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Environmental Aspect of Managing Innovation in the Construction Industry – the Example of Serbia

KEYWORDS: environment, innovation, construction industry, management

ABSTRACT - The perception of the environmental aspect in the construction industry is a necessity for the management of innovation in the companies of this industry. Construction industry has a great impact on the environment, especially in terms of energy consumption and energy saving. This study empirically analyses companies in the construction industry in Serbia with the aim to investigating how the application of the energy certification process indicates environmental benefits and improves the innovation behaviour of these companies. The results are important for the management of the construction industry.

KLJUČNE REČI: životna sredina, inovacije, građevinska industrija, upravljanje

POVZETEK - Razmatranje aspekta zaštite životne sredine je neophodno za upravljanje inovacijama u firmama u građevinskom sektoru. Građevinski sektor ima veliki uticaj na životnu sredinu, posebno, kada je reč, o potrošnji i uštedi energije. U ovom radu je prikazana empirijska analiza preduzeća iz oblasti građevinske industrije, sa ciljem da se istraži kako uvođenje energetskih pasoša utiče na zaštitu životne sredine i unapređuje inovativno ponašanje ovih preduzeća. Rezultati imaju praktičnu primenu za upravljanje preduzećima u građevinarstvu.

1 Introduction

Only enterprises, successful innovators, have the ability to survive in conditions of uncertainty. Contemporary market conditions, characterized by a quick demand saturation, impose a demand for achieving enterprise competitive advantage because of its constant innovation tendencies (Lawson & Lawson, 2001).

Statistical data from a Community Innovation Survey (CIS) has shown an increasing number of innovative enterprises in the construction industry in 2011−2020. Information is collected through CIS reports about enterprises innovative activities, enabling a better understanding of the innovation process itself which develops in an enterprise. One hypothesis, explored in this paper, states that it is a consequence of the Law on energy efficiency application, i.e. introduction of energetic passports for high-rise buildings. It is necessary to consider the environmental protection aspect to manage innovations in companies in the construction sector. The construction sector has a huge impact on the environment, especially when it comes to energy consumption and conservation. The growth of world's population accelerate energy consumption, so energy efficiency is becoming very important research issue more and more every year. The increasing level of innovation implies increasing level of energy consumption.

The construction industry is one of the greatest energy consumption areas (Gorbachevskaya, Bezrukikh, Maletina & Safronov, 2020).

The following sections will analyze, how introduction of energy passports in construction industry, has affected the improvement of business processes in companies in order to gain their innovative behavior. In addition, the importance of expenditures for companies' innovation behavior will be explored in more detail, understanding how their shortcomings could be overcome.

2 Energy efficiency in construction industry

Energy efficiency policy is based on the idea that energy should be used optimally by obtaining higher energy standard. According to literature, the main obstacles for energy efficacy process in construction industry are based on: lack of public policies in energy efficiency area; and conservative way of building in construction industry (Ryghaug & Sørensen, 2009).

There is a scope of documents in Serbia regulating pollution, increasing energy conservation and ameliorating climate change impact on the environment. Although these documents are already being applied, time will tell the efficiency of its implementation. By analyzing innovation in the construction sector, innovation in enterprises has seen a rise of up to 40% in the year when the duty to issue energy passports while projecting and construction an object is being imposed. This paper will, based on empirical research, discuss specifically this topic, trying to answer a question if and how much energy efficiency influences innovation in construction enterprises.

A concept of energy efficiency in Serbia is regulated through various documents.

National strategy of sustainable growth (2008) represents a document which highlights the importance of so called clean technology applications, energy efficiency level increase, and renewable energy sources renewal. This strategy states that an improved isolations in buildings presents the biggest potential for energy efficiency. A very important part is promotion of renewable energy sources, as well as incentives introduction which would motivate private investments in the energy section and enforce a general competition in energy and economy.

One of the five basic priorities when it comes to increasing energy efficiency in energy production, distribution and consumption is defined in the Energy Development Strategy of the Republic of Serbia up to 2015. As in the National Environment Protection Program (2010), certain duties were imposed upon Serbia according to the Contract on Energy Community of South-East Europe (2006). The signees of this Contract are obliged to develop a legal framework, which enables the introduction of the European model of market elements in electro-energetics and gas sectors – in order to, in turn, be allowed the access to transportable networks. Numerous incentives, via investments into energy and environment, are stated as main goals of this Contract. Agency for Energetics and Agency for Energy Efficiency play a big role in the development of a new legal framework in energy (Djukic & Stupar, 2011, pp. 35–48).

Law on energy consumption efficiency (Official Gazette, 2013) regulate local energy planning. This rulebook predicts an issuance of energy passports, which will state the energy consumption within the given building category, its grade and recommendation for energy characteristic improvement for new objects, as well as the one currently under reconstruction, adaptation, remediation or energy remediation. It has been applied since 2011, together with the Regulations on energy efficiency of building (2011).

The regulations closely determine the energy properties and the means of calculating heating characteristics of high-rise buildings; it also stipulates energy requirements for new and existing objects. These regulations provide a methodology of calculations of the necessary energy for heating and cooling within buildings, they state a building energy performance and CO_2 emissions created during the operations of technical systems in the objects.

The existence of the aforementioned documents proves to show that a practice of planning in Serbia is approaching modern European tendencies promoting elements of sustainable growth and energy efficiency. The construction process are changing with in innovative framework.

3 Managing innovations in the construction sector from the environmental aspect

Managing innovations in an organization requires not only strategical skills, but also operational ones, since the results of innovations can only be seen in a limited foreseeable future period. From the point of view of organizational theory, managing innovations can be described in the following way: (Subramanian & Nilakanta, 1996): adopting of innovations presents an organization's response to the changes in the environment, via an adjustment of organizational structures and processes; adopting innovations by an organization is a consequence of a proactive response by the organization strategic management. Advocates of this theory consider that organizations not only react to the changes in their environment, but also cause them to happen.

The environmental impact seen as a trigger for innovative behavior in construction industry. The Energy Efficiency Financial Institution Group (EEFIG) considers that its recommendations for market and "policy-led actions should be considered in the context of broader structural reforms needed to improve the competitiveness of the European Union (EU) economy and ensure the Investment Plan for Europe has a sustained impact on the EU 2030 climate and energy strategy". Innovation is crucial for long-term company competiveness in the construction industry. Although construction innovation has advanced rapidly with companies investing in new technologies and business process.

4 Empirical research

To explore the impacts of the energy efficiency certification process on the innovation behavior of construction industry enterprises in Serbia, the empirical research was conducted. The innovative behavior in this sector is examined in the light of applying Energy efficiency regulation Official Gazette RS no. 2011/61(Official Gazette, 2011). The questionnaire was made as short as possible, and was logically structured in three sections: general questions about the examined enterprises; the second investigated energy efficiency within the frame of the innovative behavior of construction industry enterprises and the third part of the questionnaire explored co-operation aspect with respect to innovation.

This paper will mostly analyze questions put in the second part of the questionnaire- how introduction of energy passports in construction industry has affected the improvement of business processes in companies in order to gain their innovative behavior. In addition, the importance of expenditures for companies' innovation behavior will be explored in more detail, understanding how their shortcomings could be overcome.

We first looked into the introduction of energy passports with an aim of improving solely business processes. According to OECD, innovative enterprises are defined as business parties that have, within an observed period, introduced a product or process innovations, organization

innovations or marketing innovations. In the last edition of the Oslo manual, several main functional categories for identifying the type of business process innovations have been presented (OECD/Eurostat, 2018). Having this in mind, we have been investigating how energy passport introduction has had an impact on business process improvement in construction industry enterprises in Serbia.

Table 1: Business Process Innovation

(%)	*Yes*	*No*
Improved methods of providing a service	67.1	32.9
Improved methods of delivery, logistics and distribution	57.5	42.5
Helped to introduce/improve an information system	58.9	41.1
Improved ways of administrative process implementations	59.9	40.1
Improved the business practice related to organizing various procedures	57.5	42.5
Improved methods of organizing work and division of responsibility	60.3	39.7
Enabled an introduction of a better staff management system	53.4	46.6
Introduced new marketing methods (promotion, price and other post-sale ones)	57.5	42.5

Source: Authors calculation, 2021.

Table 1 illustrates business process that are undergoing in an enterprise. According to the analysis of the presented data, it can be seen that all business processes have been improved after energy passport introduction in a mostly uniform fashion. The respondents have selected the most improved methods of providing services with the aim to unite whole process from projecting to building within one firm.

Factors that greatly influence innovative behavior of enterprises are first and foremost selected by a lack of funding and they are closely connected to economic performances of an enterprise. Data shown in Table 2 indicate how the introduction of energy passports has had an impact on the costs that directly determine innovative activities performance.

Table 2: Cost factors for innovative behavior

(%)	*Yes*	*No*
Research and Development costs	61.7	38.3
Staff training costs for licensed engineers in the country	65.7	34.3
Staff training cost for licensed engineers abroad	60.2	39.8
New software purchase with an aim of achieving facility energy efficiency	64.4	35.6
Fees for obtaining licenses for energy efficiency	69.8	30.2

Source: Authors calculation, 2021.

Cost factors relate to the costs of direct innovation financing, as well as the costs created by a huge innovation-related economic risk. Innovation demands high investments; consequently, enterprises turn to public funds for financial aid, since conventional raising of capital via bank loans are often unavailable to them. Data shown in Table 3 illustrate that enterprises that after energy certificate process, enterprises not only use their own funds to support their innovative behavior, but other funds as well. An encouraging fact is that EU funds are also used as a support to finance innovative activities.

Table 3: Aditional financial support fro innovative behavior

(%)	*Yes*	*No*
Support from other funds	33.6	66.4
Support by local authority	35.6	64.4
Support by government (including government financed funds)	38.3	61.7
Clients from the public sector	43.8	56.2

Source: Authors calcualation, 2021.

5 Conclusion

To conclude, there is a great need for R&D investments in the building sector, especially by the government, which needs to promote innovation in this sector. One way of doing this is by improving knowledge and technology among many professions of the building industry.

Public awareness about energy conservation, environment and sustainable development is raised by application of energy efficiency procedure (Abela, Hoxley, McGrath & Goodhew, 2013; Cantin et al., 2007). There has been an increase in the number of innovative construction companies in Serbia between 2011–2020 (Staistical Office, 2019; Statistical Office, 2013, 2015, 2017). The introduction of both the Law regulation on energy efficiency and energy efficiency passports have both have a positive impact on environmental and innovation issues in construction industry. The certification process is very significant for a future business of enterprises in construction industry regarding environmental and innovation issues, both. Presented research show positive relationships regarding innovative behavior of the enterprises in construction industry and introduction of energy efficiency passports.

After introduction of energy efficiency passports all business processes have been improved after energy passport introduction in a mostly uniform fashion. The respondents have selected the most improved methods of providing services that illustrate the aim to unite whole process from projecting to building within one firm.

The certification process has caused a cost increase among the innovative enterprises. However, a significant change is also reaching to other funds.

Investments in the building sector should be enlarged in future. The government should support building-related research and promote innovation activities in order to ensure that future buildings become more energy efficient (Ružičić Mosurović, Miletić & Dobrota, 2021).

Our findings put the light on understanding linkage between energy efficiency processes and innovation in construction industry in Serbia. In this way, for the companies in the construction industry could facilitate future innovation.

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Relationships between innovation and energy efficiency in the construction industry are investigated. But, it could be applied in other sectors in future research. As research limitation is the fact that Serbia is conducting specific certification process based on achievement of energy grades by the calculation of heating energy only. Cooling energy demands are not taken into consideration. Recommendations for innovative enterprises management – investment in employees' professional development, market approach to the sources of innovation funds, and strategic approach to the environment sustainability.

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