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Technical product innovation in building material industry in the Czech Republic

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Abstract

The progress of transformation of the worldwide economic system entails the need for evaluation of innovation performance of the EU Member States. Progress achieved in research, development and innovation has been monitored on a regular basis since 1993. The present article focuses on survey of innovations and their results in the form of the Summary Innovation Index for EU countries. Further focus in on innovations in the building material industry in the Czech Republic from the viewpoint of technical product innovation with regard to revenues from the innovated products and cooperation in the process of innovation. A building material provider has been selected to introduce a particular innovation process from the initial idea to the product marketing. The article further describes the options of intellectual property right protection by patent or industrial or utility model in the Czech Republic.

Keywords: Innovation, Union of Innovations of EU, Summary Innovation Index, Product innovation, Intellectual property.

1. Introduction

In the course of the past decade, with continuing transformation of the worldwide economic system, evaluation of innovation performance has become an integral part of macroeconomic studies of development of national economies. Today a major competitive edge may only be built through innovation, economic appreciation of knowledge and human creativeness.[1]
Union of Innovations as one of the EU initiatives periodically monitors progress achieved in research, development and innovations. Comparative tables are compiled with key indicators with the help of which progress in this area may be assessed. These indicators are included in the Summary Innovation Index.[2]

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On the basis of the recommendations formulated in the European document of the Union of Innovations the Czech Republic has prepared its National Innovation Strategy. Monitoring of research, development and innovations in the Czech Republic has been done by the Czech Statistical Office.[3]

2. Research methods

2.1. Measurement framework

Finding the best possible method of measurement of innovation performance in the European Union and its evaluation is a difficult task. The difficulty follows from the very essence of the subject of the measurement. By definition innovation is a qualitative change. Hence every innovation should be different[1]. But anything can be measured. If a thing can be observed in any way at all, it lends itself to some type of measurement method. No matter how "fuzzy" the measurement is, it´s still a measurement if it tells you more than you knew before. And those very things most likely to be seen as immeasurable are, virtually always, solved by relatively simple measurement methods.[4]

Construction of indicators of innovation performance is inevitably preceded by development of a schematic model of innovation – a conceptual framework. The basic source is represented by EUROSTAT statistics and data obtained from innovation surveys of CIS (survey of Community innovations). Further data are from OECD (Organization for Economic Cooperation and Development), UNCTAD (UN Conference for Trade and Development), FIBV (Global Federation of Stock Exchanges). Where official data are not available reliable private statistics are used.

One of the summary indicators allowing for clear and comprehensible comparison of country positions according to a set of selected factors and their development in time is the Summary innovation index – SII. The purpose of this index is to provide an easy-to-interpret tool for evaluation of multiple separate indicators for innovations and thus to obtain an objective ranking of the evaluated countries. The methodology of creation of this index is updated annually. Processing is based on the input-output analysis. The analysis is based on the assumption that the result will show in the context of examination of relations between sources (inputs) and performance of the innovation system (outputs).[1]

The input-output analysis was originally used for interdisciplinary balance on the national level with further applications developed later. This analysis has for example been beneficial for measurement of economic impact on culture. The analysis uses matrix count, symmetrical input – output table with the relevant inputs which influence each other. The essence of the method is work with the Leontief inverse matrix.[5,6]

$$L = (I-A)^{-1} \qquad\qquad (1)$$

L – Leontief inverse matrix, I – unit matrix of the same order as matrix A, A – coefficient matrix

The Summary innovation index 2014 summarizes the performance of a range of different indicators. There are 3 distinctive types of peak indicators – Enablers, Firm activities and Outputs and 8 innovation dimensions further divided to 25 detailed indicators. [7]

2.2. Measurement of Innovations in the Czech Republic

The first common harmonized innovation research in the EU took place in 1993. The present statistical survey of innovations is governed by EU Commission Regulation no 995/2012 and is performed in all EU countries every 2 years with 3-year reference period. In the Czech Republic the first pilot survey was performed for the reference period 1999–2001.

The found data are used for mapping the innovation environment and innovation potential of enterprises in the individual EU Member States.

Innovations of products and processes are crucial for the company and its competitiveness. Supportive function is performed by marketing and organizational innovations which enable finding new effective ways of promotion of

new products and services and introduction of flexible changes in corporate governance in reaction to new market trends and customer requirements. Statistics of innovation activities of enterprises (innovation statistics) aims at mapping of the area of innovation activities from the decision of an enterprise to innovate, information sources and partners via the innovation itself (type of innovation) and related costs to economic benefits of the innovation deployment (revenues from the innovated production). The basic methodological material for innovation activity measurement is the Oslo Manual (OECD, 2005).[8,9]

   Product innovation means introduction of goods of services which are new or significantly improved with regard to their characteristics or intended use. The term "product" is used for both goods and services. Product innovation mean both introduction of new goods and services and significant improvements in functional or user characteristics of existing goods and services.[8] Measurements of product innovations in the Czech Republic is based on statistical data of the Czech Statistical Office.

3. Results

3.1. Innovation Performance of EU Member States

Performance of national innovation systems within EU is measured by the Summary Innovation Index. Innovation performance of EU Member States is shown by Fig. 1. The Czech Republic (CZ) belongs to the group Moderate Innovators. The EU mean is around 0,54 and Czech republic around 0,45.[7]
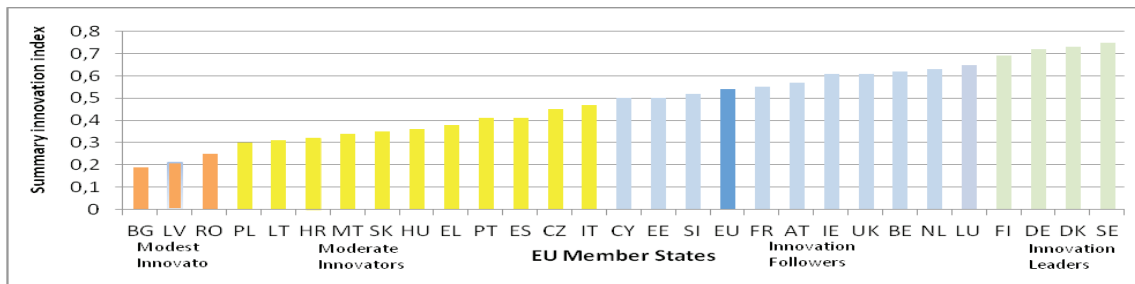

Fig. 1. Innovation performance of EU Member States in 2014[7].

3.2. Innovation Performance of Building Material Providers in CR

   In the Czech Republic 468 companies processing building materials were addressed by the survey. They received businesses with more than ten employees and their activities were classified according to NACE-CZ. Section C Manufacturing Section 23rd. The results of the survey by the Czech Statistical Office performed in the years 2010-2012 showed that almost half of the addressed enterprises were involved in an active innovation process Fig. 2(a). Structure of innovation activities was investigated, including non-technological innovation (marketing and organizational) and technological innovation (product and process innovation) Fig. 2(b).

   The following survey focused on companies with product innovations. The results of product innovation deployment were monitored.
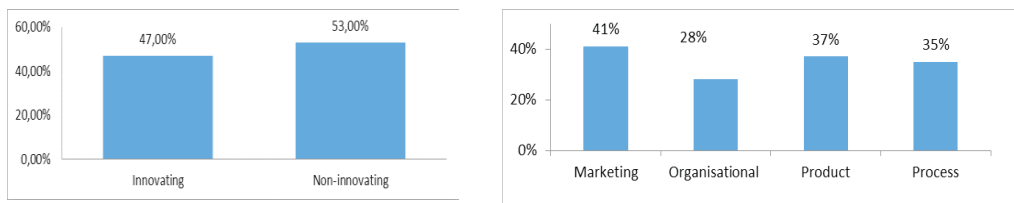

Fig. 2. (a) Classification of enterprises: innovating and non-innovating; (b) Companies by innovation type.

Inquiry about types of products introduced showed "Just innovated service" as the lowest category (5%) Fig.3(a). At

the same time revenues from innovated products were investigated in innovating companies. The lowest revenues were found in the category of "Revenues from products new to market" (11%) Fig.3(b).

On the other hand, the revenue category of "Revenues from products unchanged or just slightly modified" showed a surprisingly high percentage, reaching 70%. This point to the fact that most revenues from innovations rather come from rationalisation measures than from higher orders of innovation.

Cooperation of building material providers with partners is shown by Fig. 4. Innovations by in-house sources appears to be most important, closely followed by cooperation with universities or research institutions.
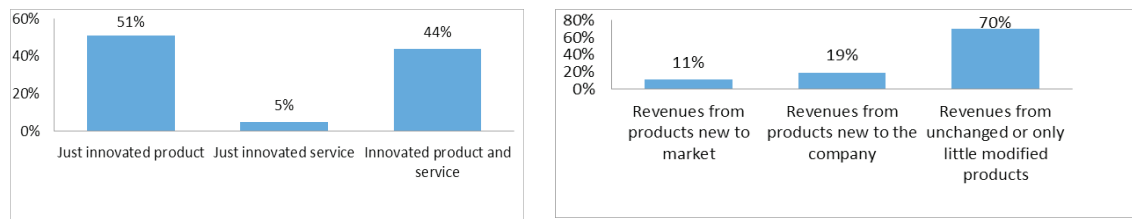

Fig. 3. (a) Introduction of technological/product innovations by innovating companies; (b) Revenues of innovating enterprises – revenue structure by product novelty.
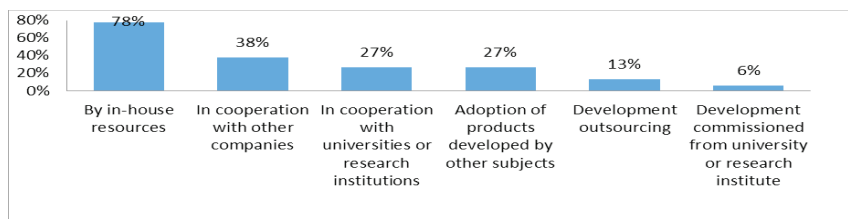

Fig. 4. Cooperation in development of innovated products by innovating companies.

3.3. Innovations in a selected building material processing company

The selected company performed mapping of the process of product innovation. The following scheme shown in Fig. 5 reveals a relatively complex process from the idea to the product marketing. The diagram also shows possible ways of intellectual property right protection by patent, industrial and utility models. The scheme also shows that part of in-house innovations remain unregistered property right – business secret. The reason is concealing the essence of the innovation from potential competitors. In the case of cooperation with universities or research institutions the resulting innovations are mostly registered as patents or utility models. Publicity through articles published by the university in professional journals and conference presentations is also part of this cooperation. For product establishment on the market product marketing is also important together with activities of the sales department of the building material provider. This area represents another field of cooperation with universities and research institutions.

At the inception of innovation in the enterprise it leads to decisions of the board of construction firm if it comes to financing of idea or it can be reprocessed or to archive (marked in black). Development and production process depend on the decisions of the Board of Directors. Business proceeds together with manufacturing process. Cooperating entities (the construction company and the university) they are highlighted in green, as well as their cooperation.
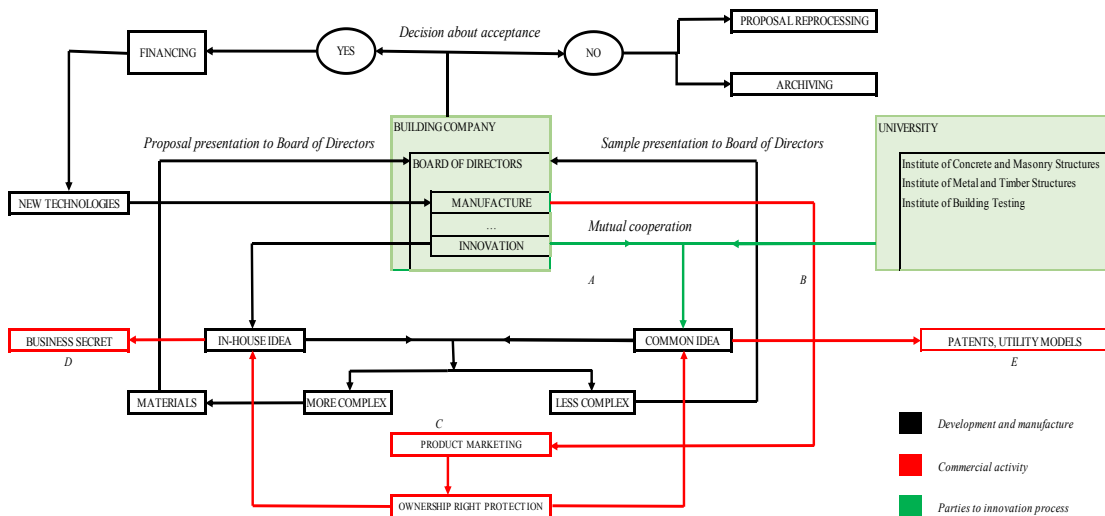
Fig. 5. Process from idea to product marketing.

Notes to Fig.5
- A: The company gets the following benefits from cooperation with a university: Tests, analyses, product or technology promotion on the scientific and professional ground, long-term assets represented by student theses.
- B: The university gets the following benefits from cooperation with a business enterprise: Finance, conferences, topics for lectures, Dp, bp etc.
- C: Preparation of manufacturing procedure, technical data sheet, sales documentation (drawings, instructions for use), certification, dealer training.
- D: Justification: The material required for personal property protection assurance – a brief instruction.
- E: Justification: The university gets themes for articles, scores.

4. Discussion

The above text suggests that the Czech Republic still has great reserves to get to the level of Innovation Leaders. As for the innovation potential of building material processing companies in the Czech Republic non-innovating companies still prevail. Product innovations are relatively balanced with the other types of innovations in innovating companies. Balance is shown in the area of mere product innovation and product – service innovation mix. The greatest surprise is the fact that the companies generate most revenues from unchanged or just little modified products. Typically for the Czech Republic building material processing companies mostly use in-house resources for innovation development. Extended cooperation with universities and research institutions is badly needed, to the benefit of both parties.

5. Conclusion

Investigation of innovation potential in building material processing companies is very closely connected with innovation monitoring in building companies. Inclusion of innovated building materials in building production is not specifically monitored by the Czech Statistical Office. The purpose of the project, including this study, is fondling out innovation potential of building companies active in the Czech Republic. A questionnaire-based inquiry will be organised by the Faculty of Civil Engineering of the Brno University of Technology. The results will be used for further orientation of the research and development focused on innovations and their evaluation by means of patents, utility models and other tangible results of intellectual property application.

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