate model and is a method used to drive products from idea to launch stages with clear go/kill criteria and timing requirements (Panduwawala, Venkatesh, Parraguez & Zhang, 2009). In addition, one of the examples that should be useful to mention is General Electric's open Stage-Gate named "Toll-Gate" (Stage-Gate system)

for handling an open innovation, both out-bound and in-bound (http://www.stage-gate.com/resources_stage-gate_openinnovation.php).

CONCLUSION

In this paper we discussed the opportunities to make connection between the Stage-Gate and Open innovation model, to integrate the open innovation principles into a closed new product/service development model. As it is previously stated, open innovation principles infiltrate almost every stage of the Stage-Gate process, while recently the most popular engagement of open innovation is in the ideation phase. The companies through co-creation or crowdsourcing try to solve current problems or even try to somehow attract end users to propose their ideas through online or offline games or over the companies' sites.

Various papers confirm that opening up the new product development process, in this case Stage-Gate process can generate significant value. On the other side, its implementation can be very challenging. We presented both Stage-Gate and Open innovation model and emphasized the possible points of their association. When it comes to this connection, it should be pointed out that not only changes in the Stage-Gate process has to be made but also company's current business model and capabilities have to be put under examination. For this model, very important is dynamic view, where companies should continuously reevaluate their business models and be aware of own capabilities in order to successfully leverage problems when engaging in external collaborations (Chesbrough & Schwartz, 2007).

The "Open Stage-Gate" model has many benefits, starting from the fact that this model systematically integrates the principles of open innovation with existing Stage-Gate processes; it increase companies' proficiency in outbound open innovation activities (selling intellectual property - licensing); it provides systematic application of open innovation principles; it helps managers to continuously evaluate and adjust companies' capabilities and business model, i.e. business model innovation; it allows systematic review and assessment of importing intellectual property from outside the boundaries. Involvement of external know-how and technology can contribute the company in many ways, such as to complete a product, add value to the product offering, speed up the innovation process and reduce development costs (Gabel & Chesbrough, 2011).

REFERENCES

1. Chesbrough, H. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press.
2. Chesbrough, H., & Schwartz, K. (2007). *Innovating Business Models with Co-Development Partnerships*. *Research Technology Management*, 50(1).pp 55-59

-
3. Chesbrough, H., Vanhaverbeke, W. and West, J. (2006). *Open Innovation: Researching a New Paradigm*. UK: Oxford University Press.
 4. Cooper, R. G. (1994). Perspective third-generation new product processes. *Journal of Product Innovation Management*, 11(1), 3-14.
 5. Cooper, R.G. (2008). The Stage-Gate Idea-to-Launch Process—Update, What's New and NexGen Systems. *Journal of Product Innovation Management*, Volume 25, Number 3, pp 213-232
 6. Cooper, R.G. (2011). *Winning at New Products: Accelerating the Process from Idea to Launch*. Third Edition. Cambridge.
 7. Cooper, R. G. & Edgett, S. J. (2008). Maximizing productivity in product innovation. *Research Technology Management*, 51(2).
 8. Cooper, R. G., & Edgett, S. J. (2005). *Lean, rapid, and profitable new product development*. Product development institute.
 9. Cooper, R. G. & Mills, M. S. (2005). Succeeding at New Product Development the P&G way: A key element is using the "Innovation Diamond". Product Development Institute Inc.
 10. Docherty, M. (2006). Primer on 'open innovation': Principles and practice. *Visions*, XXX, 2.
 11. Drucker, P (1985). *Innovation and Entrepreneurship: practice and principles*. London: Heinemann.
 12. Du Preez, N. D. & Louw, L. (2008). A framework for managing the innovation process. *Management of Engineering & Technology. PICMET 2008*. Portland International Conference on (pp. 546-558). IEEE.
 13. Gabel, D. and Chesbrough, H. (2011). *A Guide to Developing a Portfolio of Ideas and Experiments*. Filene Research Institute.
 14. Grolund, J., Ronneberg, D. and Frishammar, J. (2010). Open Innovation and the Stage-Gate Process: A Revised Model for New Product Development. *California Management Review* 5, 3: 106-131.
 15. Kahn K. (2013). *The PDMA Handbook of New Product Development*. 3rd Edition. John Wiley & Sons. New Jersey.
 16. Panduwawala, L., Venkatesh, S., Parraguez, P. & Zhang, X. (2009). *Connect and Develop - P&G's big stake in open innovation*. University of Bath.
 17. Rothwell, R. (1992). Successful industrial innovation: critical factors for the 1990s. *R&D Management*. Vol 22:3. pp. 221 – 239.
 18. Stošić, B. (2013). *Innovation Management – Innovation projects, models and Methods*, Faculty of Organizational Sciences, Belgrade.
 19. Trott, P. (2005). *Innovation Management and New Product Development*. 3rd edition. Harlow, England: Pearson Education Limited.
 20. Trott, P. & Hartmann, D. (2009). Why 'open innovation' is old wine in new bottles. *International Journal of Innovation Management*, 13(04), 715-736.
 21. <http://www.prod-dev.com/stage-gate.php>
 22. <http://www.sopheon.com/industry-innovation/>
 23. http://www.stage-gate.com/resources_stage-gate_full.php
 24. http://www.stage-gate.com/resources_stage-gate_openinnovation.php