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**DEVELOPMENT OF SOCIALLY AFFORDABLE HOUSING USING CONSTRUCTION
MANAGEMENT TEMPLATES*****Abstract***

Introduction. As a result of the military aggression of Russian Federation, an unprecedented amount of housing stock was damaged in various cities of Ukraine. Accordingly, the issue of restoring damaged and rebuilding new housing for socially unprotected population arises. In addition to a wide range of issues related to architecture, energy efficiency and structures of these buildings, there is a need to create a reliable management tool that will allow a large amount of construction and restoration work to be carried out economically and in a short period of time.

Problems. Restoring damaged and rebuilding new housing includes solving the following tasks: reduction of construction cost and life cycle cost of buildings; shortening the terms of construction and restoration works; taking into account world experience in the design and construction of high-quality socially accessible housing; flexible management of the intensity of state financing of portfolios and programs of investment and construction projects. The information and communication concept “construction management template” can be a tool for solving these tasks.

Purpose. The article is intended to justify the expediency of using a new multidimensional business-model of construction enterprise based on the concept “construction management template” for the development of social housing in post-war period of Ukraine recovery.

Materials and methods. The new information and communication concept provides the implementation of the most effective innovative and traditional management methods. The corresponding multidimensional business-model of construction enterprise provides taking into account the principles of sustainable development. It is proposed to use this concept within the framework of a multidimensional business-model that will ensure high standards of management of the construction of socially affordable housing during the post-war reconstruction of Ukraine.

Results. The information and communication concept “construction management template” is proposed. The concept served as a basis for the development of a new multidimensional business-model of construction enterprise. The principle of operation of this model consists in comparing the factors of sustainable development of the enterprise with its organizational divisions and determining the relevant performance indicators.

The multidimensional business-model of construction enterprise, proposed for the first time, allows balanced distribution of business processes and responsibilities between the structural divisions of the enterprise. This is achieved due to: the use of one unifying information and communication tool that allows to automate a number of business processes; structuring information about the project in such a way that top management can receive it without the need to use intermediate hierarchical links of management; identification of discrepancies between the activities of different divisions when creating and editing the information and communication model.

Conclusions. The multidimensional business-model of construction enterprise makes it possible to raise the standards of construction management. The corresponding technical and economic effect

consists in shortening the terms of construction and restoration works; reduction of the construction cost and cost of the life cycle of buildings; taking into account world experience in the design and construction of high-quality socially accessible housing.

Keywords: construction management, construction management template, full investment and construction cycle enterprise, information and communication technologies.

Introduction

As a result of the military aggression of Russian Federation, an unprecedented amount of housing stock was damaged in various cities of Ukraine. A significant part of this housing stock belonged to the construction of the Soviet era and served as the only housing for large groups of socially vulnerable sections of the population. Accordingly, the issue of restoring damaged and rebuilding new housing for this population arises. In addition to a wide range of issues related to architecture, energy efficiency and structures of these buildings, there is a need to create a reliable management tool that will allow a large amount of construction and restoration work to be carried out economically and in a short period of time. Such a tool should include the latest and practice-proven traditional management methods, as well as the use of information and communication technologies to solve the following tasks: reduction of construction cost and life cycle cost of buildings; shortening the terms of construction and restoration works; taking into account world experience in the design and construction of high-quality socially accessible housing; flexible management of the intensity of state financing of portfolios and programs of investment and construction projects. The information and communication concept “construction management template” can be a tool for solving these tasks. This concept served as a basis for the development of a new multidimensional business-model of construction enterprise. The principle of operation of this model consists in comparing the factors of sustainable development of the enterprise with its organizational divisions and determining the relevant performance indicators.

Presenting main material

Literature review. A review of information sources indicates the effectiveness of the introduction of the latest and traditional management methods to achieve high economic efficiency of construction [1–4]. The high relevance of research in the field of sustainable development of enterprises has been proven. Under the sustainable development of enterprises, the continuous process of increasing the organization of the company is understood due to the expanded reproduction of its structural energy, which increases the system’s ability to perform useful work [5]. There are outlined approaches to the selection of factors of sustainable development in several sources [6–10]. The vast majority of these sources highlight the factors of the enterprise’s external and internal environment.

The information and communication concept “construction management template” was developed [11]. The concept is based on effective management methods and the latest information and communication tools [12–16].

Taking into account the challenges of sustainable development, the available effective management methods, information and communication tools and the currently low level of management culture in construction, the task of developing new organizational models of enterprises of the full investment and construction cycle is urgent.

Goal and tasks of the study. The purpose of the article is to substantiate the expediency of using a new multidimensional business-model of construction enterprise based on the concept of “construction management template” for the development of social housing during the recovery of Ukraine in the post-war period.

To achieve the goal, the following tasks must be solved:

- analyze the a priori provisions of the study;
- analyze the principles of using the information and communication concept “construction management template”;
- propose a multidimensional business-model of construction enterprise;
- describe the principles of the interaction of the company’s divisions with a multidimensional model of the organization and reserves of technical and economic efficiency: additional control contours and reduction of hierarchical links;
- to propose an algorithm for improving the management methods of construction enterprises.

Analysis of the information and communication concept “construction management template”.

The construction management template (CMT) is a management method using information and communication models in the form of a three-dimensional parametric part of a building or structure and the associated resource schedule of works, which is used for the adoption and monitoring of planning, constructive, technological, organizational, operational and economic solutions throughout the entire construction project. The combination of effective modern and traditional management methods in these models makes it possible to reduce the duration of construction as the ultimate goal (**Fig. 1**).

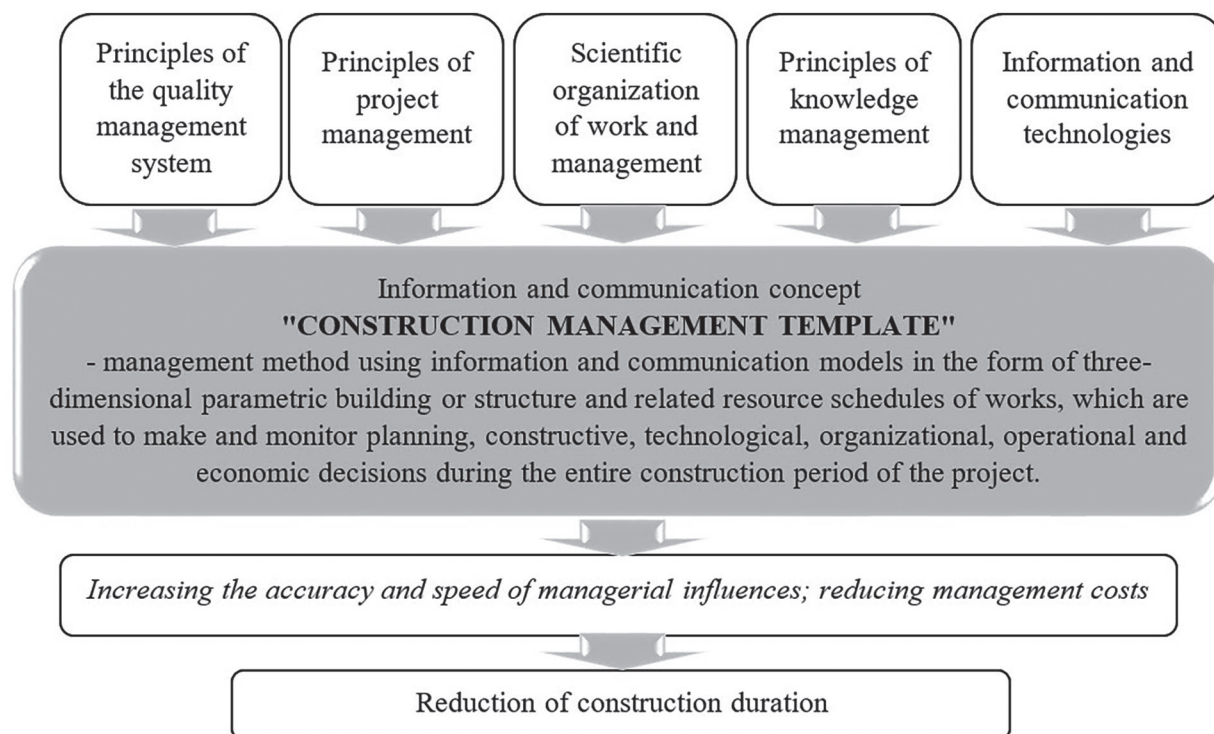


Figure 1 — The effectiveness of the information and communication concept “construction management template”

The use of the information and communication concept “construction management template” (CMT) requires compliance with a number of principles in the implementation of operational activities:

- *The principle of objectivity* — all information is based on primary documents, is collected independently of the executor of the process and is regularly checked for compliance with the real progress on the construction site.

- *The principle of data source unity* — all information is stored in the most complete form in the models compiled from CMT and is presented in different forms with the help of various reports.
- *The principle of comprehensiveness* — all departments of the enterprise issue tasks and control production through models compiled from CMT, and also fill the models with relevant data.
- *The principle of coherence* — all information in CMT and its structuring includes the requirements of all departments of the enterprise.
- *The principle of structural correspondence* — CMT are structured according to the components of the construction product, the financial, legal and organizational structure of construction.
- *The principle of ideality* — planning from the CMT reflects the most normatively agreed, legally correct and organizationally favorable version of the implementation of the investment and construction project, and the actual data record deviations from it.
- *The principle of optimal patterning* — consists in creating product models and construction processes from scientifically based templates that reflect the best practices of the enterprise and are constantly improving.

The principles of comprehensiveness are illustrated by the scheme of communication of interested parties when using the concept of “construction management template” (Fig. 2).

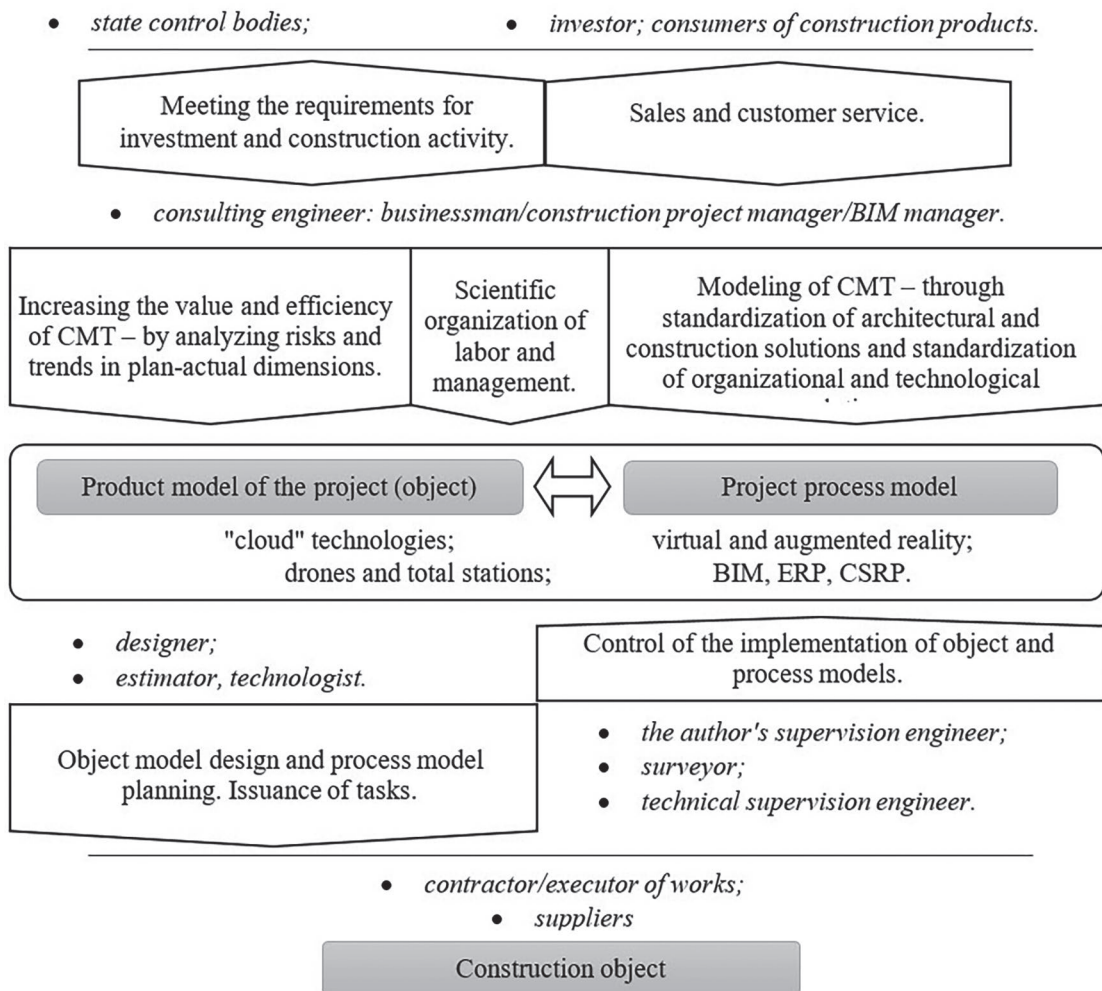


Figure 2 — Schematic diagram of stakeholder communication when using the “construction management template” concept

As can be seen from **Fig. 2**, the communications of the consulting engineer (the managing party) with contractors and suppliers (the managed parties) are conducted through the product and process models of the project — a collection of CMT. The project team helps him in this, to which he delegates a number of management functions:

- Development of the product model — to the designer; process model development — estimator or technologist.
- Tasks are issued automatically when the project team works well.
- The control of the implementation of the models takes place with the involvement of designers who carry out author's and technical supervision and surveyors — to control the conformity of the actually performed works to the developed models.

Development of a new multidimensional model of construction enterprise organization. Under the sustainable development of enterprises, we understand the continuous process of increasing the organization of the company due to the expanded reproduction of its structural energy, which increases the system's ability to perform useful work. Thus, it can be noted that there are factors of destabilization of the enterprise, both external and internal, which lead to a decrease in the efficiency of management processes.

Various classifications distinguish different factors of sustainable development of enterprises, however, most of the classifications distinguish factors of the internal and external environment. It is promising to contrast each of them, or a group of them, with an organizational element of the enterprise. At the same time, all organizational elements should be connected by information and communication links, and these links should not be distorted and slowed down.

In order to achieve the goals of sustainable development in the case of an enterprise with a full investment and construction cycle, it is proposed to highlight six challenges that characterize it (**Fig. 3**), namely ensuring: the attractiveness of the strategy and product; communication efficiency and innovativeness; efficiency by terms; efficiency, environmental friendliness and quality; financial efficiency; organizational stability and security. Each of the specified challenges can be opposed by the appropriate division of the enterprise: the board of directors; project management and stakeholder engagement department; production department; financial and economic department; HR department; legal department. Each of these departments is connected with other information and communication links within the framework of construction product and processes models formalized by CMT (**Fig. 1**).

At the same time, the allocation of the specified departments allows the establishment of additional control circuits. In addition to the hierarchical subordination that is present in traditional organizational models, the new multidimensional model allows for the division of responsibility for the components of the enterprise's activities of the complete investment and construction cycle: speed, cost, quality of product creation; organizational stability and legal security of the enterprise as a whole; attractiveness of strategy and product in the market of construction services. Due to the natural interconnection of these components and their influence on each other, mutual self-control is formed, which leads to a certain degree of self-management of the enterprise of the complete investment and construction cycle.

The project orientation of the multidimensional model should be highlighted separately. This is expressed in the presence of the appropriate department. The structure of the production department reflects the implementation of the process approach: each branch of this department creates construction products according to technological flows. For a large enterprise with a full investment and construction cycle, such products can be: materials for design and research works; results of engineering preparation of construction and installation of foundations; monolithic, stone structures; engineering networks, etc. The allocation of specialized departments in the structure of the department allows for the development of horizontal control: acceptance and transfer of intermediate construction products between departments on the fronts of work execution.

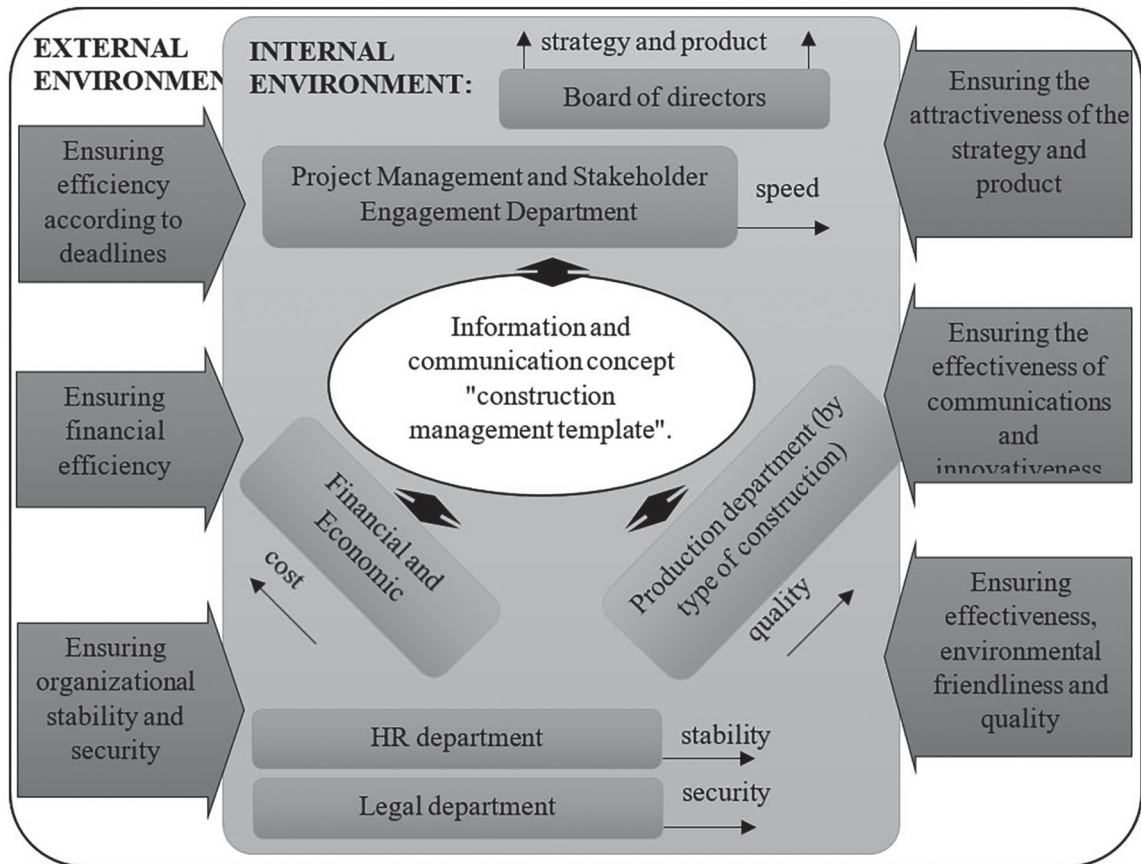


Figure 3 — Schematic A multidimensional business-model of construction enterprise using the concept of “construction management template”

The use of the information and communication concept “construction management template” compatible with the multidimensional organizational model makes it possible to speed up the logistics of information resources, formalizes and automates the process of organization and control of production. In this way, it is possible to reduce intermediate hierarchical links. Compared to the traditional organizational model, which requires up to 7 links in accordance with the decomposition of construction processes depending on the phase of the investment and construction project and the service document flow, the new multidimensional model requires three links: senior management and the head of the construction project, executors who organize and monitor implementation decisions embedded in product and processes models; workers who directly perform construction and assembly work. This reduces management costs, increases the accuracy and speed of management actions, and thereby shortens the duration of construction.

The multidimensionality of the proposed organizational structure consists in the allocation of departments responsible for the challenges of sustainable development, which allows optimizing production in many directions at the same time.

The algorithm for implementing a multidimensional business-model using the “construction management template” concept is shown on **Fig. 4**. This algorithm includes the steps of implementing the CMT concept and allows the realization of identified efficiency reserves: optimization of production due to additional control circuits and reduction of intermediate hierarchical links.

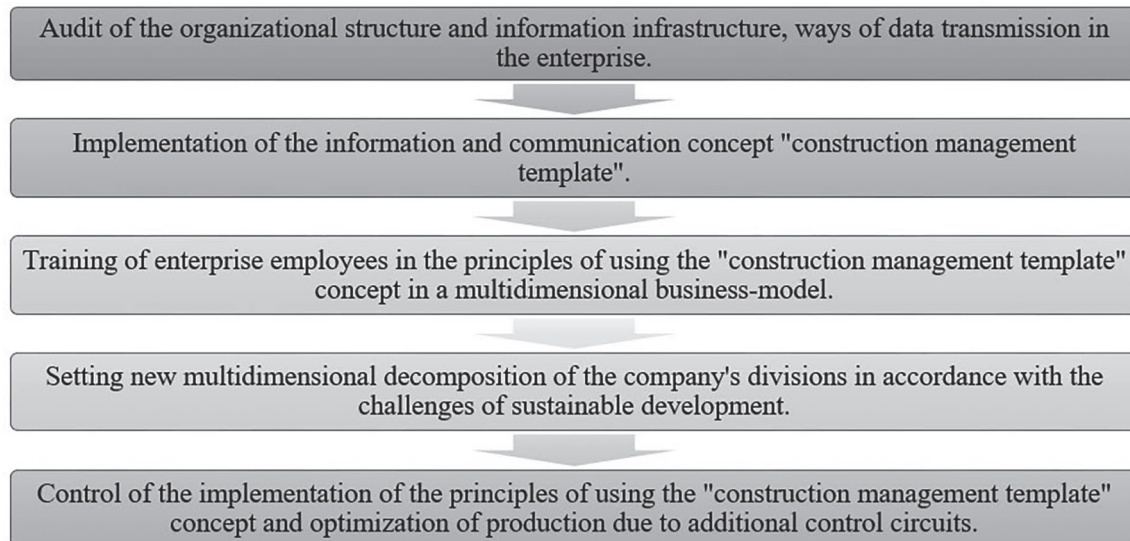


Figure 4 — Algorithm for implementing a multidimensional model of enterprise organization when using the “construction management template” concept

Conclusions

The need to create a multidimensional business-model of construction enterprise for the erection of socially affordable housing was revealed with the aim of: shortening the terms of construction and restoration works; reduction of cost and life cycle cost of buildings; taking into account world experience in the design and construction of high-quality socially accessible housing.

The developed principles of using the “construction management template” concept make it possible to increase the flexibility and controllability of construction management and thus help reduce the cost of socially affordable housing construction

For the first time, the proposed multidimensional business-model of construction enterprise allows to reduce the duration of construction at the expense of:

- mutual self-control of departments of the enterprise due to the allocation of divisions according to the challenges of sustainable development and the assignment of areas of responsibility;
- reduction of intermediate hierarchical links in the organization and additional control circuits of production.

The algorithm for improving management methods allows introducing multidimensional business-model of construction enterprise.

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РОЗВИТОК СОЦІАЛЬНО ДОСТУПНОГО ЖИТЛА З ВИКОРИСТАННЯМ ШАБЛОНІВ УПРАВЛІННЯ БУДІВНИЦТВОМ

Анотація

Вступ. Внаслідок військової агресії Російської Федерації в різних містах України було зруйновано безпрецедентну кількість житлового фонду. Відповідно, постає питання відновлення зруйнованого та будівництва нового житла для соціально незахищеної категорії населення. Крім широкого кола питань, пов'язаних із архітектурою, енергоефективністю та конструкціями цих будівель, існує потреба у створенні надійного інструменту управління, який дозволить економно та за короткі строки виконати великий обсяг будівельно-реставраційних робіт.

Проблематика. Відновлення зруйнованого та реконструкція нового житла включає вирішення таких завдань: зниження вартості будівництва та життєвого циклу будівель; скорочення строків виконання будівельно-відновлювальних робіт; врахування світового досвіду проектування та будівництва якісного соціально доступного житла; гнучке управління інтенсивністю державного фінансування портфелів і програм інвестиційно-будівельних проєктів. Інструментом вирішення цих завдань може стати інформаційно-комунікаційна концепція «шаблон управління будівництвом».

Мета й завдання роботи. Стаття покликана обґрунтувати доцільність використання нової багатовимірної бізнес-моделі будівельного підприємства на основі концепції «шаблон управління будівництвом» для розвитку соціального житлового фонду у післявоєнний період відновлення України.

Матеріали та методи. Нова інформаційно-комунікаційна концепція передбачає впровадження найбільш ефективних інноваційних і традиційних методів управління. Відповідна багатовимірна бізнес-модель будівельного підприємства передбачає врахування принципів сталого розвитку. Пропонується використовувати цю концепцію в рамках багатовимірної бізнес-моделі, яка забезпечить високі стандарти управління будівництвом соціально доступного житла під час повоєнної відбудови України.

Результати. Запропоновано інформаційно-комунікаційну концепцію «шаблон управління будівництвом». Концепція послужила основою для розроблення нової багатовимірної бізнес-моделі будівельного підприємства. Принцип дії даної моделі полягає у порівнянні факторів сталого розвитку підприємства з його організаційними підрозділами та визначенні відповідних показників ефективності.

Вперше запропонована багатовимірна бізнес-модель будівельного підприємства дозволяє збалансовано розподілити бізнес-процеси та відповідальність між структурними підрозділами підприємства. Це досягається за рахунок: використання одного об'єднуючого інформаційно-комунікаційного засобу, що дозволяє автоматизувати ряд бізнес-процесів; структурування інформації про проєкт таким чином, щоб вище керівництво могло отримати її без необхідності використання проміжних ієрархічних ланок управління; виявлення розбіжностей між діяльністю різних підрозділів при створенні та редагуванні інформаційно-комунікаційної моделі.

Висновки. Багатовимірна бізнес-модель будівельного підприємства дозволяє підвищити стандарти управління будівництвом. Відповідний техніко-економічний ефект полягає у скороченні строків виконання будівельно-реставраційних робіт; зниження вартості будівництва та вартості життєвого циклу будівель; врахування світового досвіду проектування та будівництва якісного соціально доступного житла.

Ключові слова: управління будівництвом, шаблон управління будівництвом, підприємство повного інвестиційно-будівельного циклу, інформаційно-комунікаційні технології.

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