Problems and Factors of Construction Business Innovation and Investment Development

Liana Ptashchenko, Lyudmyla Svystun, Maya Chechelashvili, and Kateryna Shtepenko

Abstract The article is dedicated to consideration of theoretical and applied aspects of the main balance factors of construction business successful innovation and investment development. The analysis of scholars' works enabled presenting the components of a construction enterprise innovation and investment development, in particular process, resource and potential. Considering the relationship between innovation potential and development, the author's definition is suggested, where construction business innovative development is an activity based on constant search and use of new methods, technologies and areas of enterprise potential realization in changing external and internal market of construction products and the adopted competitive strategy of activity and business development. Analysis of the problems associated with conservatism and slowness in introduction and dissemination of new technologies in the construction industry is performed. Despite the fact that energy-efficient technologies are being actively introduced in the industry, "smart homes" are being built etc., analytical report of the Global Innovation Index states that the share of R&D expenditures in construction is only 2.9%. One of the reasons for such a low rate is that a significant part of new technological developments implemented in construction, originate from other industries, namely metallurgy, forestry and woodworking, chemical industries and others. It is established that innovation inertia of Ukrainian construction companies is determined by buildings and structures prolonged operation, during which the faults of the used technology may be revealed as well as builders' high responsibility for the result, since construction products must be safe for people's lives. In order to implement the strategy of construction company innovative development, it is suggested to create the success factors of innovation and investment development, which are balanced and to some extent interdependent. Adequate assessment these factors impact will enable choosing the right direction

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of construction business innovation and investment development and construction industry in general under pandemic and growing economic selfishness.

Keywords Innovation and investment development · Construction business · Potential · Construction · Technologies · Innovation activity

1 Introduction

The world economy and national economies of most countries are in crisis due to quarantine measures taken to combat COVID-19. Thus, the reduction in gross domestic product of the United States is estimated at an average of 3.3% per year. In countries with developed tourism, GDP is projected to fall even more. For example, in Greece and Cyprus - up to 6%, Montenegro - by 8%, in Lithuania and Latvia - by 7%. In Ukraine, the forecast for GDP decline is 7–8%, and according to the latest data - by 4.5% [1]. Such trends lead to increase in economic selfishness in society, inhibit restrain of investment processes and, consequently lead to economic crises of enterprises, individual industries and national economies. Lack of investment financing of Ukrainian enterprises negatively affects their innovation activity and makes it impossible to bring Ukraine closer to European Union standards of economic development. Problems of investment and innovation nature that arise as a result of the pandemic, actualize the study, which is dedicated to theoretical and applied aspects of balance of innovation and investment development of construction industry under pandemic and growing economic selfishness.

2 An overview of the Latest Sources of Research and Publications

The works of such scientists are devoted to the problems of investment-innovation and safety-oriented development of construction industry: Torkatyuk V.I., Drill N.V., Khoroshko I.O., Zheleznyakova I.L., Onyshchenko V., Sivitska S., Trach R. V., Onyshchenko S., Yehorycheva S., Matkovskyi A., Puhach A., Svistun L., Glushko A., Lukianov A. M., Kysh L. M. [2–10]. The problems of innovation-oriented management in construction enterprises focusing by Onyshchenko S., Yehorycheva S., Furmanchuk O., Maslii O., Svistun L., Glushko A. [5, 8]. Onyshchenko V. and Sivitska S. are investigating financing of construction industry in Ukraine [7]. Torkatyuk V.I., Drill N.V., Khoroshko I.O., Lukianov A. M. considered the principles of innovative development of construction companies [2–4].

3 Main Material

Governments of economically developed countries are pursuing a course of innovative development. Yet in Ukraine, this development is hampered by a number of objective and subjective reasons. And those innovations that are implemented, are unbalanced in different sectors of the economy. For example, construction is given much less attention than industry or IT technologies in the context of monitoring and stimulating innovation and investment activities [2].

Much less work is dedicated to the issues of construction industry innovative development than other industries. However, importance of the construction industry in the system of national production and the dynamics of its development in recent years indicates the problem importance. Lag of the Ukrainian economy from the average European level of economic development is so significant that even large-scale deployment of construction activity will not be effective, since outdated logistical and technological base requires significant investment in innovation.

The main objective of construction industry innovative development is to create competitive advantages in the strategic perspective, which create safe and comfortable environment for human life, which meets high world quality standards, to ensure sustainable socio-economic development of the country. Achieving competitive advantages should be based on innovative re-equipment of the construction industry, formation of innovative competencies, engineering schemes for managing the construction site life cycle, use of information modeling to increase productivity, reduce energy, material consumption and cost of construction products. Construction industry makes a significant contribution to national economy modern infrastructure creation and development, on which functioning of industries, enterprises of the real sector depends. Competitiveness of construction industry is an important factor for its sustainability ensuring, which guarantees the population employment, comfort of living environment, quality of housing, and has a crucial role in reducing greenhouse gas emissions. Further development of construction industry is associated with innovative efforts and innovation activity, which should result in new building materials, construction design technologies, construction, operation of buildings and structures, access to new markets for construction services (exports), as well as transition to new management technologies (engineering companies creation) etc. Innovative development of construction industry is based on implementation of national, regional and corporate innovation programs, projects for development of its innovative potential and innovative culture of construction production [3].

It should be noted that in most cases in the research by domestic and foreign scholars the term “innovation and investment development” is used when referring to the appropriate type of development at macro level and research on mechanism of scientific and technological progress in the country’s economic development, formation of so-called knowledge economy, search for new sources of economic growth, construction of a state innovative model of development etc. In this case, innovation and investment type of development is understood as a way of economic growth based on constant and systematic innovations aimed at significant improving of all

aspects of economic system, periodic regrouping of the forces due to the logic of scientific and technological progress, goals and objectives of the system, possibility of using certain resource factors in the creation of innovative goods and formation of competitive advantages; an innovative one is such a model of development that is directly based on obtaining new scientific results and their technological implementation in production, providing GDP growth mainly through production and sale of science-intensive products and services [4].

As a rule, the term "innovation and investment development" has long been used not only at the macro but at the micro level as well. The existing definitions of "innovation and investment development of the enterprise" concept presented in the scientific works of scientists are heterogeneous (Table 1) [9].

The analysis of scholars' works enabled presenting the components of construction business innovation and investment development (Fig. 1).

Considering the relationship between innovation potential and development, let us define that innovative development of a construction company is its activity based on constant search and use of new methods, technologies and areas of realization of the company's potential in terms of changing conditions of external and internal construction products market within the vision and accepted competitive strategy of the enterprise activity and development.

It was considered previously that construction companies characteristic is their conservatism and slowness in introduction and dissemination of new technologies. In the ranking of leading economic states innovation and investment active industries, construction complex took one of the last places. In the special literature, the label "laggard industry" was used for construction. The main argument was that many studies refer to extremely low share of research and development in the overall cost structure of construction companies [3].

As stated in the analytical report of the Global Innovation Index, the share of R&D expenditures in construction is only 2.9%, while ICT equipment and electronic equipment is 23.5%, pharmaceuticals and biotechnology - 18.8%, cars - 15, 6%, software and ICT services - 14.4% (Fig. 2).

Statistics confirms low innovation activity in the construction industry. Thus, during 2017–2019, the highest share of innovative enterprises was at the enterprises of information and telecommunications (22.1%), processing industry (21.9%), financial and insurance activities (21.7%), activities in the field of architecture and engineering (20.1%). Whereby the share of enterprises with technological innovations was higher than the national average among processing enterprises (15.6%), electricity, gas, steam and air conditioning supply (12.6%), as well as enterprises engaged in activities in the spheres architecture and engineering, research and development, advertising - 13.2%; with non-technological innovations - among enterprises of financial and insurance activities (18.0%), information and telecommunications (17.3%), processing industry (15.3%) [18].

However, in the recent years the situation with innovations in the construction industry has been somewhat improving. Energy-efficient technologies are being introduced, "smart homes" are being built etc. In addition, it is necessary to make a significant correction to the fact that a considerable part of new technological

Table 1 Scholars approaches to interpretation of "innovation and investment development of the enterprise" definition

Author	"Innovation and investment development of the enterprise" definition	Definitions
O. Adamenko [11]	Enterprise activity that is based on constant search of new methods and means of consumer needs satisfaction and increase in managing efficiency	New methods and means of meeting consumers' needs, efficiency increase; innovations introduction in various spheres of activity
I. Borysova [12]	Creating attractiveness in the stock market in terms of return on investment risk, i.e. increase in business value through innovation management	Investment risk profitability, business value
H.Gumba [10]	Development of a system of factors and conditions necessary for innovation and investment process implementation, i.e. innovation and investment potential	Innovation and investment process; innovation and investment potential
S. Illiashenko [13]	Economic management process that is based on continuous search and use of new ways and areas of enterprises potential realization in terms of changing environmental conditions	Economic management process; potential realization; activity modification; market outlets
O.Moros [14]	Process of finding and creating new products and processes based on the use of all available tools and capabilities of the enterprise, which leads to qualitative changes	Qualitative changes, creation of new products and processes
T. Piliavoz [15]	The process of purposeful, consistent enterprise movement to a balanced innovation and investment state under the influence of synergistic action of external and internal factors that determine the enterprise organizational and functional system stability under the market economy	Purposeful, consistent movement towards a balanced state of innovation and investment; the result of quality, which depends on intensity and speed of innovation and investment processes
I.Fedylova [16]	This enterprise, where the source of development is innovation, that develops	Development through innovation

developments that are implemented in construction, originate from other industries - metallurgy, forestry and woodworking, chemical industries and others.

Due to the influence of a number of factors, the situation has changed profoundly over the last decade. Conservative construction industry is likely to be forced to abandon its established traditions and go through a series of radical changes. Thus,

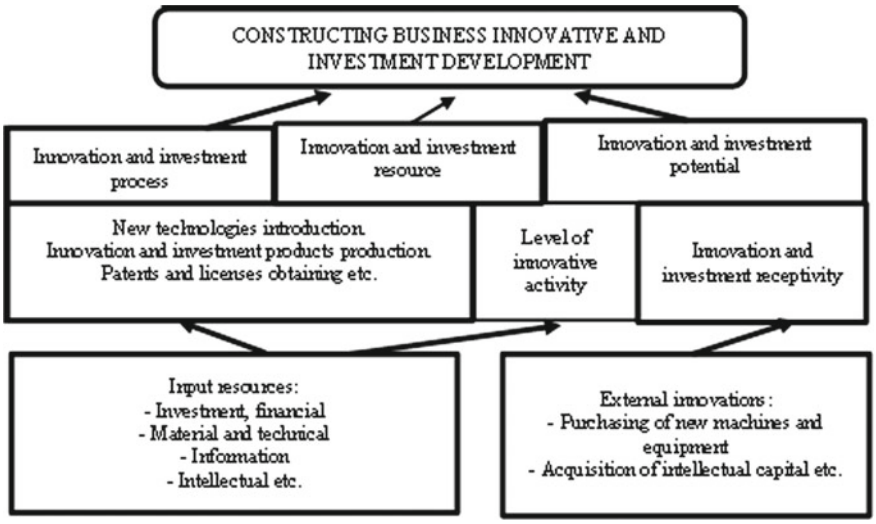

Fig. 1 Construction business innovation and investment development components

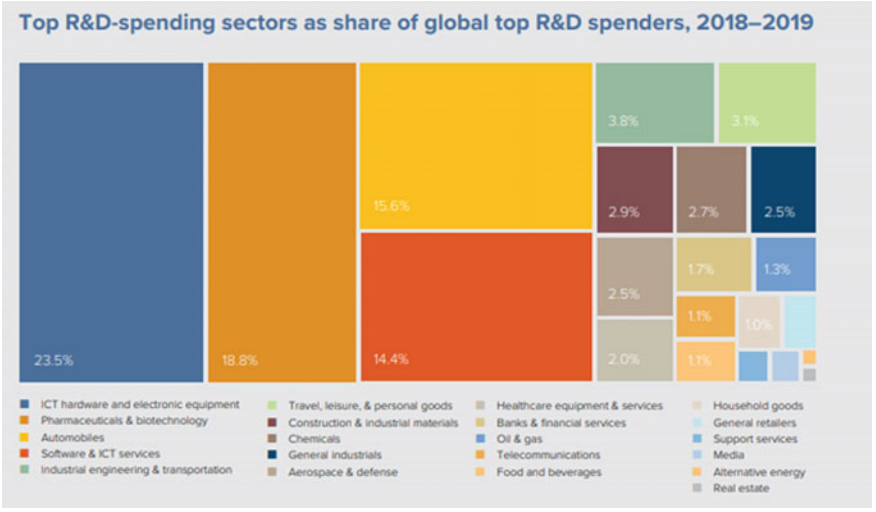

Fig. 2 Top R&D-spending sectors as share of global top R&D spenders, 2018–2019 [17]

rapid implementation of computer methods of information modeling (BIM) of all the key stages of the construction cycle and other advanced IT-technologies already has a significant impact on the innovative component of the industry.

In just a few decades, the very set of materials and technologies used in the field may change almost beyond recognition [19].

Despite the positive changes in the innovative development of construction industry in economically developed countries, most Ukrainian construction companies are not particularly prone to innovation. The inertia of the construction complex enterprises is determined by several factors. First of all, it is a buildings and structures prolonged operation, during which the faults of the applied technology may be revealed. Therefore, construction companies are extremely careful in choosing new materials or methods of construction. The second reason for conservatism is high responsibility of builders for the result, because the use of inappropriate technology or design errors can pose an immediate danger to the lives of a large number of people.

Besides, the lack of innovation activity of construction companies is explained with lower level of globalization than in industries, mainly due to the length of the construction cycle, existence of a large number of small and medium size enterprises that are reluctantly conservative since they cannot invest in research, and do not have the necessary competence to evaluate and use high-tech innovations. For this reason, innovations in the construction industry in all the developed countries are also carried out mainly by large enterprises, construction holdings and network associations. Network organizational structure enables providing services in several areas of construction activities simultaneously, to involve different suppliers of construction materials and equipment in construction works, to provide interaction of subjects of construction production by means of information and communication technologies and information modeling.

The pace and scale of technological progress in the industry will depend on degree and speed of transition to automated methods of construction and mass implementation of robotics and technology with minimal human intervention. Thus, many experts today agree that one of the key trends in the coming decades in the construction industry should become accelerated transition from traditional technologies of buildings construction directly on construction sites (on-site manufacturing) to prefabricated (offsite) housing construction and then - to practically conveyor production of houses from unified panel or modular components designed by means of computers.

In order to choose a certain strategic direction of innovation and investment development, enterprise managers need to determine and assess the impact of success factors of innovation and investment development (Fig. 3).

Based on the assessment of the influence factors, the company can choose adequate areas of innovation and investment development.

According to the strategic direction of innovation and investment development, a construction company can choose several areas:

– balanced innovation and investment development, which is applied in terms of gradual technical changes;
– offensive innovation and investment development, which is used under rapid technical changes, when it is necessary to achieve advance or maintain market leadership through the use of new achievements of scientific and technological progress;

Fig. 3 Balance of the main factors of construction business innovation and investment successful development

– absorbing innovation and investment development, through nominal, rather than real innovation transformations [20].

Therefore, challenges facing the construction industry on the way to improving its efficiency can be formed via the agreed upon areas, the model of which is shown in Fig. 4.

Among the effective investment programs, the greatest multiplier effect have those related to residential construction, since this sector of economy has the closest relationship with other industries. In addition to positive impact on economic growth, residential construction performs an important social function: providing housing for the country population, and thus able to indirectly affect the country's demographic situation.

Despite the fact that energy-efficient technologies are being actively introduced in the industry, "smart homes" are being built etc., the analytical report of the Global Innovation Index states that the share of R&D expenditures in construction is only 2.9%. One of the reasons for such a low rate is that a significant part of new technological developments that are implemented in construction originate from other industries - metallurgy, forestry and woodworking, chemical industries and others.

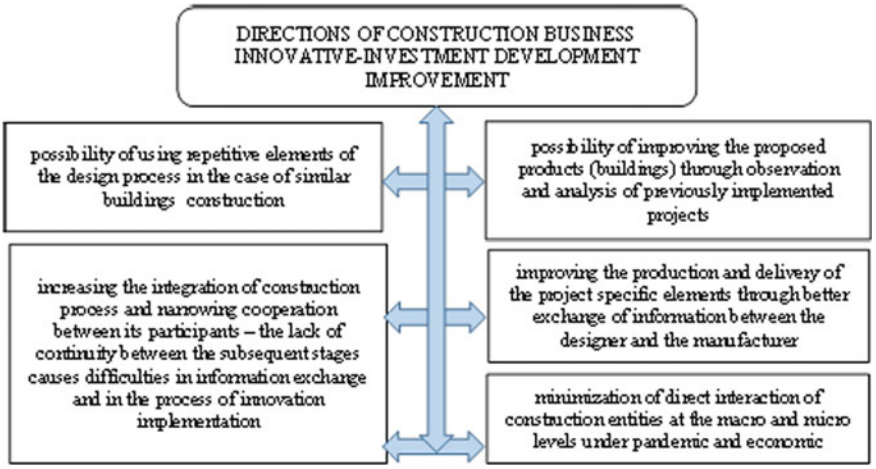

Fig. 4 Consistency in improving the construction business innovation and investment development

4 Conclusions

Global crises and pandemics make adjustments to the economic policy of development and support of various sectors of the national economy, including construction. Technological renewal of the construction industry on the basis of innovations is necessary for the of competitive advantage development in the strategic perspective due to increasing in global competition in the construction services market, acceleration of innovation and technological development and reindustrialization of the world economy, as well as requirements dictated by new technologies in the field of construction materials production, energy saving, energy efficiency, environmental issues and pandemics.

It is determined that innovative development of the construction business is an activity based on constant search and use of new methods, technologies and areas of the company's potential realization in terms of changing conditions of external and internal construction products market within the vision and agreed upon competitive strategy of the enterprise activity and development.

It is established that Ukrainian construction companies inertia to innovation is determined by the prolong operation of buildings and structures, during which there may be faults of the technology used, and high responsibility of builders for the result, since construction products must be safe for people's lives. In order to implement the construction business strategy of innovative development, it is suggested to create the success factors of innovation and investment development, which are balanced and to some extent interdependent. Adequate assessment of these factors impact will enable choosing the construction business and the construction industry in general right direction of innovation and investment development in terms of pandemic and growing economic selfishness.

In order to choose a certain direction of innovation and investment development, managers of a construction company must determine and assess the influence of the factors on success of innovation and investment development. Further research by the authors involves adapting existing models for estimating such factors to the construction business.

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