

ANALYZING THE RELATIONSHIPS AMONG INNOVATION ACTIVITIES AND ORGANIZATION INNOVATION

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Abstract

In this paper the effects of one of the most important innovation activity, the Idea Management, to the innovation performance are analyzed. These effects are quantified in specific business sectors. While it is obvious that organizations should be able to gather and evaluate ideas from all employees and in a systematic and flexible way, the exact influence in company innovation and performance cannot be easily be modeled and measured. Different organization parameters and data related to idea management and organization innovation are analyzed. The output of this analysis is the relationship between the managing of the ideas of employees and the relevant Innovation Key Performance Indicators (KPIs).

Key words: Innovation; Knowledge; Key Performance Indicators (KPIs); Knowledge Management; Innovation Management; Idea Management.

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1. Introduction

Our society in 21st century has been transformed from Knowledge to Innovation society. According to the definition of innovation of OECD in the Frascati handbook (OECD, 2002), it is “the transformation of idea in marketable product or service, functional method of production or distribution - new or improved or still in new method of benefit of social service”. Innovation concerns the use of knowledge for the creation of new ideas that leads to products and services that can be successfully sold in the market or in new enterprising activities that improve the operation, the flexibility and the adaptability of enterprise to the continuously changing conditions of market. According to Intel’s CEO Paul Otellini, “innovation is to give customers new reasons to buy.”

Since products’ life cycle decreases progressively, enterprises are forced to constantly innovate. Nowadays, production is not characterized any more by mass production but by flexibility, while the innovation becomes the more important parameter (Afuah A, 2003). Increasingly, the new core competences are creativity, imagination, and, above all, innovation. Innovation Management is emerging as a new discipline for managing the creation of innovative products and services and introduce them to market. It involves forming organizational structures and systems that encourage creative solutions to difficult problems. Furthermore, innovation appears to be the only way for survival and growth of a company (Cooper, 1999). Innovative companies can achieve bigger market share, higher productivity, higher growth rates and of course profits (Geroski, P. and Machin S, 1992, Griliches 1990).

Innovation and Creativity should constitute the basic enterprise processes that can combine different activities, from research to customer support, for a common objective, a successful commercial product. The company executives’ capabilities and experiences, the innovation and creativity possibilities, the most optimal enterprising practices, the patents, the knowledge that the enterprise has accumulated from its suppliers and its customers and the knowledge gained by the competitors, constitute its most precious resource. The innovation should constitute the key component of the strategy of a modern enterprise, the

DNA of its daily operation and culture. Almost 30% of total sales of innovative 3M derive from relative new products, i.e. from products that were introduced in the market during the last 4 years.

According to R. Solow, (Solow, 2004) recipient of the 1987 Nobel Prize in Economic Sciences, innovation is the **X Factor** and the aim of corporations should be to create innovations that give them a sizeable and long-term competitive advantage. That advantage is produced through the creation and development of more complex innovations that embrace more than a single **dimension of innovation** i.e. more than just a new design, package, or marketing technique. To achieve this, and to maximize the innovation market impact, each opportunity should be “expanded” to several different innovation dimensions to create something that is harder for the competition to copy and attack.

Innovation does not only concern companies of high technology and the introduction of new products/services that satisfy real customers’ needs is a more important innovation factor itself than the hi-technology, the research and the growth. It is not necessarily synonymous with (high) technology but concerns all stages of new product development, including Opportunity Identification and Selection, Concept / Idea Generation, Concept / Idea Project Evaluation, Research & Development and Market launch. Organizations are competing based on the speed at which they can create, develop and implement ideas for new products and services.

Due to the importance of innovation, they are executing a number of innovation activities supported by IT systems like *Creativity Support Systems*, *Brainstorming Support Systems*, *Inventive Problem Solving Systems*, etc. The analysis of relationships between innovation activities and innovation performance and organization performance is an open research issue. In this paper the effects of one of the most important innovation activities, the Idea Management, to the innovation performance are analyzed. The focus is on specific business sectors and it analyzes different organization parameters and data from questionnaires related to idea management and organization innovation. It uses different approaches including statistical methods and data mining techniques. The output of this analysis is the relationship between the managing of the ideas of employees and the innovation KPIs. The factors that can have an impact to this relationship, like organization structure and culture are evaluated.

The rest of this paper is organized as follows: In section 2 we describe the major Innovation Activities and the related Information Systems. In section 3 we provide the major Innovation Key Performance Indicators (KPIs) that will be used in our analysis. In section 4 we describe in more detail the Idea Management Innovation Activities since their impact on Innovation KPIs will be explored. In section 5 we analyze the effects of Idea Management Systems to Innovation KPIs. Finally in section 6, we provide certain conclusions and directions for future work.

2. Innovation Activities Support Systems

Due to the importance of innovation in our era, organizations should execute innovation activities including knowledge management, and generation, collection, organization, distribution and evaluation of ideas. Innovation Activities can support all the phases of innovation cycle: *Idea Generation*, *Research on the technology used to develop the idea*, *Development*, *Technology Transfer* and *Commercialization*. Particular emphasis should be given to the management information systems that support Innovation activities and help companies create more and improved ideas.

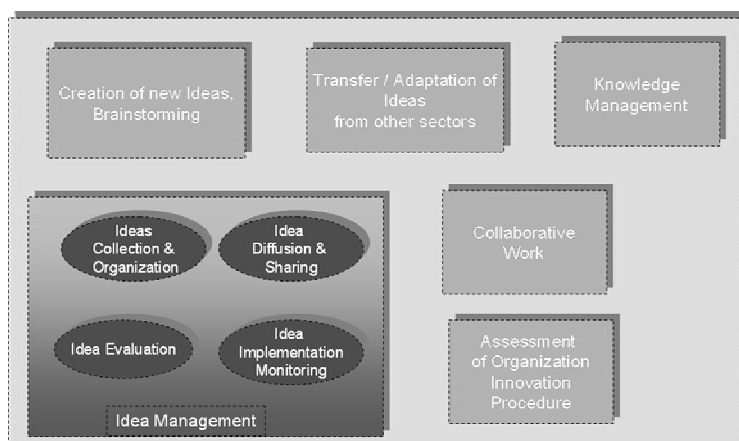


Figure 1: Important Innovation Activities

The main categories of innovation activities are (Figure 1):

- Creativity Support and Brainstorming
- Discovery, transfer and customization of Ideas from other sectors
- Idea Management
- Knowledge Management & Collaborative Work

These activities can be supported by Information systems:

1. *Creativity and Brainstorming software support tools*, help companies create more and better ideas. They operate as catalysts, allowing human brain to “externalize” its creativity. Some of these tools ask questions, while others are based on the use of a variety of relevant as well as parallel thinking techniques. Additionally to the creation of new ideas, they can support definition of company’s priorities as well as organisation of the best ideas. A classical Brainstorming technique is the *Mind Mapping* that allows the visual representation and arrangement of ideas and their inter- relations.

2. *Systems supporting the Discovery, transfer and customization of Ideas from other sectors*: They consider that somebody, in another place of the planet has already resolved your problem or another one similar with yours, likely in other field. Creativity means you find that solution and you adapt it in your running problem. This approach is used widely today for the development/improvement of existing products, services and processes, while it saves time in order to create and develop new innovations and inventions. *TRIZ theory* is based on the analysis of the creative solutions via older problems and is applied for the continuous improvement as well as for the development of new products and services, (Smith L. 2001). The research for TRIZ method was implemented in the former USSR from 1946 until 1985 and is continued in world level from then (Raskin A. 2003, Slocum et al, 2003, Fortune, May 16, 2005, Kellner T. 2005) .

3. *Idea Management Systems* support the process of gathering and evaluating ideas from all employees in a structured way, with a goal of selecting the best ideas with the greatest potential for implementation. Companies are competing on the speed they discover, develop and materialize ideas on new products and services.

4. *Knowledge Management Systems* organize the unstructured enterprise data and information into knowledge that is actionable and provides business value. They help organizations to capture, share and leverage their collective knowledge, expertise and wisdom and consist of the following components: Collaboration, Content Management, Search, Taxonomy management, Business Process Management, Business Intelligence and Portal.

3. Key Performance Indicators for Innovation

You cannot manage what you do not measure, as the old management adage clearly states. The difficulty, when it comes to innovation, is that its nature and innovations complexity, does not allow direct measurements (like cost per hour etc) so it is approached in an indirect way. *Key Performance Indicators (KPIs)* represent a set of measures focusing on those aspects of organizational performance that are the most critical for the current and future success. They tell what to do in order to increase performance dramatically (Parmenter, 2007). Companies are dynamic organizations interacting with their environment, which has a great complexity to analyze and manage. Never the less, all companies and production system on a standard input must have a standard output, so during sort term periods we could say that all systems are deterministic (with a standard deviation +/- X%). So, actually, we can have a “picture” of an organization for a specific time frame (year when talking about balance sheet, second when we monitor the changes of a stock value).

In order to measure innovation performance we use *Innovation Key Performance Indicators (Innovation KPI)*. Table 1 presents a series of well-tested and established Innovation KPIs, along with our comments and improvements. These KPIs are used in our work to evaluate the importance of innovation activities to the innovation performance.

No	Innovation KPI	Description
1	Revenue growth due to new products or services	The revenue growth due to new products and services is a strong indicator by which we can assume that an organizations new products and services have been approved by the organizations market and the organization has outpaced its competitors.
2	Customer satisfaction with new products or services	Customer satisfaction is a very important key indicator. Nevertheless, it should be supported by a sub-indicator, the customer reference percentage, meaning the ratio of the satisfied customers that suggested our products or services to new customers
3	Number of ideas or concepts in the pipeline	The new ideas soon to be evaluated and realized. The average time before realization or rejection should be also taken under consideration
4	R&D spending as a percentage of sales	How much strongly an organization believes that innovation is the key.
5	Percentage of sales from new products/services in given time period	Would the new products or services make the majority of the total sales? How important are the new products or services. Pretty much an ABC analysis for our innovations.
6	Number of new products or services launched	In combination with indicator number 3, this can also be negative, meaning that if from an organization only one idea occurred, the idea's realization was the organization's only choice.
7	Return on investment (ROI) in new products or services	How fast did the organization get the money back from its innovations.
8	Number of R&D projects	Can show organisations' will to innovate.
9	Number of people actively devoted to innovation	Number of creative employers devoted to innovation, working in any department of the organization
10	Profit growth due to new products or services	More focused indicator than the first one, meaning that new products and services have really gave advantage to the organization along with money for R&D.
11	Potential of entire new product/service portfolio to meet growth targets	The potentiality is always estimation. Nevertheless, when there is a possibility that the entire portfolio will meet growth target, that means that in the portfolio there are some "star" products or services that can meet growth sales for a very long period of time.
12	Changes in market share resulting from new products/services	The diffusion of organization's innovation in the market. Actually, the diffusion of an innovation within the organizations boundaries should also be a factor
13	Net present value (NPV) of entire new product/service portfolio	The NPV of the entire portfolio shows the total present value (PV) of a time series of cash flows. It is a standard method for using the time value of money to appraise long-term projects.

Table 1: Important Innovation KPI

4. Idea Management

In the 1990s a number of approaches were developed for better collection and management of ideas, including "innovation councils" (cross-functional bodies enabling cross-business / function / geography decision making and coordination.) and innovation "cross-functional teams". With these developments, the modern Idea Management System was born. In recent past many large companies relied upon suggestion box systems to gather ideas from employees. Suggestion box was originally a physical box, with a slot in the top, that sat in a suitable location in a building and people dropped their written idea suggestions into it. The ideas periodically reviewed by a designated person, typically a member of the administrative staff or the owner of the business or manager of a business unit. But these systems because they weren't usually focused on specific business goals, they tend to attract a small volume of low-quality ideas. Moreover, once an employee submitted an idea, s/he usually never learned what became of it. As a result, employees often would no longer contribute their ideas. Moreover these systems made it hard to ensure that all ideas were evaluated on a timely basis and a consistent manner.

In parallel with the use the Suggestions Box for idea management, companies such as Imaginatik (1994) and General Ideas Software (now BrightIdea) (1999) entered the market of Idea Management

Information Systems, allowing companies to capture and process ideas through dedicated software packages that allowed managers to organize and run 'idea campaigns.'

Idea Management currently can be supported by **Idea Management Technology**, which is a new type of enterprise software tool that can support the effectiveness of the innovation strategy. These applications are often Web-based and help companies discover focused ideas from the all employees (despite their geographic place) and gather them on a central online database. Idea management systems provide also structured activities for the evaluation, sharing and dissemination of ideas and support the recognition and remuneration of employees that offer the best ideas. They can include knowledge management components that help employees have quick access in knowledge and experience that are diversified in the whole organization to help them solve an emerging problem.

The new product development process suggests 7 stages of development of a new product (or service): (1) Idea Generation, (2) Idea Screening, (3) Concept Development and Testing, (4) Business Analysis, (5) Beta Testing and Market Testing, (6) Technical Implementation and (7) Commercialization. Idea Management software products typically focus on at least the first two stages, with some products extending into the third and fourth stages. Typically the fourth through seventh stages are handled by other organisational systems outside the Idea Management System.

5. Analyzing Organization Innovation through Idea Management Systems

Organizations should use Idea Management Technology and Systems in order to efficiently exploit the creativity of employees. While it is obvious that organizations should be able to gather and evaluate ideas from all employees and in a systematic and flexible through Idea Management System, the exact influence in company innovation and performance cannot be easily been modeled and measured.

Idea Management Systems can help organizations to focus the creativity and ideas of employees on specific business issues. This tends to result in a larger quantity of very high quality ideas. Also, because today's idea management systems are powered by databases, setting up and managing a closed-loop evaluation process -- which automatically reminds evaluators of upcoming deadlines and unevaluated ideas -- is much easier to set up and administer. They also share some common roots with knowledge management systems. But many companies that have implemented knowledge management systems are finding it hard to measure their bottom-line impact. Since they track ideas from inception to implementation, idea management systems make it much easier to track key metrics as the ones defined in section 3.

Idea management tools offer a number of compelling benefits to companies of all sizes, and collect ideas from all areas of the organization, not just specialized departments like R&D and marketing. They focus employees' creative efforts around specific organizational goals and objectives. Research by two leading suppliers of idea management systems (*Imaginatik* and *General Ideas*) shows that when employees are asked to generate ideas or suggestions for a specific business problem or objective, the quantity and quality of ideas tends to increase significantly. They encourage employees to capture all of their ideas. In most types of businesses, employees rarely capture their ideas, and most of them are lost forever. Idea management systems help employees to share ideas, comment on, add to and further improve each others ideas, and acquire knowledge by viewing others' ideas.

By placing ideas in a shared repository, idea management systems promote greater transparency. Employees can see the outcome of all of the ideas they have submitted, which increases their enthusiasm for participation in idea campaigns. Also, these database-driven tools make it easier to measure how much each implemented idea has contributed to the firm's bottom line. This makes it easier, in turn, to reward employees who have contributed winning ideas. Idea management systems help companies to share best practices. For companies that have multiple offices or locations, idea management systems enable them to quickly and cost-effectively share ideas and best practices that have been used successfully at one location with other locations. This allows them to multiply the bottom-line benefit of a single cost-saving idea many times over. Web-based idea management systems can be accessed via any computer with an Internet connection, from anywhere in the world, vastly simplifying the transfer of valuable ideas and best practices across geographical and organizational barriers (*Idea Management Resource Center*).

They help companies to take advantage of the best ideas and increase their time to market. They do so by providing a structured process for evaluating ideas and selecting the best for implementation, and by providing mechanisms to make sure that all ideas are promptly reviewed and evaluated. They not only

provide a toolset for developing new product and service ideas, but can also have greater results from cost-reduction. Outside partners, such as suppliers and partners can also contribute ideas.

In our initial research we analyze the effects of one of Idea Management to the innovation performance.

We focused on private and public organizations in Greece from the service sector. As a first step we have tried to identify the level of idea management performed in the organizations. The following parameters were examined:

- Whether organizations have formal procedures to collect the ideas of their employees
- The effects of organization structure to idea management. How different groups, departments and divisions communicate and change ideas. There is a practice the departments or divisions of the organizations (that can be located in different areas) to operate like silos, rarely sharing information and ideas.
- If the climate of the organization facilitates employees to discuss and share their ideas (informal exchange of ideas)
- From whom and how new ideas are created, screened and evaluated.
- If there is a culture in the organization for idea sharing and if there are incentives for the employees with the best ideas
- The effects of the *suggestion box systems* or the *suggestion e-mail* used by some companies to gather ideas from their employees.
- The companies that are using Idea Management Information Systems and how they are trying to exploit these systems.
- How the companies that are trying to gather ideas from outside partners, such as customers, suppliers, dealers and joint venture partners.

The second step was to collect data in order to calculate the most important Innovation Key Performance Indicators (KPI) of these organizations as described in section 3. After selecting information about the level of Idea Management performed in the organization and calculating the most important Innovation Key Performance Indicators we tried to link the organization Idea Management approach to these indicators.

Decision (mandatory)	☐ Implement - firm plans ☐ Implement - with modifications ☐ Implement - some plans ☒ Implement - under certain conditions ☐ Not Implement - except under conditions ☐ Not Implement ☐ Thank you for the Contribution
Message to the Idea Author	Your idea will have a strategic input to our competitive situation. The Innovation Council will work out a reward for your achievement
Benefit Type (mandatory)	What is the main type of Benefit of this idea: ☒ Revenue Increase ☐ Cost Saving ☐ Intangible Benefits
Revenue Increase (please include \$00s)	Increase in Revenue \$ 1200000
Net Benefit	Implementation Cost \$ 450000
Multiplier	Net Revenue Increase \$ 750000
Overall Potential	How many times can these benefits be incurred 1
Comment on Benefits	Total Net Revenue Increase \$ 750000
Implementing the Idea	Choose a person to take care of the implementation Ian Jones
Comments / Next steps	Rough estimation - need to prepare a thorough analysis.
	Devise project plan. Add to the agenda of R&D Innovation Committee meeting.

Figure 2 : Idea Management Tool "Idea Central" by Imaginatic: Part of page with the conclusions of the idea evaluation

Major outcomes of our work that was performed through questionnaires and personal interviews with personnel in all levels within the organizations, were:

- None of the examined companies invests on Idea Management Information Systems. Only some subsidiaries of multinational companies use such systems. This is not the case in other countries where at least the big organizations like *Coca Cola*, *IBM*, *Bayer*, *Nokia* and *Zerox* use these systems and have structured idea management processes. Some researches (Turrell, 2003) show a *Return on Investment (ROI)* of 10X or higher with the adoption of Idea Management Tools.
- In most companies there are no formal processes to collect and evaluate the ideas of their employees. In some of them the employees can send a message with suggestions to a specific company e-mail address (suggestion e-mail) but the e-mail content is provided unstructured and cannot electronically processed. In some companies a number of ideas are collected through the e-mail but there are no skilled persons responsible to check, evaluate and approve the ideas.
- Through *suggestion e-mail*, companies are receiving a number of ideas that have nothing to do with the business objectives.
- In most companies the structure and the culture does not help the idea sharing
- In the majority of companies the ideas for new products and services or for new processes start from the high level management
- The employees cannot follow what happened with their ideas. This results in negative climate and in damaging any additional idea generation campaigns.
- In general in all companies that have some kind of idea management, the related Innovation KPIs, have better values (for example the "New Product Turn Around Time" and the "Number of Collected Ideas that were implemented" are at least 25% better).

6. Conclusions - The Present and the Future of Innovation through Idea Management

Facilitating **innovation** is increasingly acknowledged as a key factor for competitive advantage. Existing Information Systems support planning, scheduling and executing tasks. However, in order to achieve

continuous innovation and persistent competitive advantage, they should also support non-linear knowledge-based tasks with the broad participation of employees. This must be supported by new paradigms of Information Systems for generation, organization and dissemination of ideas and knowledge.

Idea Management is one of the most important innovation activities. The Idea Management Systems, enable organizations to gather, share and evaluate ideas with quality, speed and flexibility. They enable managers to measure the impact of ideas collected and implemented, and determine the "return on ideas". Moreover, it is a cost effective approach because it allows management tap into its own employees rather than hiring of consultants. However, in order to be successful, the idea management system needs to be implemented in an appropriate organization structure and culture in order to lead to highly profitable innovations. Our future work include (a) the long-term analysis of the innovation KPIs after the introduction of innovation management systems to a large number of European companies and (b) the analysis of the innovation performance with the adoption of other innovation activities described in this paper.

References

1. Afuah Allan, "Innovation Management", 2nd Edition, Oxford University Press, 2003, ISBN: 0195142306
2. Akahira, M. (1983). Asymptotic deficiency of the jackknife estimator.// The Australian Journal of Statistics. Vol. 25, 123 – 129.
3. Burgelman R. A., Christensen Clayton M., Wheelwright S.C., "Strategic Management of Technology and Innovation," 4th Edition, McGraw-Hill Irwin Co., New York 2004, ISBN 0-07-253695-0
4. Burgelman R. A., Christensen Clayton M., Wheelwright S.C., "Strategic Management of Technology and Innovation," 4th Edition, McGraw-Hill Irwin Co., New York 2004, ISBN 0-07-253695-0
5. Business Week, 24 April 2006, «The World's Most Innovative Companies»
6. Business Week, August 1, 2005 SPECIAL REPORT - Get Creative! How to build innovative companies by Bruce Nussbaum
7. Business Week, August 1, 2005, «3M: Reading Between the Lines»
8. Cooper (1996) Overhauling the New Product Process, Industrial Marketing Management 25, p.465-482
9. Domb Ellen, "Enhance Six Sigma Creativity With TRIZ," Quality Digest, Feb. 2004
10. Drucker Peter, 2001, Management Challenges for the 21st Century, Harperbusiness, 2001, ISBN: 0887309992.
11. Fortune, May 16, 2005 "25 Breakout Companies,"
12. Franko, L. G. (1989), "Global corporate competition: who's sinning, who's losing, and the R&D factor as one reason why", Strategic Management Journal, 10, p.449-474.
13. Geroski, P. A. and Machin, S. (1992), "Do innovating firms outperform non-innovators?", Business Strategy Review, Summer, p.79-90.
14. Griliches (1990), "Patent statistics as economic indicators", Journal of Economic Literature, 28, p.1661-1707
15. Karlsberg Robert (2005), Jane Adler, «7 strategies for sustained innovation», 2005 (<http://www.innovationtools.com/Articles/EnterpriseDetails.asp?a=185>)
16. Kellner Tomas, "Reengineer That Ad," Forbes, May 23, 2005 (www.kowalick.com/news/forbes.html).
17. OECD (2002), The Measurement of Scientific and Technical Activities, "Frascati Manual 7th Edition", 2002
18. Parmenter David, "Key Performance Indicator, Developing. Implementing and Using Winning KPIs", John Wiley & Sons, Inc. 2007.
19. PricewaterhouseCoopers, Consulting, Innovation Survey, November 2000
20. Rozwell C., Harris K., Caldwell F.; 21 January 2002, <http://www.gartner.com/DisplayDocument?id=351964>
21. Slocum Michael S., Domb Ellen and Lundberg Catherine, "Solution Dynamics as a Function of Resolution Method (Physical Contradiction vs. Technical Contradiction)," The TRIZ Journal, Jan. 2003.
22. Smith Larry, "Six Sigma and the Evolution of Quality in Product Development," Six Sigma Forum Magazine, Nov. 2001. (www.asq.org/pub/sixsigma/past/vol1_issue1/evolution.html)
23. Solow Robert M. , Flexibility and Endogenous Innovation, The Journal of Technology Transfer, Volume 30, Numbers 1-2 / December, 2004 Springer Netherlands, p.p. 11-15
24. Turrell, Mark, Idea Management ROI: Quantifying the Returns from Advanced Idea Management, WHITE PAPER, June 2003
25. Verduyn, David M. and Alan Wu. 1995. Integration of QFD, TRIZ, & Robust Design: Overview & "Mountain Bike" Case Study. ASI Total Product Development Symposium, Nov. 1-3, 1995, Dearborn, MI
26. Idea Management Resource Center (www.innovationtools.com)