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Methodological aspects of implementing an innovative approach to improving the efficiency of development projects

In this paper, the authors touch upon the issue of competition of development companies and the existing trends of increasing the competitiveness of development projects in modern conditions. There are two main approaches to increasing competitiveness. The first organizational approach is to create an additional organizational unit in the structure of the development company, which is designed to control the choice of technical solutions for construction projects, as well as to evaluate them in terms of functionality, cost and efficiency in order to obtain a better development product for the end user without increasing the cost. The second approach is innovative, it is aimed at increasing the efficiency of the development company's activities using modern digital technologies, which are designed to reduce the cost of construction by reducing deadlines, minimizing the number of errors, speeding up approvals and automating the processes that accompany a development project during its implementation. In the implementation of the innovation approach, the main directions of innovative digital technology implementation in construction are listed and their basic description and characteristics are given. The main advantages that can be achieved through the application of these approaches are identified: reduction of construction time, improvement of the quality of construction products, and cost reduction. The paper also describes the main problems and limitations of the approaches under consideration, such as high regulation of the construction industry, lack of financial resources, imperfect methodology for assessing the effectiveness of innovative projects, lack of qualified personnel capable of applying and mastering innovations. **Keywords:** development, development activity, innovation, innovative development, innovative processes, innovative building materials, digitalization, information technology, robotization

The residential and commercial real estate construction market has been actively developing in recent years, even during the pandemic the growth of the construction industry was maintained unlike other segments of the economy [1]. Large federal-scale development companies that started their operations in Moscow are now actively expanding into regional markets. Regional developers are replenishing their land banks in the regions and trying to enter the capital market, which will lead to an increase in their competition in the coming years. Increasing competition of developers contributes to the improvement of the quality of development projects, but the unstable economic situation, the rising cost of construction materials and services, as well as stagnation of household incomes reduces the affordability of residential and commercial property and intensifies competition between developers in the struggle for customers' [2]. The time of high margins in the development business is gradually passing, buyers are increasingly demanding high quality of construction and the cost of the development product. In this situation, in order to ensure business stability and the ability to sustainably resist the onslaught of competitors, developers are forced to develop development strategies, optimize costs and apply new non-standard approaches to

construction management, seeking to use their financial, material and labour resources as economically and efficiently as possible. The most progressive developers apply a comprehensive approach in the implementation of their development strategy, they not only seek to optimize their financial strategy and organizational structure, but also pay great attention to the technological aspect of development activity increasing the efficiency of technological processes by introducing digital innovations and achievements of scientific and technological progress in their activities, apply an innovative approach' [2, 3]. The share of companies interested in innovation activity is rapidly increasing. Development leaders mainly associate their development vectors with such areas as:

- reduction of construction time;
- introduction and dissemination of energy efficiency technologies;
- improving the quality of construction products;
- introduction of innovative digital construction technologies' [3].

The authors consider two main approaches as the most promising directions for managing time, construction costs and improving project efficiency — the organizational approach, which consists in organizational changes to ensure control over the effectiveness of technical decisions and the modern approach of increasing efficiency

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1 Strategy of innovative development of the construction industry of the Russian Federation for the period up to 2030. URL: <https://minstroyrf.gov.ru/docs/11870/> (date of reference 09.04.2022).

through the introduction of new digital technologies. In this paper, we propose to consider the second approach — the innovative approach to improve the efficiency of a development project.

Advanced developers are adopting innovative digital tools to help to reduce construction costs by shortening timelines, minimizing errors, expediting approvals and automating processes.

In recent years, one of the main directions of this trend has been the widespread introduction of information modelling technologies¹ [3].

Today information modelling allows to reduce the terms of verification and acceptance of project documentation to one week, when before it took on average 10 days.

The amount of documentation to be processed is reduced, and the reliability and openness of construction control is significantly improved.

Designing is accelerated by 2–3 months on average, while the quality of development of technological solutions becomes much higher.

Construction time in general has become shorter by an average of 1–2 months and cost has decreased by 10 %, there is also a significant reduction in the likelihood of design errors.

However, IMT (Information Modelling Technologies) are not the only digital innovations that have rapidly burst into and been applied to the construction industry in recent years.

It is possible to list the main directions of innovative technology implementation in construction [4]:

1. Implementation of common data environments in construction activities.
2. Implementation of digital services to automate the processes of executing executive documentation.
3. Advanced visualization of construction production and product.
4. Utilizing online shopping and mobile applications for development purposes.
5. Advanced online analytics and dynamic pricing.
6. Creation of a unified federal information space in the field of pricing in construction.
7. CRM and process robotization.
8. 3D technology.

COMMON DATA ENVIRONMENT IN CONSTRUCTION ACTIVITIES

In general terms, a common data environment is a set of technical means and software designed to provide information services to users. The technical means include equipment for data input, storage, transformation and output.

These systems allow project participants to access project documents in a single information environment. In CDE it is possible to exchange documents, view files of all common formats, flexibly customize access rights, identify the relevance of documents, conduct verification and electronic approval of documents, and link all this with scheduling tools [4, 5].

Some real estate developers develop such systems for their own needs.

Therefore, development company Etalon developed its own cloud-based common data environment solution called CONTRUST.

The scenario model of work in CONTRUST CDE is schematically presented in Fig. 1.

A distinctive feature of the CDE product developed by Etalon is that each document in the system is assigned an individual QR code, thanks to which any project participant can check the relevance of the document in real time, which minimizes the risks of confusion in case of a large number of versions of the same document.

In construction, such software products as Autodesk BIM360 Docs, Sarex CDE, Project Point, SiGNAL DOCS, Vitro-CAD, etc. can also be attributed to ODS products.

DIGITAL SERVICES FOR AUTOMATION OF EXECUTIVE DOCUMENTATION PROCESSES

Applications and services for debugging and accelerating the processes of execution of executive documentation appeared several years ago and have already proved to be a very effective tool that increases the speed and quality of execution of executive documentation on the construction site.

Modern systems are able to organize and automate the processes of formation of executive documentation (supporting documentation for supplied materials, certificates of witnessing of concealed works, executive schemes, online filling of the general log of works and special construction logs), create registers, control the relevance of documents and upload information to

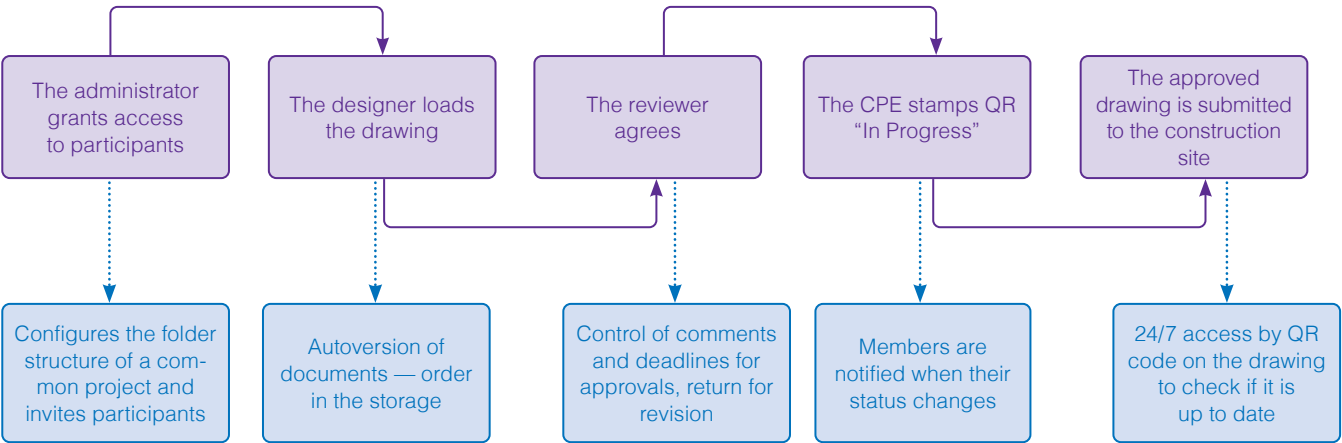


Fig. 1. Scenario model of operation in CONTRUST CDE

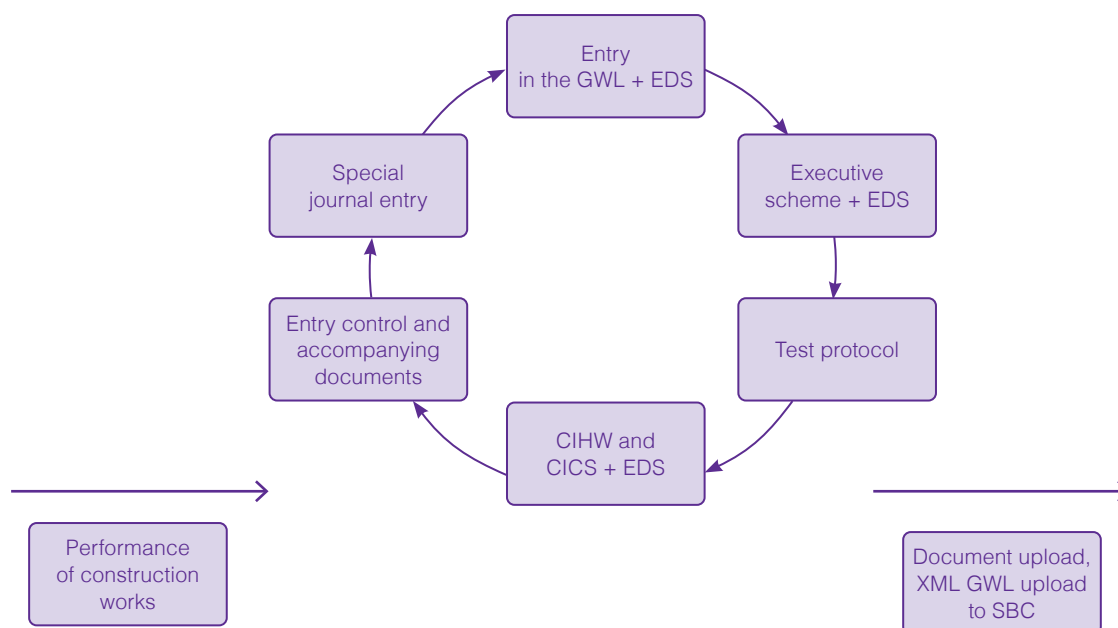


Fig. 2. Typical scenario model of an application for automation of construction inspection processes

the Customer and to the state construction supervision authorities online.

The customer gets more complete control over the process of execution of executive documentation, costs are reduced, access to executive documentation and risks of its loss are simplified. Contractors and executors reduce and automate their routine operations, reduce the time spent on execution of performance documentation, reduce the risks of errors and delay in preparation of performance documentation.

The Fig. 2 shows a typical scenario model of an application for automation of construction inspection processes.

Such applications include such software packages as Adept, CONTRUST, HARDROLLER, Stroyform, BuildDocs, DACON.

VISUALIZATION OF CONSTRUCTION PRODUCTION AND PRODUCT

Augmented Reality (AR-Augmented Reality) technology is fairly recent on the market as a product of modelling.

Over time, augmented reality has been used not only for entertainment, but also in construction. With the help of augmented virtual reality, projects for various construction projects are already being developed.

The advantages of the augmented reality method are that the projected model allows visualizing the process of object construction and seeing the object under construction with just augmented reality glasses on the face [6]².

On the plus side, we can mention:

1. Operational control of deviations of construction progress from the design solution.
2. Visual inspection of structural solutions.
3. Reduction in the number of changes on the construction site, as a result of observation and avoidance of deviations during the construction of the project.

4. Increasing the productivity of workers and engineers.

Sales departments are also actively interested in the technology. It can be used to create a complete image of the proposed real estate object in the mind of a potential buyer, long before it is built in reality. For this purpose, increasingly sophisticated virtual visualization and online tours of the construction site are used.

ONLINE STORES AND MOBILE APPS FOR BUYING REAL ESTATE

Nowadays, almost everything can be bought online, and this trend has reached real estate sales. A powerful impetus to this process was given by the pandemic of 2020, when in the conditions of self-isolation and insecurity of personal contacts online sales allowed developers to maintain the level of apartment sales [4].

Online sales allow you to save time to make a purchase and reduce transaction costs, and the virtual reality technology described above allows you to remotely select your favourite property.

According to the statistics of development companies today up to 45 % of real estate is booked online, although before 2020 such transactions were rare.

ONLINE ANALYTICS AND DYNAMIC PRICING

Many development companies are already using special corporate data warehouses, collecting BIG Data and creating "data lakes" (Data Lake). Developers are actively mastering technologies for obtaining and managing data in different formats: raw, unordered or, on the contrary, structured or loosely structured, in a single storage¹ [2, 4].

This allows them to further engage in effective product analytics and also becomes the basis for dynamic pricing.

► Dynamic pricing is a technology for calculating the selling price of real estate objects according to certain algorithms in real time, based on demand and market conditions. When used skillfully, the technology helps businesses to extract maximum profit from a product in a particular situation.

The main advantage of the technology is that sales are built taking into account a large number of external factors. After all, the balance of supply and demand is fragile and is influenced by many factors: from the general state of the economy to the appearance of new housing estates in the area or competitors' promotions.

Dynamic pricing helps not only to maximize profits, but also to protect against potential losses.

CREATION OF A UNIFIED FEDERAL INFORMATION SPACE IN THE FIELD OF PRICING IN CONSTRUCTION

The most important achievement in this direction was the launch of the federal state information system of pricing in construction (FGIS CS), the final formation of which should be completed by 2025¹ [5].

This system today collects, processes and stores the data required to determine the estimated cost of construction of facilities financed with budgetary funds.

CRM AND PROCESS ROBOTIZATION

A modern CRM system (from "customer relationship management") is not only a tool for comprehensive communication with customers, but also an environment for organizing joint work between management and employees.

In a broad sense, CRM is an online office both for interaction with clients and for managing tasks and projects within a company. This innovation allows you to bring customer service to a new level, automate the acceptance and processing of applications, distribution of tasks, mailings, financial accounting and generation of various kinds of documents.

In the construction business, control of all processes is important, and with the help of modern CRM systems, construction companies track the efficiency of tasks, plan work, generate reports and find new clients.

If the multifunctional CRM for construction in the organization is synchronized with 1C and BIT Construction systems, in this case the company has a reliable tool that allows it to make management decisions in an operational mode and establish a transparent process of interaction with clients and customers¹ [4, 5].

The system increases company productivity by reducing paperwork and converting processes, including customer interaction, to electronic format.

A peculiarity of the construction industry is the variety of factors affecting the project realization time and the large number of involved participants. With the help of automation, it is possible to take control of each task, plan the work and assign responsible persons, track the current status of the project and make adjustments if necessary.

The challenge of involving robots in the construction process remains the most pressing, especially true for companies that apply information modelling technologies (IMT)^{3, 4}.

Due to the fact that in modern construction almost all operations are performed manually by humans, in practice no even the most accurate IMT model will be accurately constructed. No matter how professional the craftsmen-executors are, technical errors occur.

Already now the construction industry is piloting robotic systems, so they are used for bricklaying, plastering, carrying and installing sheet materials, robotic cranes and robots for handling wooden building materials, robots for demolition of buildings and structures, 3D printers, drones and others.

In the future, robots will reduce the number of errors and project adjustments caused by them, increase the accuracy of installation and help to follow the technological instructions of the IMT model and reproduce it as accurately as possible.

They will save time and ensure that construction schedules are adhered to.

They will help to control the management of the construction process and significantly reduce the amount of construction materials. Finally, robots will make it possible to reproduce complex geometric shapes and forms that were impossible to recreate before them.

Robots are gradually going beyond the scope of academia, technology centers, and construction giants and into the real world of medium and small contractors — they are becoming more and more affordable.

While the prevalence of robots in construction is not yet universal, real estate developers and construction companies can still gain a big advantage over their competitors by increasing their efficiency with the use of 3D printers, all sorts of specialized robots, robotic arms and drones.

3D SCANNING IN CONSTRUCTION

Periodic or permanent geodetic measurements made to monitor the construction of a project provide technical and management services to clients and investors with objective information on construction progress, design irregularities, and quantities of work performed.

3D technology is one of the most promising trends in construction, designed to automate and simplify the process.

In 3D scanning, high-precision equipment "reads" any material objects and reproduces their digital copy. This brings the design to a new level, helps to control the construction process, find and eliminate deviations from the project at the construction site, carry out landscaping of the territory, simplifies the process of monitoring the condition of finished objects, etc.² [5].

If deviations from the project are detected in a timely manner, a decision can be made quickly to finalize the project or to correct the deficiencies in the builder's work.

This article considers the main directions of increasing the efficiency of development activity relevant to today.

Each of them has both positive and negative aspects. The traditional approach, which consists of controlling the efficiency of design decisions, has a good result in improving the efficiency of development projects, but it has certain limitations due to the significant regulation of the construction industry and the need to comply with building codes.

3 The role of 3d scanning in construction site inspection. URL: <https://dzen.ru/a/Y5fQCCiVunAcapyC?experiment=931376>

4 How robots are changing the construction industry right now. URL: <https://pacs.ru/blog/tekhnologii/kak-roboty-menyayut-stroitelnyuyu-otrasl-uzhe-seychas/?ysclid=lr10rvw3bd8325924703>

At the same time, the modern approach related to the application of innovative technologies can also bring a significant effect in some cases, but is often faced with poorly developed methodology, high cost of development and implementation, difficulty in assessing the effectiveness of innovative projects, lack of a sufficient number of specialists 3D designers, drone operators, robotics engineers, programmers, managers of innovative projects in the construction industry, etc., as well as a lack of specialists in the construction industry.

Due to the fact that the construction industry is conservative to innovations, the implementation of innovations is slower than in related industries, but this lag carries a significant growth potential in this direction in the horizon of the next five years.

Summarizing the above, we see that, based on practice, it is necessary to carefully approach the selection of technical solutions for construction projects. To control the functionality, cost and efficiency of construction solutions, so that it results in a better development product for the end client without increasing the cost.

New technologies are designed to reduce construction costs by reducing deadlines, minimizing errors, speeding up approvals and automating processes.

Developers' activity in this direction is increasing every year. Many market participants are already using the described approaches, and those who are not using them yet are coming to realize this necessity or are losing their competitiveness.

In our opinion, the most effective strategy is a combination of the above approaches — traditional and innovative, it can create a competitive advantage for the company.

At the same time, the introduction of innovations can bring developers not only financial, but also scientific and experimental effect.

The trends listed in the paper can become key vectors in the future transformation and sustainable development of development activity and the construction industry as a whole.

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Методические аспекты реализации инновационного подхода к повышению эффективности девелоперских проектов

В статье авторы затрагивают вопрос конкуренции девелоперских компаний и существующие тенденции повышения конкурентоспособности девелоперских проектов в современных условиях.

Выделяется два основных подхода повышения конкурентности. Первый, организационный подход, заключается в создании дополнительной организационной единицы в структуре девелоперской компании, которая призвана контролировать выбор технических решений для строительных проектов, а также проводить их оценку с точки зрения функциональности, стоимости и эффективности с целью получения более качественного девелоперского продукта для конечного потребителя без увеличения стоимости.

Второй подход — инновационный, он нацелен на повышение эффективности деятельности девелоперской компании за счет применения современных цифровых технологий, которые призваны снижать стоимость строительства за счет уменьшения сроков, минимизации количества ошибок, ускорения согласований и автоматизации процессов, сопровождающих девелоперский проект в процессе его реализации.

При реализации инновационного подхода перечислены основные направления внедрения инновационных цифровых технологий в строительстве и дано их главное описание и характеристики.

Выявлены основные преимущества, которые могут быть достигнуты благодаря применению данных подходов: сокращение сроков строительства, повышение качества строительной продукции, уменьшение стоимости. Также в статье описаны основные

проблемы и ограничения рассматриваемых подходов, такие как высокая зарегулированность строительной отрасли, дефицит финансовых ресурсов, несовершенство методики оценки эффективности инновационных проектов, недостаток квалифицированных кадров, способных применять и осваивать инновации.

Ключевые слова: девелопмент, девелоперская деятельность, инновации, инновационное развитие, инновационные процессы, инновационные строительные материалы, цифровизация, информационные технологии, роботизация

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