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**Article**

## Measuring the Capacity of Organizations Innovation - Major Process of Innovation Management

Amfiteatru Economic Journal

**Provided in Cooperation with:**

The Bucharest University of Economic Studies

*Suggested Citation:* Maier, Dorin; Anastasiu, Livia; Sârbu, Roxana; Eidenmüller, Thorsten (2015) :  
Measuring the Capacity of Organizations Innovation - Major Process of Innovation Management,  
Amfiteatru Economic Journal, ISSN 2247-9104, The Bucharest University of Economic Studies,  
Bucharest, Vol. 17, Iss. Special No. 9, pp. 1156-1166

This Version is available at:

<https://hdl.handle.net/10419/168972>

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**MEASURING THE CAPACITY OF ORGANIZATIONS INNOVATION – MAJOR  
PROCESS OF INNOVATION MANAGEMENT****Dorin Maier<sup>1\*</sup>, Livia Anastasiu<sup>2</sup>, Roxana Sârbu<sup>3</sup> and Thorsten Eidenmüller<sup>4</sup>**<sup>1)2)</sup> *Technical University of Cluj-Napoca, Romania*<sup>3)</sup> *Bucharest University of Economic Studies, Romania*<sup>4)</sup> *European Education Group AG, Liechtenstein***Please cite this article as:**

Maier, D., Anastasiu, L., Sârbu, R. and Eidenmüller, T., 2015. Measuring the Capacity of Organizations Innovation – Major Process of Innovation Management. *Amfiteatru Economic*, 17 (Special No. 9), pp. 1156-1166

**Abstract**

The article approaches the problem of companies' success in today's economic context, characterized by a generalized market with increasing 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 present a measurement tool to analyse the extent of innovation. The authors have divided the complex phenomenon of innovation in seven types of innovation according to their influence in the company, for each type of innovation proposing 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 survey method* – using a questionnaire, 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

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## Introduction

Innovation is an extensively studied topic in the literature and there are numerous definitions of innovation (Varis, 2010; Xu, 2010; Ribiere, 2010). In this article, the authors 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 to success' increasing and firms' survival. 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 well is innovation measured nowadays? Is there a clear definition of innovation? Is the 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.

### 1. 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 survey method* - using a questionnaire, on 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 indicator type, the Quality Function Deployment method (QFD) will be used, which mainly focuses on customer requirements and on a set of indicators. Using the QFD method for the prioritization of each indicator, we designed a nine steps process (shown in figure no. 1.), achieving the importance levels of each indicator, as well as the indicators with greatest impact:

*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 HR innovation indicators; *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.

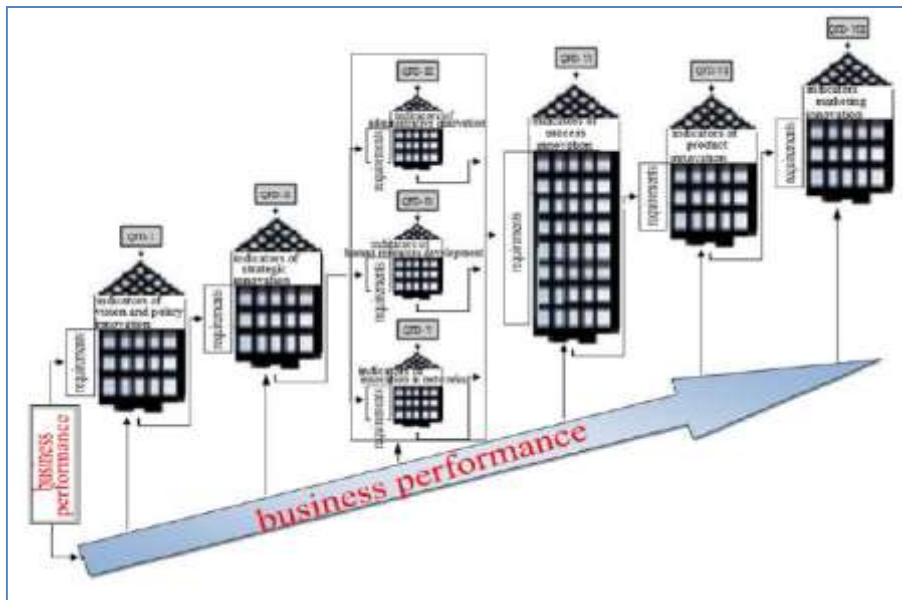


Figure no. 1: The general cascade diagram of the House of Quality method

Source: Maier, Olaru and Maier, 2013

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 2013 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 how they measure the extent of innovation within the company. Valid responses to the questionnaire were 104, so the representativeness was not fulfilled, in these conditions the survey method has a low degree of credibility and the results will have the value of opinions about truth.

## 2. Results

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

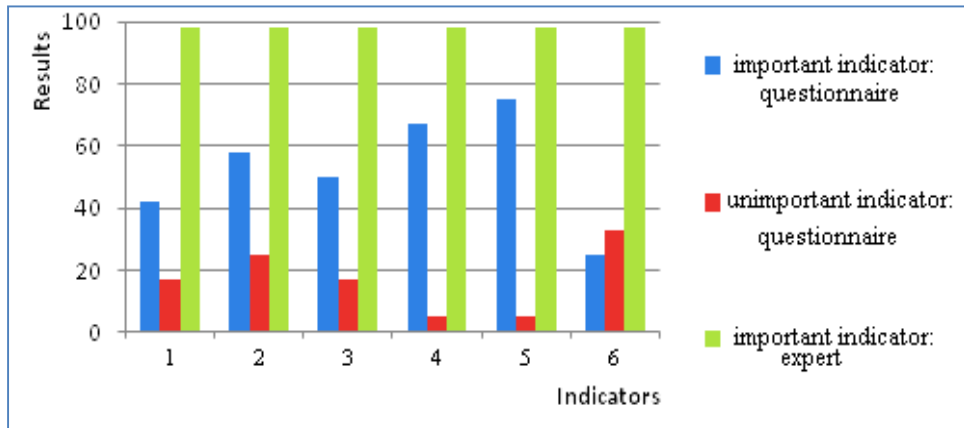
**Table no. 1: Importance of the innovation type for the organizations**

Assessment Innovation type	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 no. 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 survey one. 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 survey method.

According to the opinion of the companies the type of innovation that was rated as the most important one is the product innovation, so we will begin the presentation of the results with it. The values obtained are presented in figure no.2.



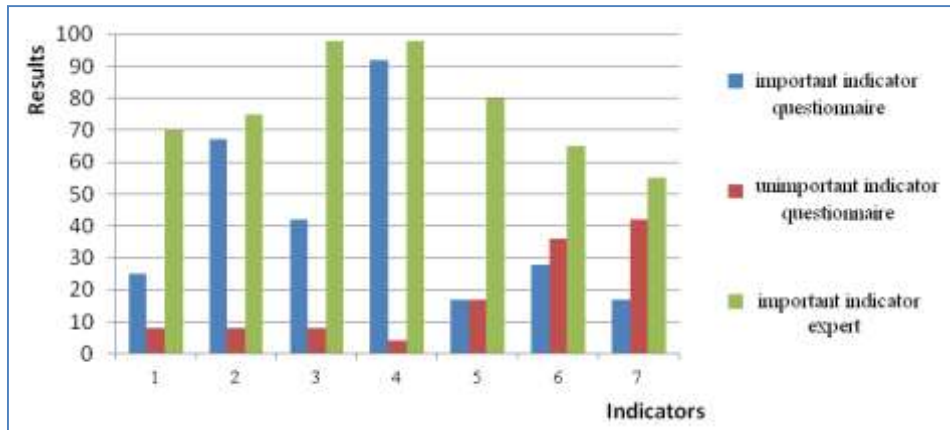
**Figure no. 2: Comparative analysis for product innovation indicators**

*Note: 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)*

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

After the product innovation on the second place as importance is the marketing innovation and the result of our comparative analysis are presented in figure no. 3

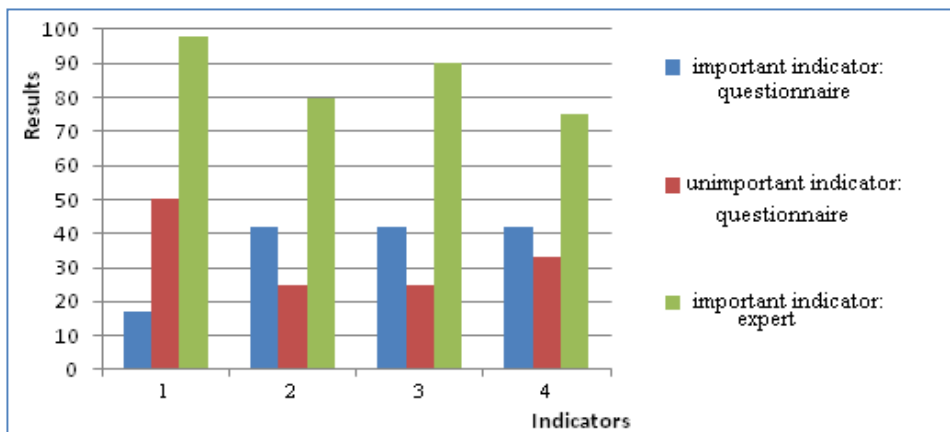
Through comparative analysis of data, presented in figure 3, from the questionnaire, and from the expert method, we have found similar results for some indicators, as the percentage of profit growth from innovation in marketing (92% survey method to over 75% in expert method), the number of new methods of presentation (67% survey 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% survey method to over 75% by expert method), the number of new studies / concept / approaches/on consumer psychology (28% versus survey method over 75% expert method), the number of significant changes to the design and mode of packaging products (28% by survey method to over 75% by expert method).



**Figure no.3: Comparative analysis for marketing innovation indicators**

Note: 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.

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 figure no. 4.



**Figure no. 4: Comparative analysis for human resources innovation indicators**

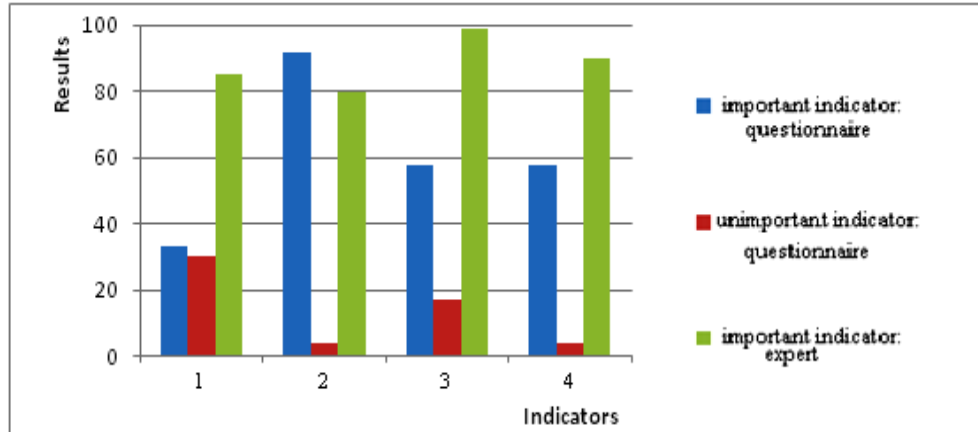
Note: 1 - Number of researchers from the company; 2 - Training of staff involved in research of the company; 3 - Number of training courses in innovation; 4 - Stimulating research staff.

It can be seen in figure no. 4, that the indicator of the number of researchers in the company, a very important indicator established by expert method, by applying the

questionnaire 50% of the companies surveyed consider it as an unimportant and a percentage very low 17% see it as an important indicator.

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

The next type of innovation situated on the fourth place in the opinion of the respondents is the process innovation. The data from the comparative analysis are presented in figure no. 5.



**Figure no. 5: Comparative analysis for process innovation indicators**

Note: 1-New management systems (where necessary); 2 New methods to reduce the time to meet customers or suppliers; 3 - The rate of change in processes, techniques and technologies; 4 - The effectiveness (ratio between effort and result).

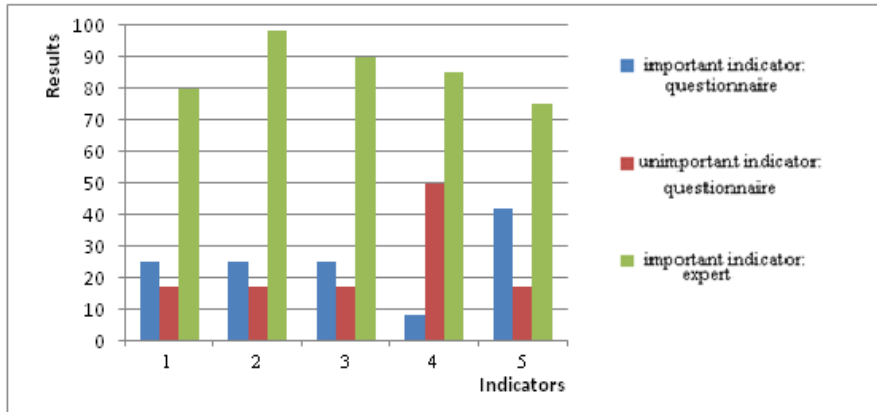
By the comparative analysis of data obtained through survey methods based on the results obtained by processing data from the questionnaire on degree of innovation, and the expert method, by processing data from the AHP - QFD method in Qualica QFD program, we found similar results for the indicator *new methods to reduce the time to meet customers or suppliers* (92% vs. survey method over 75% in the expert method) but also differences in case of the indicators *the rate of change in processes, techniques and technologies* (58% by survey method compared to over 75% in the expert method) and for *process efficiency (ratio between results and effort)* (58% by survey method compared to over 75% in the expert method)

The next type of innovation taken into consideration was the network innovation, the results can be seen in the figure no. 6.

By analysing the graph we found differences in the results for indicators *the interconnectivity between business objectives with the network* (42% by survey method compared to over 75% in the expert method), *the number of new ideas from outside the organization* (25% by survey method compared to over 75% in the expert method),



the number of products/services developed within the network (25% by survey method compared to over 75% in the expert method), the degree of heterogeneity of the network business (25% in survey method compared to over 75% in the expert method).

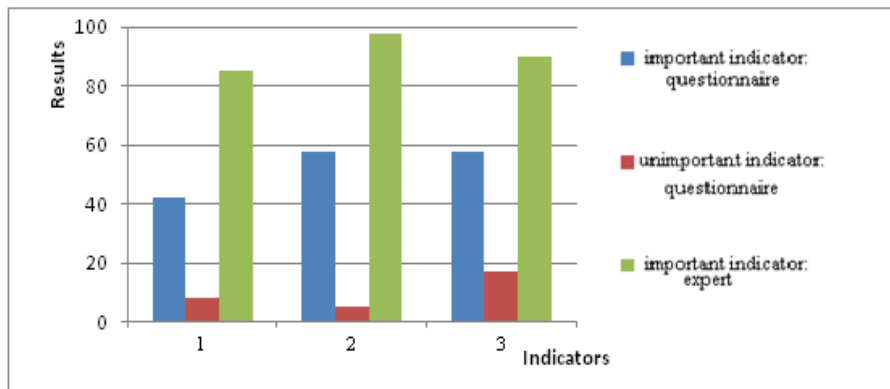


**Figure no. 6: Comparative analysis for network innovation indicators**

Note: 1 - The degree of heterogeneity of the network business; 2 - Number of new product /services developed within the network; 3 - Number of new ideas from outside the organization; 4 - Number of cooperation between universities and businesses; 5 - The interconnectivity of the network with business goals.

Going forward with the comparative analysis between the survey method and the expert method, rated with 50% importance the results for strategic innovation are presented in figure no.7.

It can be seen, in figure no. 7, that the indicator *the maturity of the innovation strategy of the company*, a very important indicator determined using the expert method, was rated by 17% of the surveyed organizations as an unimportant indicator and 58% of them rate it as an important indicator.

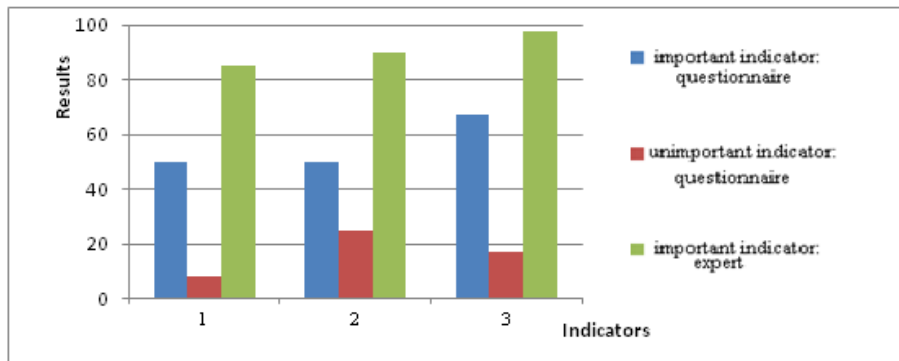


**Figure no. 7: Comparative analysis for strategic innovation indicators**

Note: 1 - The novelty of the business model; 2 - The effectiveness of the business model; 3 - The maturity of innovation strategy firm.

As for the other indicators we found differences in the results for the indicators *the novelty of the business model* (42% by survey method compared to over 75% in the expert method), *the effectiveness of the business model* (58% by survey method compared to over 75% in expert method).

Also rated with 50% importance is the vision and policies innovation. The results of the comparative analysis are presented in the figure no.8.



**Figure no. 8: Comparative analysis for vision and policies innovation indicators**

Note: 1 - The frequency analysis/review of the company's vision; 2 - The frequency analysis of the company's innovation policies; 3 - The degree of originality/niche company vision.

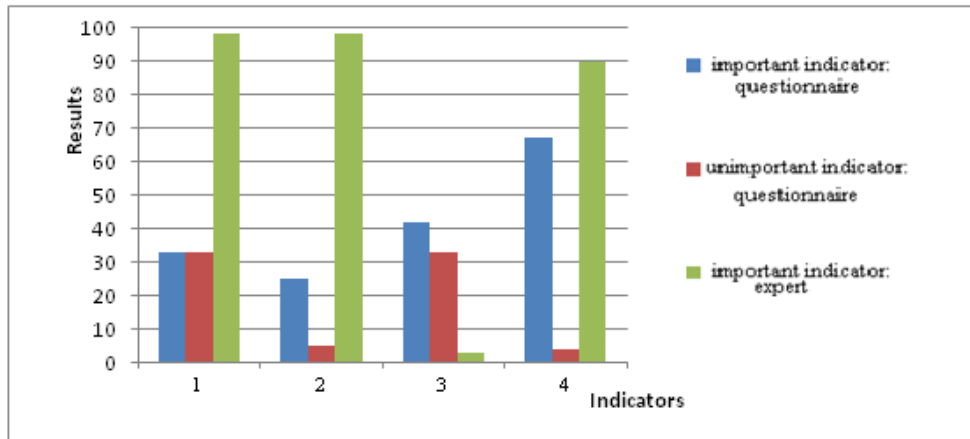
It can be observed that the indicator on *the frequency of analysis of the innovation policies of the company*, a very important indicator determined using the expert method, using the questionnaire method it was rated as an unimportant indicator by 25% of the companies surveyed and a 50 % of them rate it as an important indicator.

Through the comparative analysis of data of the survey method and expert method we found similar results for the indicator of *the degree of originality/niche vision company* (67% by survey method compared to over 75% in the expert method) and also differences between the results for the indicator on *frequency analysis /review of the company's vision* (50% by survey method compared to over 75% in expert method).

The last type of innovation studied which was rated as important by only 42% of the respondents is the administrative innovation.

It can be noted in figure no.9. that the indicator on the *number of innovation projects based on number of employees*, a very important indicator established by expert method, applying the questionnaire method it obtained 33% as an unimportant indicator and a 42% as an important indicator.

We also found similar results for indicator on *effectiveness and efficiency of information flow* (67% by survey method compared to over 75% in the expert method) but also differences between the results for indicators on *number of innovation projects related to the number of employees* (42% by survey method compared to over 75% in the expert method), *the number of managers involved in the innovation process* (33% by survey method compared to over 75% in the expert method).



**Figure no. 9: Comparative analysis for vision and policies innovation indicators**

*Note: 1- The number of managers involved in the innovation process; 2 - New methods for the evaluation of aspects related to innovative process; 3 - Number of innovation projects related to the number of employees; 4 - The effectiveness and efficiency of the information flow.*

**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 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.

The use of the two methods, the expert method and the survey method, for prioritizing the indicators used to measure the innovation capacity, permits to have a better image of the importance of the indicators used. 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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