DOI: 10.32347/2412-9933.2021.48.95-101
UDC 69.003: 658

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DEFINING COMPONENTS OF THE METHODOLOGICAL PLATFORM FOR THE TRANSFORMATION OF THE MANAGEMENT SYSTEM OF CONSTRUCTION COMPANIES IN THE CONTEXT OF DIGITALIZATION

Abstract. *The lack of clear and accessible information sources, services, platforms, applications or portals on digital business transformation slows down the speed of innovation in domestic entrepreneurship. In turn, this does not allow businesses to integrate with global trends, which complicates access and work in the international economic arena. The identified problems necessitate the development of a methodological approach to the study of digital transformation processes at the enterprise level; polystructural methodological approach to determining the index of digital transformation of business structures on the basis of relevant indicators; design and implementation of a digital platform for small and medium-sized businesses, which would automatically determine the Digital Transformation Index and provide an individual "road map" to improve the digital development of the enterprise. The article presents recent innovative technology for modeling business processes of enterprises based on process management. The paper considers the creation and justification of the updated methodological and analytical tools for assessing, selecting and regulating the production system of administration of an enterprise project portfolio in a single operating management system. The application of the process approach is based on a comprehensive, systematic review of the enterprise as a set of processes, the development of a process management system using the principles of ISO 9000: 2000. The new process approach is proposed that allows excluding routine operations from the actions of employees, increasing the speed of employee interaction, effectively optimizing existing business processes, and quickly rebuilding the enterprise's business processes in response to significant changes in business conditions. The work identifies executable business processes, proposes a new approach to modeling the business processes of an enterprise, gives examples of problems associated with the new approach, and suggests possible ways to solve them. Criteria for the results of simulated business processes are defined that allow linking the target indicators of a balanced scorecard of the enterprise with the established results of business processes. It is proved that the use of this recent innovative technology for solving scientific and practical problems of enterprise management significantly expands and deepens the possibilities of economic analysis in the process of solving problematic situations and makes management decisions more grounded and effective.*

Keywords: business process; management systems; process approach to modeling; technology modeling business processes

Introduction

The modern market environment creates requirements for continuous development and implementation of innovations by economic entities. Effective change management in the dynamic conditions of external and internal environments of business structures requires the use of fluctuation-resistant tools of project management, which is based on the process organization of management activities.

The level of success of the implemented changes in the activities of economic entities is determined by the extent to which the needs of all stakeholders have been taken into account and implemented. The latter appear in economic activities as specific individuals or groups with their own beliefs, opportunities for influence and value expectations of the project. Perception of project results is differentiated by stakeholders, and, as a rule, it is possible to observe the manifestations of opposing interests through the prism of finding the best conditions for the distribution and consumption of benefits. In general, the successful implementation of the project is possible only if the interests and values of all stakeholders are taken into account. That is why the application of a value-oriented process approach is the most important condition for the successful implementation of projects in the enterprise, which in the long run provides it with additional competitive advantages and stable development.

Analysis of the standardized process decomposition of project management shows the existence of bottlenecks in the field of knowledge of project personnel management. It is proved that organized and managed individual processes of monitoring labor participation in collective work on the project, on control of satisfaction and loyalty and disbandment of the project team will contribute to the formation of effective and motivated interaction of internal project stakeholders.

The purpose of this article is to substantiate and develop theoretical and methodological provisions, scientific and methodological approaches and practical recommendations for the rational organization of the process of digital transformation of business structures as an imperative for their innovative development.

Achieving this goal necessitated the solution of such tasks:

– to develop the interpretation of the essence of the concepts of "digital transformation of business", to identify the components of the impact of the digital economy on diversified groups of stakeholders;

– explore the features of digital transformation in the context of reengineering business processes of the organization;

– highlight the challenges and prerequisites for the digital transformation of domestic business structures.

Proposed methodology

The BIM concept has emerged as an alternative to existing traditional CAD. The new system offers both great intellectual advantages and the ability to interact with all participants in the construction process [1]. Digital representation of physical and functional characteristics of the object allows users to transfer design data and specifications both between different software applications and in one organization or within a multidisciplinary group. All available information about objects is stored in the BIM database and can be accessed throughout the life cycle of the object as needed.

Analysis of recent research. BIM has been identified as "the technology of generating and managing parametric building models" [2]. It is also mentioned as a multifaceted phenomenon with an object-oriented 3D model structure to ensure interoperability and information exchange [3]. Thus, BIM is a growing field of theory and practice, which brings together different areas of knowledge in the construction industry [4]. BIM tools optimize the processes of parametric object modeling, create new levels of spatial visualization, model the "behavior" of buildings, effective project management and operational cooperation between team members. BIM refers to a set of technologies and solutions that can promote between organizational collaboration and productivity in the construction industry, as well as improving the design, construction and maintenance of a facility. BIM technologies are constantly expanding and developing new functionalities. BIM tools provide comprehensive information about the criteria that must be considered during the design process, from the individual components and location of the building to the relationship between these criteria. BIM includes information on construction, ranging from geometry, spatial relationships, lighting analysis, geographic information, quantity and properties of building materials and components, specifications, fire resistance, cost. Although the benefits of BIM are implicitly understood by the designer, they may become apparent to other project participants, such as owners, contractors, subcontractors, and finishing companies. In the case of design changes, BIM tools can integrate and systematize changes throughout the project [5]. Moreover, BIM can be used to integrate object management.

The complexity of construction projects has increased significantly in recent decades. To "keep up with the times" and promote innovation in construction, information technology (IT) and information and communication technology (ICT) must also be actively developed [7]. BIM has been developed as a system capable of facilitating the design, construction and maintenance of a construction site using an integrated approach. It provides a common platform for all

stakeholders involved in the project. Owners, designers, contractors and construction managers can use BIM for more efficient construction than ever before [8]. In addition, innovative IT / ICT tools are important factors in the training and development of the construction industry. There is a predictive suggestion that BIM will also be used to integrate knowledge and improve learning [9]. BIM can be used as an interactive guide for the safe management and operation of the building, providing complete information about the object [10], such as physical structure, mechanical and electrical systems, interior design. With the help of BIM you can simulate the process of maintenance or modification of the object [11], which will naturally improve the operation process, reduce management costs [12], due to a more accurate estimate for repairs and renovations [13]. BIM can also be used to simulate evacuation scenarios and crowd behavior in emergency situations [14]. Due to the use of BIM it is possible to more accurately calculate the amount of building materials and components required for project implementation [15]. This can help coordinate the procurement process during the design and construction phases [16]. The BIM model can be used as a source of information for automated machines in the manufacture of finished building components [17]. Modeling the construction process and linking the model to the network schedule allows you to detect various collisions and inconsistencies in the initial stages of the project, before the actual start of the construction process [18]. The widespread use of BIM tools in the modeling of buildings with a complex design concept [19] gives architects great freedom for creativity. In the future, BIM is considered a key solution in the construction and operation of intelligent buildings [20]. BIM has also been identified as a tool that can deliver significant economic benefits. Positive financial indicators are a powerful driver for the introduction of innovative technologies in practice. Studies have shown that BIM has the greatest impact on preventing building delays and prevention of alterations based on early evaluation of the model.

BIM users have identified both short-term and long-term benefits of using BIM. The most important short-term advantage of BIM was the minimization of documentation errors. Another advantage is the ability to use BIM as a marketing tool. Lower staff turnover is also seen as a short-term benefit from using BIM. Fewer contract claims and reduced construction costs are seen as long-term benefits. Long-term cooperation with customers is also a major advantage of BIM [21]. BIM can also be used for initial planning and feasibility studies. A conceptual building model can include cost information to help developers determine if a house of a certain size, quality level, and desired requirements can be built within a specific cost and time budget. In addition, the 3D BIM model will provide a more realistic visualization of the design at all stages of the project. BIM 4D network graphics are a powerful tool for phasing, coordinating and transmitting information about the planned work to project participants [22]. Since all materials and components are determined and calculated automatically, it is possible to order them via electronic form and deliver to the construction site as needed, which reduces costs and increases productivity. The 3D model provides acceptable visualization of the workspace, while the 4D network graph offers a simplified understanding of the various requirements throughout the project lifecycle. This is especially useful for stakeholders who are directly responsible for the construction work. BIM has the ability to link manufacturer data, construction data and communications with a single fully integrated dashboard. A key aspect of any visualization system is to facilitate real-time interactive updates. Inefficiency in upgrading eliminates the benefits of using such technology. Inconsistent updates make monitoring and use of the project more difficult, which can lead to team members losing the track [23]. In the future, BIM tools are expected to provide seamless real-time updates and sufficient visualization performance to ensure effective interaction between team members [24].

Multidisciplinary integration of project participants allows to identify and solve problems before the start of the construction phase. This is important both for the development of new facilities and for the integration of new facilities with existing ones. Early interdisciplinary integration avoids unnecessary costs and time by reducing errors and requests for information and, consequently, reducing change.

Building Information Modeling is an advanced method of transmitting information about a construction project. This exchange can take place between different participants throughout the project life cycle. In the construction industry, there are clear signs of fragmentation and division of various works into stages, so the introduction of new processes can be expected to have barriers and problems. Rapid and accurate identification of potential problems is crucial, as it will allow project participants to take the necessary steps to mitigate them and ensure the success of the project.

Factors of communication and exchange of information flows are very important in the implementation of construction projects. Traditionally, this was done in the form of two-dimensional drawings and paper documentation. The concept of BIM involves the use of information models not only as a design tool, but also as an interface for the exchange of information between different participants at all stages of the project. The fragmented nature of the construction industry has led to the need to use different design and construction management tools. Each project participant prefers tools that specialize and adapt to his individual roles. The results of global research on the practice of process

project management tend to quantify the level of development of the project management system of organizations and have a complex methodological basis. A number of studies involve the assessment of individual processes according to the model of maturity, others – aimed at calculating the overall result on the basis of integrated assessment.

Chronological analysis of research results indicates that there is still significant potential (about 35%) for the development of project management processes of organizations. Generalized experience and best practices of conducting research on the level of development of project management processes allow to establish the optimal composition of the relevant analytical tools. To determine the key characteristics of individual processes, a universal three-level model of maturity of project management processes was proposed (Fig. 1).

The model assumes the delimitation of three levels of maturity of a single project management process: starting from the absence of process as a subject of project manager management, moving to non-standardized process management according to individually defined procedures and project team experience at the first level of maturity. procedures at the second level and ending with the level of continuous development and improvement of the individual process on the basis of the experience of the project.

To collect primary information on the development of project management processes, the author proposed a special form of the questionnaire, which indicates the characteristics of individual project management processes at the appropriate levels of maturity, established in accordance with the maturity model. Assessment of the maturity of such processes was provided at a formally defined level (fixed order of decision-makers on the necessary nature of project management procedures) and at the level of practical use (actual level of maturity of the project management process, which is observed in normal project implementation).

The most informative for the purposes of such a study are indicators of the generalized actual level of maturity of processes, the level of maturity of the project management process system, the generalized system development potential and the level of balance of the project management process system (Fig. 2).

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The same situation was with the development of BIM tools, when each of the project participants used software that interacted poorly with each other.

Industry Foundation Classes (IFC) – an open specification data format that is not controlled by any company or group of companies. The file format was developed by building SMART (International Alliance for Interoperability, IAI) to facilitate interaction in the construction industry. Used as a format for Building Information Modeling. This has led to the introduction of the Industry Foundation Classes (IFC), an open source international standard. The file format was developed by buildingSMART (International Alliance for Interoperability, IAI) to facilitate interoperability when using BIM.

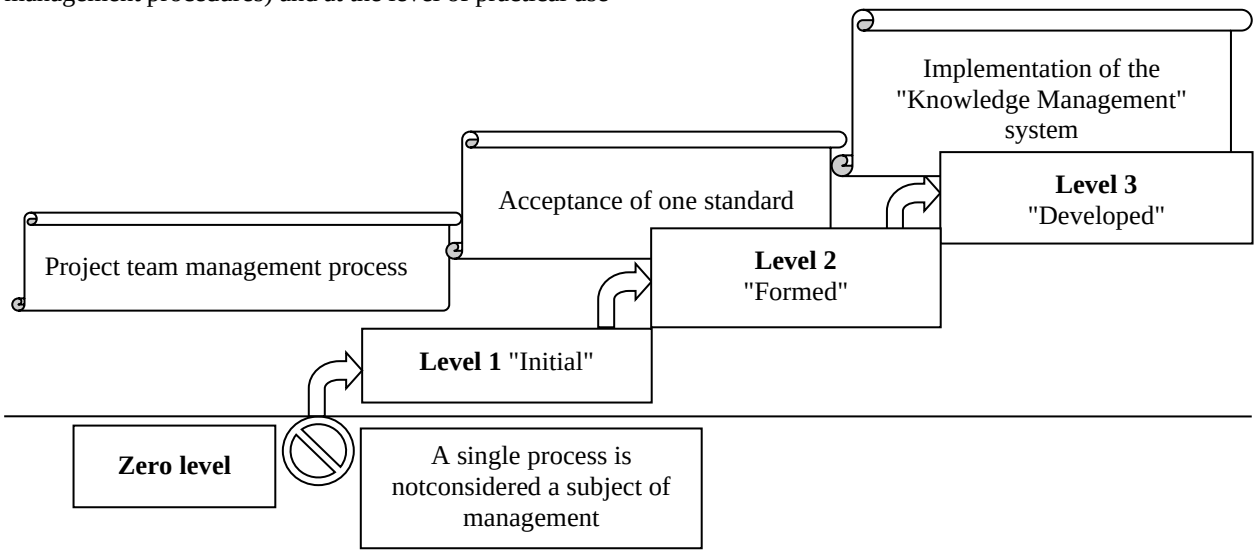

Figure 1 – Applied prerequisites for changing the format of the operating system of construction companies in terms of digitalization

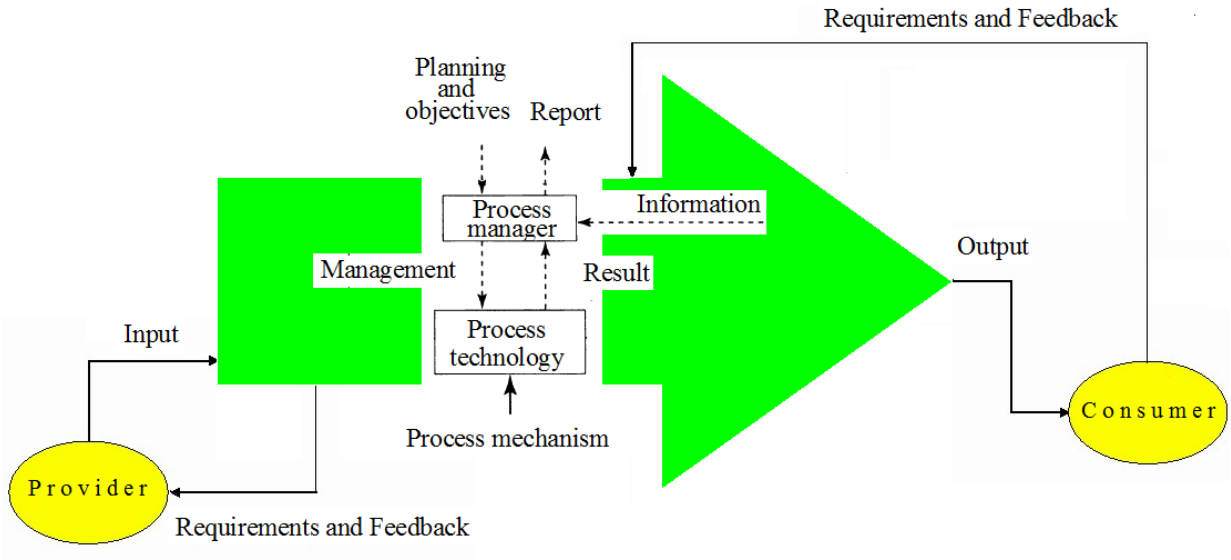

Figure 2 – The proposed technology for modeling of business processes [16]

The level of expectations from the use of BIM in the project varies depending on the role of the project participant and the size of the enterprise. Designers expect BIM to further develop and improve 2D CAD. Designers view BIM as a tool that facilitates document and information management. The larger the enterprise, the more flexibility it wants from software to be able to implement larger and more complex projects. The difference in expectations from BIM is most likely the result of a lack of consensus on what BIM is. Most industry professionals agree that BIM consists of three-dimensional models rich in information, but the exact ways in which BIM influences workflows are uncertain. BIM information transfer can be used by all project participants in all disciplines throughout the life cycle. It is important to note that in the project, BIM itself is not a goal, but rather a means to an end. Project teams should develop a plan for the use of BIM in the project at the earliest stage of its implementation. This will allow them to identify all possible ways to use BIM to achieve project objectives. After clearly defining the objectives of the project, all major participants must agree on the exchange of information throughout the period of its implementation. A comprehensive and well-thought-out BIM project implementation plan is a key factor in ensuring that all project participants are on one page and work together to implement the project on time and budget.

BIM, as a common approach to the planning, design, construction and management of facilities, requires that investors, contractors, end users and facility managers be involved in the development process in the most active way. Key players should be able to add, delete, update or change information in the building model throughout their life cycle.

Conclusion

Information systems are playing an increasing role in achieving the strategic goals of organizations, as they not only provide information processing for departments and end users in the internal environment, but also directly generate products and services based on information and provide competitive advantage in the market. Given the importance of information management infrastructure of the organization for its operation and development, a model of its construction is proposed. Theoretical and methodological approaches to modeling management informatization are substantiated, which cover problems to consistent description of each aspect of the organization management system in coordination with all others based on the implementation of information management information infrastructure and the formation of digital strategy.

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Received 28.11.2021

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ВИЗНАЧАЛЬНІ КОМПОНЕНТИ МЕТОДОЛОГІЧНОЇ ПЛАТФОРМИ ТРАНСФОРМАЦІЇ СИСТЕМИ УПРАВЛІННЯ БУДІВЕЛЬНИМИ ПІДПРИЄМСТВАМИ В УМОВАХ ЦИФРОВІЗАЦІЇ

Анотація. *Відсутність зрозумілих і доступних джерел інформації, сервісів, платформ, додатків чи порталів з трансформації цифрового бізнесу уповільнює швидкість інновацій у вітчизняному підприємництві. Своєю чергою, це не дає змоги бізнесу інтегруватися у світові тенденції, що ускладнює вихід і роботу на міжнародній економічній арені. Виявлені проблеми зумовлюють необхідність розроблення методичного підходу до дослідження процесів цифрової трансформації на рівні підприємства; запровадження поліструктурного методологічного підходу до визначення індексу цифрової трансформації бізнес-структур на основі відповідних показників; розроблення та впровадження цифрової платформи для будівельного бізнесу, яка б автоматично визначала Індекс цифрової трансформації та забезпечувала індивідуальну «дорожню карту» покращення цифрового розвитку підприємства. У статті представлено новітні інноваційні технології моделювання бізнес-процесів підприємств на основі управління процесами. У роботі розглянуто створення й обґрунтування оновленого методологічного й аналітичного інструментарію оцінки, вибору та регулювання виробничої системи адміністрування портфеля проєктів підприємства в єдиній операційній системі управління. Застосування процесного підходу базується на комплексному, систематичному огляді підприємства як сукупності процесів, розробці системи управління процесами з використанням принципів ISO 9000: 2000. Запропоновано новий процесний підхід, що дає змогу виключити рутинні операції. Від дій співробітників залежить підвищення швидкості взаємодії, ефективна оптимізація існуючих бізнес-процесів, швидка перебудова бізнес-процесів підприємства у відповідь на значні зміни умов ведення бізнесу. У роботі визначено виконувані бізнес-процеси, запропоновано новий підхід до моделювання бізнес-процесів підприємства, наведено приклади проблем, пов'язаних із новим підходом, і запропоновано можливі шляхи їх вирішення. Визначено критерії результатів моделювання бізнес-процесів, які допомагають зв'язати цільові показники збалансованої системи показників підприємства з встановленими результатами бізнес-процесів. Доведено, що використання цієї новітньої інноваційної технології для вирішення науково-практичних завдань управління підприємством значно розширює та поглиблює можливості економічного аналізу в процесі вирішення проблемних ситуацій, робить управлінські рішення більш обґрунтованими й ефективними.*

Ключові слова: бізнес-процес; системи управління; процесний підхід до моделювання; технологія моделювання бізнес-процесів

Link to the article

APA Ryzhakova, Galyna, Kishchak, Nataliia, Mironov, Aleksandr, Chupryna, Khrystyna, Shpakova, Hanna & Veremeev, Serhii. (2021). Defining components of the methodological platform for the transformation of the management system of construction companies in the context of digitalization. *Management of Development of Complex Systems*, 48, 95–101. dx.doi.org\10.32347/2412-9933.2021.48.95-101.

ДСТУ Рижакова Г. М., Кіщак Н. Г., Міронов О. О., Чуприна Х. М., Шпакова Г. В., Веремєєв С. О. Визначальні компоненти методологічної платформи трансформації системи управління будівельними підприємствами в умовах цифровізації. *Управління розвитком складних систем.* Київ, 2021. № 48. С. 95 – 101, dx.doi.org\10.32347/2412-9933.2021.48.95-101.