

PREREQUISITES FOR DEVELOPING A MEASUREMENT TOOL TO ANALYZE THE EXTENT OF INNOVATION

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Abstract

This article approaches the problem of the success of companies in today's economic context, characterized by a generalized market with increase competitive and client requirements. In order to stay on the market and to make profit the companies must change or improve their way of thinking, such that they can be more adaptable to the rapid information changes. A solution to this problem is innovation, which is a complex phenomenon that needs to be understood and measured in every company. The aim of this paper is to offer a measurement tool to analyse the extend of innovation. We have divided the complex phenomenon of innovation in seven types of innovation according to their influence in the company, for each type of innovation, we have proposed a set of measuring indicators. To widen the extent of analysis, this paper used two research methods, namely: *the expert method* - using the Quality Function Deployment (QFD) that focuses on the requirements for innovation performance and on a different set of indicators to calculate the importance of each type of indicator; and *the empirical method* - using a questionnaire with questions, a representative sample of firms to check the current extent of innovation and to offer suggestions for improving innovation management.

Keywords

Innovation, innovation management, innovation indicators, innovation matrix, metrics of innovation, business improvement success.

JEL Classification

O32, M21

Introduction

Innovation is an extensively studied topic in the literature and there are so many definitions of innovation (Varis, 2010; Xu, 2010; Ribiere 2010). In this article, we define innovation as the implementation of a new product or the significant improvement brought to a new product (good or service) or process, a new marketing strategy, an organizational strategy or a new business strategy, workplace organization or external relations management (OECD, 2005; Maier, 2014; Purcarea, 2011).

Not only the theoreticians study innovation also the practitioners and researchers deal with it mainly because of its relevance for the increase of the success and survival of firms. Innovation was considered the elixir of life for companies, regardless of their size and profile (Pirainen, 2010; Legardeur, 2010). Innovation is a dominant factor in maintaining global competitiveness (Leavengood, 2011).

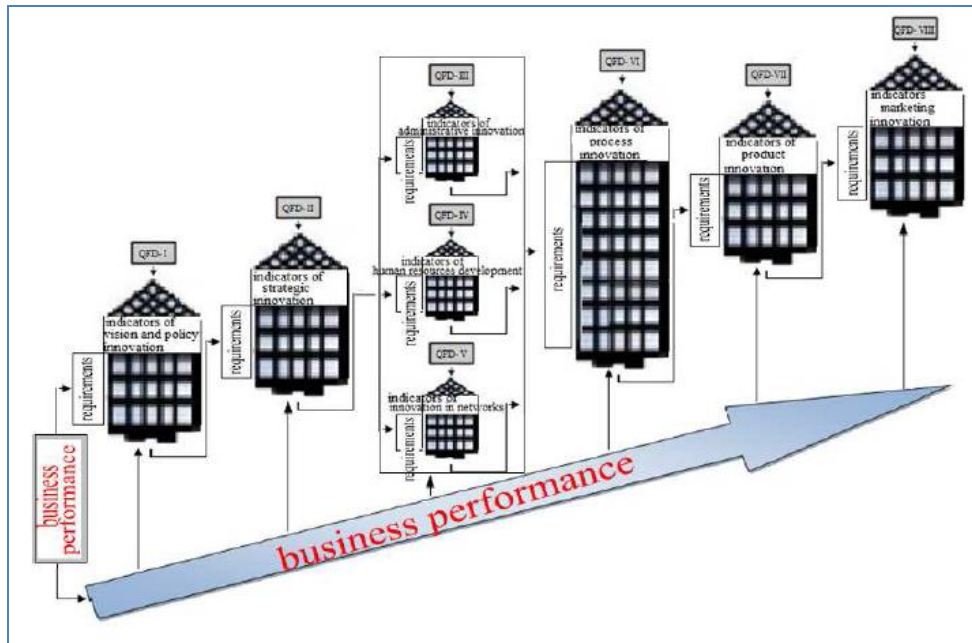
Developing a framework for the measurement of innovation provides a valuable opportunity for companies to assess the degree of innovation and also to discover possible knowledge gaps (Brad, 2008). A widely known quality expert, W. Edwards Deming incorporated his first challenge in a quote: "You can't manage what you can't measure". However, there is no unique innovation "model" for today's businesses (Maier, 2013). To develop an effective framework for the measurement of the degree of innovation, the following aspects must be understood: a new perspective on the measurement of innovation performance is necessary; a pre-assessment is necessary, which can be achieved through a series of questions, such as: How good is innovation measured nowadays? Is there a clear definition of innovation? Is the real innovation that matters being measured? It is the understanding of innovation growing? How much has the measurement of innovation changed or improved in the past 3 years? How well are ideation and creativity measured and managed? How useful are the currently collected data for innovation? How much do you trust that the current system used for measuring innovation will lead and support innovation now and in the future? Does the current innovation measurement system help stakeholders to work together in order to innovate?; there are no "magic indicators" to measure the degree of innovation; innovation is too important not to be measured accurately.

2. Research methodology used for developing the innovation matrix

To widen the extent of analysis, this paper used two research methods, namely: *the expert method* - using the Quality Function Deployment (QFD) that focuses on the requirements for innovation performance and on a different set of indicators to calculate the importance of each type of indicator; and *the empirical method* - using a questionnaire with questions, a representative sample of firms to check the current extent of innovation and to offer suggestions for improving innovation management.

To measure the extent of innovation, we suggest a set of indicators for each type of innovation. To calculate the importance of each type of indicator, the Quality Function Deployment method (QFD) will be used, which mainly focuses on customer requirements and on a different set of indicators. Using the QFD method for the prioritization of each indicator, we designed a process that consists of nine steps (shown in fig. no. 1.), achieving the levels of importance of each indicator, as well as the indicators with greatest impact:

Fig. no. 1. The general cascade diagram of the House of Quality method



Source: Maier, D., Olaru, M., Maier, A. (2013), *Integrating concepts of innovation and creativity - a key to excellence in business*, Proceedings of the 8th European Conference on Innovation and Entrepreneurship

Step 1: the indicators of each type of innovation are ranked in relation to innovation performance requirements; *Step 2:* innovation performance requirements are classified in relation to the indicators used to measure vision and policy innovation; *Step 3:* the indicators used to measure vision and policy innovation are classified in relation to the indicators used to measure strategic innovation; *Step 4:* strategic innovation measurement indicators are ranked in relation to the indicators measuring innovation in developing networks; *Step 5:* strategic innovation indicators to measure indicators are classified in relation to the indicators assessing HR innovation; *Step 6:* strategic innovation indicators are ranked in relation to the indicators for the measurement of administrative innovation; *Step 7:* the indicators for the measurement of innovation in developing networks, human resource innovation indicators and the indicators for the measurement of administrative innovation are ranked in relation to the indicators used for the measurement of process innovation; *Step 8:* process innovation indicators are ranked in relation to the indicators used for the measurement of product innovation; *Step 9:* product innovation indicators are ranked in relation to the indicators used to measure marketing innovation.

The questionnaire developed herein is based on a model that is validated and used worldwide, namely the Innovation Climate Questionnaire (ICQ). The questionnaire is divided into two parts, the first part is dedicated to personal identification data and information on the respondents and the second part contains questions regarding the

identification of the extent of innovation for each segment within the company. The second part of the questionnaire consists of 209 items, divided into six classes, as follows: the importance of the innovation process within the company - 1 item, the importance of the types of innovation within the company - 97 items, the existence of an innovation strategy in order to increase efficiency and ensure competitive advantage - 1 item, the importance of the requirements necessary for innovation performance - 13 items, and the types of innovations implemented within the company in the past 3 years - 97 items.

To study the extent of innovation, we used the multistage random sample method, by identifying the group of participants in the questionnaire used for analysis. For the determination of the sample, we used data provided by the 2014 Romanian Statistical Yearbook, in an attempt to determine the total statistical population in the north-west region. Thus, we established the total number of companies in the north-west region by size, according to the number of employees. Knowing the size of the total community, we tried to establish the optimal number of statistical units that must be included in the survey so that the sample is representative. Therefore, sample size was calculated using Taro Yamane's formula. Considering a 95% probability and a +/- 5% maximum permissible error, we obtained a sample of 381 companies for our total number of 7.988 companies. The managers of these companies were asked to answer the questions in the survey to obtain more concrete data on the measurement of the extent of innovation within the company. A number of 104 companies responded to the questionnaire.

3. Results

Further, we present the results obtained for the proposed indicators that reflect the practices of companies surveyed. The innovation process was considered very important by 58% of the 104 companies interviewed, while 17% regarded it as unimportant within the organization they are part of. The importance of innovation type is presented in table no. 1.

Table no. 1. Importance of the innovation type for the organizations

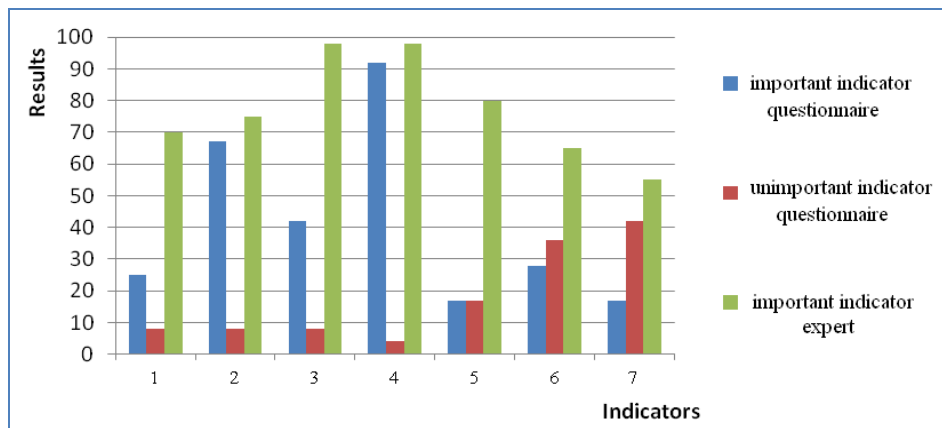
Innovation type	Assessment		
	Important	Medium importance	Unimportant
Marketing innovation	75 %	25 %	0 %
Product innovation	92 %	0 %	8 %
Process innovation	67 %	25 %	8 %
Network innovation	67 %	33 %	0 %
HR innovation	75 %	25 %	0 %
Administrative innovation	42 %	50 %	8 %
Strategic innovation	50 %	50 %	0 %
Vision and policy innovation	50 %	42 %	8 %

As it can be seen in table 1, all companies assessed product innovation as the most important (92%), followed by marketing innovation (75%) and human resources innovation (75%), process innovation (67%) and network development innovation (67%), strategic innovation (50%) and vision and policy innovation (50%), with the lowest percentage being assigned to administrative innovation (42%).

After the analysis of the result of the questioner responses we have made a comparative analysis between the expert method and the empiric one. Due to the limited space, in this article we present the results for only three type of innovation, marketing innovation, product innovation and developing human resources for innovation, as this three innovation type were considered most important for the companies. In our comparative analysis we have considered the most important indicators based on the expert method and the important and unimportant indicators assessed by the empiric method.

For marketing innovation the result of our comparative analysis are presented in fig. no. 2

Fig. no.2. Comparative analysis for marketing innovation indicators:

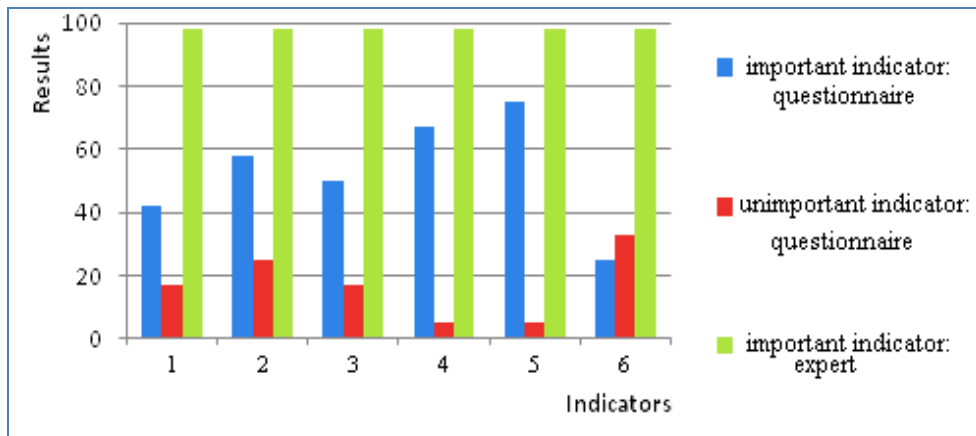


- 1 - The number of significant changes to the design and style of packaging products;
 2 - Number of new methods of presentation; 3 - Number of innovations on how to increase the market share; 4 - Percentage of profit growth from innovation in marketing; 5 - Number of employees dealing with innovation in marketing / total employees; 6 - Number of new studies / concepts / approaches / on consumer psychology; 7 - Number of new methods to increase the creativity of marketing specialists.

Through comparative analysis of data, presented in figure 2, from the questionnaire, and from the expert method, we have found similar results for some indicators, as *the percentage of profit growth from innovation in marketing* (92% empiric method to over 75% in expert method), *the number of new methods of presentation* (67% empiric method to over 75% in expert method) but also differences in results between the two methods for indicators like *the number of innovations on how to increase the market share* (42% empiric method to over 75% by expert method), *the number of new studies / concepts / approaches / on consumer psychology* (28% versus empiric method over 75% expert method), *the number of significant changes to the design and mode of packaging products* (28% by empiric method to over 75% by expert method).

The next type of innovation that we have analysed was the product innovation for which we have obtained the values presented in fig. no. 3.

Fig. no. 3. Comparative analysis for product innovation indicators:



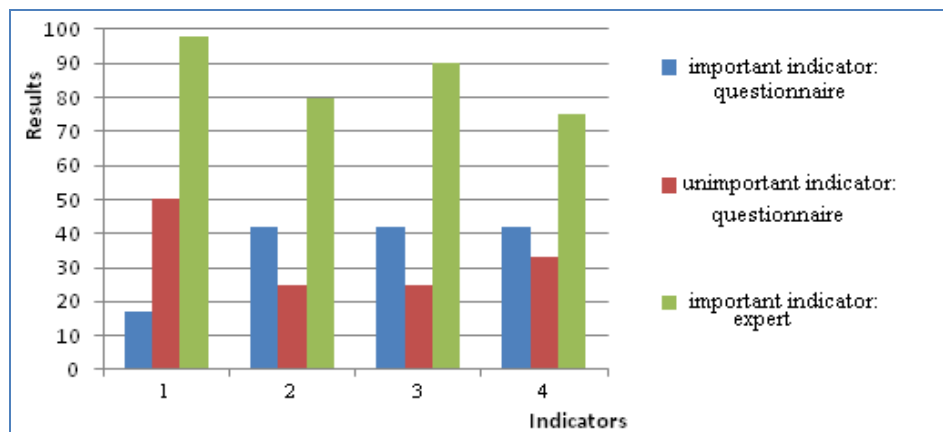
1 - Number of products with changes in raw materials, materials and components used; 2- The number of products with changes in the shape, appearance, size (new design); 3 - Number of products / services with the latest technological innovations; 4 - Number of products / services on the market; 5 - Sales of new products / services; 6 - Percentage of innovation projects from year to year (development of innovation projects)

As in the case of marketing innovation indicators, the comparative analysis of expert and empirical method data for product innovation indicators, we found similar results for the indicator like sales of new products / services (75% by empirical method vs. over 75% in expert method), or for the indicator the number of products / services placed on the market (67% on empirical method vs. over 75% in expert method), but also we found some differences in results between the two methods for indicators like the number of products with changes in raw materials, materials and components used (42% empirical method to over 75% in expert method), the number products with changes in the shape, appearance, size (new design) (58% by empirical method to over 75% in expert method), the number of products / services with the latest technological innovations (50% versus empirical method over 75 % in the method of the expert).

The third type of innovation, according to its importance gave by the companies, is the innovation in human resources or developing human resources for innovation. The same steps we have followed here also, and we summarize all in the graph from the fig. no. 4.

It can be seen in fig. nr. 4, that the indicator of the number of researchers in the company, a very important indicator established by expert method, by applying the questionnaire obtained a 50% of the companies surveyed consider it as an unimportant and a percentage indicator very low 17% see it as an important indicator.

Fig. no. 4 Comparative analysis for human resources innovation indicators:



1 - Number of researchers from the company; 2 - Training of staff involved in research of the company; 3 - Number of training courses in innovation; 4 - Stimulating research staff.

By the same comparative analysis performed for the other type of innovations, in case of human resources innovation indicators, we found differences between results of the two methods weighted indicators on training of staff involved in research company (42% empirical method to over 75% in expert method), the number of training courses in innovation (42% empirical method compared to over 75% in expert method), stimulating research staff (42% empirical method to over 75% in expert method).

4. Conclusions and discussions

Although the innovation process is one of the most important factors behind today's global economic growth and prosperity, it is still poorly understood. Over the last century, industry leaders have learned to master the production process to such an extent that it no longer functions as a significant competitive advantage. The new challenge is to master the innovation process - making a change, creating new competitive advantages by offering better products, using better processes, providing better services or even offering entirely new solutions.

However, the results included and analysed in this study have revealed a series of aspects:

- innovation management delivers results regardless of industry or company size - small companies, large companies or high-tech enterprises do not have a special advantage, as the contribution to the increase in innovation depends on the quality of the effort of the management.
- innovation management is practiced in a variety of ways in different industries, such as products, processes, services or new businesses, thus reflecting broad-based innovation and great potential for innovation in the business environment.
- a good innovation management provides something extra, generally having a significant impact; innovation projects account for 6 to 30% of the extra income, which is a significant amount as compared to the growth rate of overall revenue, namely between 5 and 10%. However, the increase is much lower in those areas of the public sector where it does not work according to commercial standards.
- innovation management also generates savings, close to 10% on average.

As a conclusion, the result of our aim to test the innovation management model in Romanian is gratifying, because for each enterprise included in our sample, the extent of innovation was either medium or high. Finally, we would like to mention that true competitive advantage arises from radical innovation, thus we suggest all companies to encourage their employees to be innovative at work.

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