Experience in digitizing the services of public authorities in the transport sector

I M Savin\textsuperscript{1,2} and S A Sinenko\textsuperscript{1}

\textsuperscript{1} Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow, 129337, Russia
E-mail: savin.vanya2013@gmail.com

Abstract. In the modern world, computer technologies 3D and VIM-modeling are being used more and more often, often you will not find architects drawing by hand. Digitalization of the construction industry is developing rapidly and in various directions. Modern construction organizations are actively introducing information technologies into their professional assets, which, in turn, will include the following business processes: starting from personnel selection, accounting, internal document management, planning, development and placement of advertising, search and customer support, procurement, production of goods, performance of work, provision of services, ending with control over the execution of contracts, and many others. Technologies of augmented reality, the Internet of things, 3D-printing, generative design, machine learning, technologies including three-dimensional representation of buildings and structures, premises and many other technologies that help make various decisions are of particular importance. The article outlines some considerations about digitalizing the functions of a contractor, technical customer in the construction of buildings. The future is fast approaching, and we are moving towards technological singularity. The issue of digitalization of the functions of a contractor, technical customer in the construction of buildings is relevant in modern conditions. Taking into account the importance of the changes that are taking place, it is necessary to start using BIM modeling for the contractor, technical customer, intended for use by the public and private customer, developer, technical customer, and contractor in order to plan and implement information modeling processes for construction projects.

1. Introduction
It should be noted that at the state level, the digitalization process in construction is aimed at:

- implementing urban planning procedures in digital format (in electronic form, in electronic form); proper maintenance and storage of documents of urban development activities in electronic form; collection and publication of statistics collected automatically by extracting data from information systems; processes for the formation of search and reference platforms; introduction of information modeling technology for capital construction objects.

The rapid development of the latest technologies requires a technical customer, contracting construction organizations to adapt to modern realities. The goals and objectives of the current period are the need to learn how to continuously develop and transform certain functions, to develop trajectories of adaptation to modern production conditions. This problem is closely related to the development of the modern economy. A distinctive feature of the technological process of building production, in addition to a large number of parameters affecting its final cost, is the use of a large number of different
types of resources and the ability to create various combinations of these resources in the form of certain sequences.

Development of technology, the growth of foreign equipment contributed to the launch of online platforms for the technical customer.

Among the highly promising technologies, the specialists of the World Economic Forum (WEF) called augmented and virtual reality (58%), blockchain (45%), 3D printing (41%) and unmanned vehicles (40%) [1].

Digitalization of services is a unique opportunity to use a variety of presentation principles, remembering and transmitting informational nature, including the possibility of encrypting messages, transmitting in a certain form, as well as the possibility of subsequent decryption, the ability to transmit information using various material carriers; copying and distribution of information without loss of accuracy; a multiple increase in recording density and transmission speed, as well as “not decreasing” and “not disappearing” when consumed; its algebraic properties definitely improves the digitalization process itself, makes it more efficient compared to analog ones. Distinctive features of the transmission of digital information have influenced the emergence of a whole scientific field of “digital economics” [1], which includes both mathematical methods and models based on the digital format for presenting information and its properties arising from it. In this case, one can indicate as an example the technologies used in logistics, geotechnology, modern technologies for providing banking services, technologies for implementing information security, etc.

The current relevance of the digitalization of the activities of the contractor and technical customer is explained by the fact that the modern approach has undoubted advantages, in addition, this approach has been partially tested. The old approach corresponds to all the cliched ideas of the “ordinary” contractor, technical customer about Russian reality, where there are cynical administrators, cruel investors and a lot of the most diverse subjects of government impede the introduction of electronic controls.

According to experts, the development of artificial intelligence, Big Data and the “Internet of things” will inevitably lead to a reduction in the number of employees, they will be replaced by robots and automated systems. However, human employees will still be needed, only they will have to study throughout their lives.

The world is on the verge of the fourth industrial revolution (<Industry 4.0>), which will lead to the automation of most production processes, increased labor productivity, economic growth and increased competitiveness of industrial enterprises.

Digital transformation embraces not only production activity itself, but also changes in organizational structures, business models, the formation of a digital culture in terms of social and educational aspects. Of course, the use of information modeling (BIM) is an important and necessary basis for such a transformation.

Building information modeling (BIM) is a technology for optimizing design and construction processes, which is based on the use of a single building model and the exchange of information about any object by all participants throughout the life cycle from the owner’s intention and the architect’s first draft to the technical maintenance of the finished building. One of the advantages of BIM over computer-aided design (CAD) is its support for distributed use, which allows using this technology to implement IDA (interactive disassembler, which is widely used for reverse engineering). The BIM toolkit is designed to eliminate redundancy, re-entry and data loss, errors in their transmission and conversion.

The introduction of the IDA approach and BIM tools requires organizational and structural changes that are involved in the design and construction process of companies. The experience of foreign firms shows that the efforts made in this direction will pay off by increasing productivity and quality of work, and as a result, by increasing profits. For the investor or owner of the construction project, the result of applying BIM and the IDA approach is to reduce investment risks due to the predictability of the project implementation and guarantee that the constructed building meets its goals, desired technical and economic characteristics.
2. Materials and methods
The construction industry is increasingly using the clouds. Autodesk, taking into account the various cloud capabilities, compiled the main applications used, destroying all unnecessary, added a new one, which further contributed to the emergence of cloud services such as BIM 360. Autodesk BIM 360 is a collection of cloud services that can be used at various stages from the beginning of the design of construction projects, access to which is carried out both from desktop applications and from mobile devices. This BIM 360 service made it possible to create an alliance of all participants in the construction project, while increasing the speed of completion of the project and reducing possible risks. Cloud solutions of Autodesk and other companies contribute to the organization of joint work, management, management of construction projects, facilities and construction production in general, planning of construction, modeling of the construction site and analysis, at the final stage, the possibility of forecasting technical operation and the appointment of responsible persons for technical support of facilities.

The economic incentive for the transition of the construction market participants to new digital technologies, including BIM, is the development in universities and colleges of a special training course for new specialists for the construction industry, as well as retraining of existing ones. BIM technologies are needed to eliminate redundancy, re-entry and data loss, errors in their transmission and conversion. The creation of an IDA approach and BIM tools involves organizational and structural changes involved in the design and construction process of enterprises. The experience of foreign companies shows that transformations in this direction can pay off by an increase in productivity and quality of work performed, and subsequently by an increase in the company's profit. For investors of construction projects, the result of applying BIM technologies and the IDA approach is a significant reduction in investment risks due to the predictability of the project implementation and certain guarantees that the constructed building will meet the goals and the desired technical and economic characteristics.

The direct use of integrated information systems in construction is extremely slow, the approximate lag behind industries such as shipbuilding or engineering is one and a half to two decades. If in heavy industry in different regions of our country, enterprise management systems have been widely introduced since the late 90s, then for construction production this remains a new and modern challenge. It seems to us that the start of operation of such systems is the most difficult, therefore specialized corporations appear in the markets that are engaged in professional development and making proposals in the base system, offer their services to the customer for the gradual and phased launch, commissioning, adjustment of various systems. Obviously, in this case, a quick optimization of construction production is not possible, but in the future the mass residential construction sector will be especially effective, where the use of standard projects is possible.

The specifics of construction production directly depends on working with many different subcontractors. In Western countries, such as Sweden or Finland, such control and monitoring systems are associated with a single standardized BIM solution, i.e. a certain digital representation of both the physical and functional features of the projects, which includes the necessary characteristics about the construction site, which is a full-fledged “bimification” of the entire construction industry, including detailed parametric design in 3D and the creation of simulation information models and ending with decision management, the efficiency of the construction process production and control, as well as operation of the project. Such an interconnection between the management of the construction project itself and the quality control system directly with BIM is today effective and promising for any construction corporations. For example, Setl Group today uses a product unique to the construction market for building control. This is not only attracting investors, but also a prerequisite for all participants in the construction industry from customers, contractors to buyers of construction projects.

Such a system includes many modules that determine the schedules of various works, collection, automation of reporting on the stages of construction, planning a working day and determining the degree of readiness of an object for delivery. Technical supervision in construction should provide not only the acceptance of construction and installation works, but also monitor the quality of various works. In this case, the human factor may incorrectly determine the state of construction projects. For example,
if there is a delay in work, the builders themselves try to eliminate this problem by transmitting this information to higher authorities, which can lead to interruptions in the deadline for the completion of certain works. This is a loss of resources. The introduction of an automated building control system prevents the development of such situations, because all emergency situations are immediately known to all concerned. This is possible due to the fact that there is a special control department for employees, who regularly visit construction sites and enter data into a common database, which generates reports on the performance of work. Full automation of construction production provides impartial quality control of all types of construction works. Employees are moved around the facilities by means of a route map, which indicates the floor, building, etc. A similar scheme determines for each controller a new section of the project for each day, which reduces the likelihood of missing something, not taking into account, because double-check of controllers takes place. The monitoring of construction production at different places is fixed by means of a notification on the controller’s tablet that he should check and what indicators he will have to enter into the system. For example, photographing the installation of a heating system, water disposal, measuring the area of a room. It is possible to use a laser scanner that removes a cloud of points that transmit the real dimensions of the building, then they are combined with a 3D model and all the flaws are highlighted in a special color. Then another controller begins to work, which receives the same task for fixing the parameters and the system itself begins to analyze how the defects have been eliminated. When constructing large facilities with a large number of queues, the use of such systems is especially relevant, because allows you to eliminate the delay in the work of various types.

Using an automated investment control system will allow for better customer interaction with contractors. At Setl Group facilities, it is possible to eliminate long discussions of problematic issues, as it is possible to provide an objective picture of the work performed, simulation of construction schedules, calculate volumetric indicators of areas and time of work performed. Such a system includes several options for eliminating construction deadlines, such as a warning, offer of assistance transferring part of the work to other companies, etc. In case of failure to fulfill the conditions of the customer, it is sometimes more profitable to change the company than to spend resources on modernization and elimination of shortcomings in the construction industry. The head of construction projects must quickly and clearly make decisions to ensure that there are no breakdowns in the deadlines of objects. Therefore, the faster the problem is detected, the faster it can be solved using an automated system that saves all the data on the object that has been executed by Setl Group objects. Preservation of the tabular format, commentary, key events of the project, elimination of shortcomings during construction, the history of a particular room help the manager in making various decisions, as well as in the future, to provide customer service information to potential customers. A large amount of information, workflow is minimized by using the construction control of Setl Group. Today, this system is fully implemented, which can significantly increase the quality of construction and reduce the time for commissioning.

The emergence of online storage, such as Google Drive, Yandex Disk and others, has contributed to the fact that the time taken to send and transfer necessary for the transfer of any kind of documentation is greatly reduced. The big plus is that all this has significantly reduced the amount of paper, drafts and waste paper that inevitably appears during the maintenance of any documentation from the beginning to the completion of construction projects.

The Government of the Russian Federation, launching national projects, announced a significant change in approaches and technologies for working on them [2]. Two years ago, there was a need to deal with issues of project management methodology, the development of relevant regulatory documents, training and certification of personnel - managers responsible for project management. The new program, launched at the end of 2018, provides for the training of Chief Digital Transformation Officers for professionals who provide digital transformation.

In today's world, no one can say with certainty what will be done in ten years: not a person, not a company, not an industry, not a region.
The dynamism of modern technology requires the technical customer to constantly adapt to new challenges. The task of the technical customer in many ways is to learn to continuously develop and transform its functions, to develop the trajectories of its adaptation to modern production conditions.

However, this is a problem for our economy. Anything good for short-term growth is bad for long-term growth. And everything that is useful for long-term economic growth cannot be presented in the statistics of next year [3,6,8,9,11].

3. Result
The Moscow government ensured the translation of the entire cycle of procedures - from the beginning to the end of construction into electronic form. The developer receives public services on the official portal of the mayor and the Government of Moscow, and all documents that are necessary for the provision of the service and are available from the federal and Moscow authorities are obtained through electronic interagency interaction and are not requested from the applicant [4,5].

Description of the official portal of the mayor and the Government of Moscow, its electronic services and capabilities:

You can apply from anywhere in the world and at any time using the Internet through your personal account on the official portal of the Mayor and the Government of Moscow, which significantly saves the time of the builder.

There, on the portal, you can track the progress of consideration of your appeal.

The procedure does not require a full-time visit from the builder at any stage of the application consideration.

The authorities and organizations of the Moscow Construction Complex through the official portal of the Mayor and the Government of Moscow provide developers with 19 key services (15 of them are provided exclusively in electronic form).

Electronic services of the Moscow Architecture Committee:

- preparation and issuance of urban plans for land plots;
- preparation and issuance of a certificate of approval of the architectural and urban planning decision of the capital construction facility;
- execution of a passport for the coloristic decision of the facades of buildings, structures, structures;
- provision of information contained in the integrated automated information system for urban planning of the city of Moscow;
- approval of the design project for the placement of signs;
- acceptance of executive documentation for maintaining the Consolidated plan of underground utilities and facilities in the city of Moscow;
- providing information from the Consolidated Plan of Underground Communications and Facilities in Moscow;
- an information service for sending proposals on amendments to the Land Use and Development Rules of the city of Moscow.

Mosgosstroinadzor electronic services:

- issuance of building permits;
- issuance of permission to commission facilities;
- issuing a conclusion on the compliance of the constructed, reconstructed capital construction facility with the requirements of design documentation, including the requirements of energy efficiency and the requirements for equipping the capital construction facility with meters for the use of energy resources;
• submission by developers of notifications of the beginning of construction, reconstruction, overhaul of the capital construction facility;
• submission by developers of notifications of completion of construction, reconstruction, overhaul of the capital construction facility.

Electronic resources of Moskomekspertiza and its subordinate organizations:
• conducting a state examination of design documentation and engineering survey results;
• coordination of special specifications.

Electronic services of Moskomstroyinvest:
• submission by developers of quarterly reports on the implementation of activities related to raising funds from participants in shared construction;
• issuance to the developer of a statement on the compliance of the developer and the project declaration with the requirements established by Part 2 of Article 3, Articles 20 and 21 of Federal Law dated December 30, 2004 No. 214-FZ “On participation in shared construction of apartment buildings and other real estate objects and on amendments to some legislative acts of the Russian Federation.”

Electronic services GBU "Mosgeorgeotrest":
• Providing a technical opinion on the conformity of project documentation to the Consolidated Plan of underground utilities and facilities in the city of Moscow.
• Conducting a geodetic survey of underground utilities and structures, underground parts of buildings and structures.
• Also, separate state services of authorities that are not part of the Moscow Construction Complex are available for developers in electronic form.
• In addition, through the official portal of the mayor, the services of resource-supplying organizations are provided in electronic form.

Modern electronic resources of the Moscow Government for the work of the customer-developer:
Register of business reputation of the partners of the Government of Moscow https://stroi.mos.ru/document/1066;
Automation system for the formation of the Targeted Investment Program in Moscow and the Housing Renovation Program in Moscow "Construction investments" Information-analytical system of urban development management
Automated system "Monitoring of urban development objects"
Integrated Automated Information System for Urban Planning of the City of Moscow https://isogd.mos.ru/
Automated information system "Town-planning plan of the land plot (for individuals and legal entities)"
Automated Information System "Architectural Urban Solutions"
Automated information system "Regulation of the movement of construction waste, demolition and soil in the city of Moscow"
Automated information system "Monitoring of investment activity in construction"
Building complex services
1. "Cabinet of the developer"
2. "Developer Calculator"
3. "Unified Contact Center Stroykompleksa"
Automated information system "Town-planning plan of the land plot (for individuals and legal entities)"

Register of business reputation of the partners of the Government of Moscow, Portal of public services.

Thus, on the part of state bodies and services, all the necessary information is received by the technical customer without problems and in a timely manner [4-13].

4. Discussion

“Automation technologies can remove the need for routine administrative work and allow employees to focus on solving more complex issues while reducing the risk of errors,” explain experts at the World Economic Forum (WEF).

A distinctive feature of the technological process of building production, in addition to a large number of parameters affecting its final cost, is the use of a large number of different types of resources and the ability to create various combinations of these resources in the form of rigid sequences of sequences.

Today, the work of a technical customer is multifaceted and depends on the initial state of the project and the needs of the builder, which may be state authorities, development companies, construction companies, industrial companies.

With the advent of cloud storage, such as Google Drive, Drop Box and others, the time required to transfer any documentation has significantly decreased. At the same time, they saved us from storing mountains of waste paper and drafts that had been accumulating on the shelf until the project was completed.

The construction industry does not stand still and is actively using clouds. Autodesk, taking into account all the cloud capabilities, compiled the main applications used, deleted everything unnecessary, added a new one - and as a result received BIM 360 cloud services.

Autodesk BIM 360 is a set of cloud services used at the design and construction stages, accessed both from desktop applications and from mobile devices. BIM 360 allows you to unite all participants in the construction process, thereby speeding up the implementation of the project and reducing risks.

The cloud solutions of Autodesk and other companies allow you to organize collaboration, manage, manage projects, tools and construction, plan the construction process, take models to the construction site and conduct analysis, and at the end, predict operational plans and designate those responsible for providing technical facility support [1,2,8,9,10].

5. Conclusion

Based on the results of consideration of all the functions of the technical customer, the following conclusions can be drawn:

The obligations of the technical customer are so voluminous and varied that it is impossible to successfully fulfill them without having many years of experience. Professionals in this field are not only well acquainted with the technical side of the matter, but also protect the financial interests of the developer and are aware of all the legal subtleties of preparing and agreeing on project documentation.

For a more efficient work and integration of various stages and types of work, a technical customer needs to use modern software systems, portals and BIM technologies.

Economic incentive for the transition of construction market participants to new digital technologies, including BIM [7].

Stimulating the development of domestic BIM programs [7].

Connecting universities and colleges to train new specialists for the construction industry, as well as retraining existing ones.

Currently, the activities of government bodies, development companies, construction companies, industrial enterprises, contractor, technical customer is multifaceted and depends on the initial state of the project and the needs of the builder, construction conditions, which largely determine the level of
preparation of production and the conditions of interaction for the speedy construction of buildings and structures.

References
[1] Sinenko S A, Ginzburg V M, Sapozhnikov V N, Kagan P B Ginzburg A V 2019 Automation of organizational and technological design in construction (Saratov: Higher education) P 240
[2] Gordienko I O Autodesk BIM 360 the future of the construction industry https://sapr.ru/article/25528
[3] GOST R 57363-2016
[4] https://www.mos.ru
[5] The Urban Planning Code of the Russian Federation of December 29, 2004 N 190-FZ (as amended on August 2, 2019) (as amended and supplemented, entered into force on November 1, 2019)
[6] Guide to information modeling (bim) for customers on the example of industrial facilities. BIM-STANDARD for industrial facilities. Version 1.0
[7] SP 333.1325800.2017
[8] Usanova, K., Vatin, N. 2017, Advances and Trends in Engineering Sciences and Technologies II - Proceedings of the 2nd International Conference on Engineering Sciences and Technologies, ESaT 2016, pp. 297-302.
[9] Vatin, N.I., Usanova, K.Y. 2019, Advances and Trends in Engineering Sciences and Technologies III- Proceedings of the 3rd International Conference on Engineering Sciences and Technologies, ESaT 2018, pp. 651-656.
[10] Resolution of the Moscow Government No. 880-PP of December 24, 2013
[11] Sklyar A.V., Marinchenko T.E., Babadzhanyan M.B., Asryan G., 2019. IOP Conference Series: Earth and Environmental Science. V. 403. P. 012043, DOI: 10.1088/1755-1315/403/1/012043
[12] Marinchenko T.E., 2019. IOP Conference Series: Materials Science and Engineering. V. 643. P. 012007. DOI: 10.1088/1757-899X/643/1/012007
[13] Resolution of the Government of Moscow of June 16, 2014 N 335-PP