Who Can be CDO in Construction?

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Abstract. Digitalization of the economy requires new specialists for data-based management called Chief Data Officers (CDOs). It is noted that digitalization is no longer the prerogative of a single IT industry. The digital transformation of the construction industry introduces general processes of digitalization, but it has its own peculiarities. The technology of building information modeling (BIM) is being implemented by construction sector companies. The specialist who leads the implementation of information modeling technologies in the organization is a BIM manager. A BIM manager, as well as CDO, must have competencies in the field of IT, management, and data applications. Analysis of the functions and competencies of a BIM manager allows us to conclude that he can become a CDO for managing the organization’s production activities based on BIM data.

1. Introduction
The Russian economy, like the economies of other countries, is undergoing a digital transformation. Data is now recognized as one of the most important of the strategic assets. Data should be reliable. Special processes and standards should be created for efficient use of data. Many organizations of all levels and sizes aim to make data management another business function. Changes are taking place in the organizational and management structure of the organization, and new specialists are required. Many organizations now have a Chief Data Officer (CDO) position or entire data management departments.

According to research by Gartner [1], the global demand for Chief Data Officer is growing rapidly. By 2021, CDO will be among the top managers of 75% of large companies, along with Chief Information Officers (CIOs) and managers of other important areas, such as finance, HR, etc.

Informatica published the results of a 2017 study entitled "the New role of the CDO"[2]. 108 CDOs from the e-business group took part in the survey. Respondents stated that ensuring data management is a priority project for the CDO, including establishing clear rules for data access and sharing, as well as ensuring data quality and reliability. The ultimate goal of a CDO is to enable companies to create business value. The most popular candidates for becoming CDO are data scientists, who simultaneously have knowledge of technology and business.

The need for CDOs arises in a wide variety of areas of the economy, from medicine and agriculture to education and metallurgy. In America, it is necessary to have a CDO in every Department of Government administration [3]. Most experts agree that the competencies, roles, and functions of a CDO differ from company to company depending on its needs. It is very important to know the specifics of data and information systems used in various sectors of the economy.
2. Materials and methods
The purpose of the study is to determine who can be CDO in construction and to determine the specifics of the work of CDOs in the construction industry. The research method is a system analysis of construction information, a comparative analysis of universal CDO tasks and data management tasks in construction. It should be noted that there are two types of CDO decryption (Chief Digital Officer and Chief Data Officer), but these are specialists with different goals and functions. In this study we are talking about Chief Data Officer.

3. The role of chief data officer
In 2014-2020, there was a lot of research on CDOs in the world. In papers [4,5] the business areas where CDOs work most often are analyzed. These are the IT sector, the banking sector, the service sector and the trade sector. Paper [6] discusses three main areas of CDO activity: «collaboration direction, data space, and value impact». The main functions performed by the CDO in the organization are described. Paper [7] discusses the importance of CDO work to improve data quality.

In papers [8, 9] competencies of CDO were analyzed to take responsibility for data management. It is noted that the key competencies of CDO consist of the following areas of knowledge: data science, management and business, information technologies. In addition, CDOs must understand the regulatory issues that accompany the use and transfer of data.

Paper [5] analyzes the ways to get CDOs depending on the size of the organization. It is noted that de facto job titles in organizations can be different, not necessarily CDOs. In [4,5,10,11,12, 13] the conversion between CIO to CDO is often discussed. It is concluded that the boundary between CDO and CIO responsibilities is often blurred. Many experts think that it is not necessary to convert existing positions CIO into a CDO position. The CIO and CDO must complement each other and work closely together to achieve digital transformation in the organization. The main objectives of a CDO are to connect technology and business, as well as to build a data-centric culture of the organization. Both tasks involve major changes in the organizational structure of the company.

Article [10] describes the main functions of CDO. This includes managing data, training employees in how to work with it, and distributing access rights and data operations. In [14] it is noted that the CDO is necessary for effective coordination of tools and specialists for operational data management processes. Article [15] presents a diagram of CDO operational tasks. In [16] it is noted that a CDO requires a technical education: for example, mathematics or engineering. Marketing training will also be useful, which will help to build business processes and promote organization's digital assets. The demands of the labor market are changing in the direction of universality (to replace narrow specialization).

3.1. Chief data officer in Russia
In Moscow, the INFADAY 2019 forum hosted a discussion of CDOs from different sectors of the economy [17]. Participants noted that the position of CDO has ceased to be exotic. Most of the largest Russian companies were able to decide for themselves how much they need this position and what tasks it includes. Operational data management processes include searching, creating, integrating, using, monitoring, and updating data. The focus should be on the context in which the CDO operates. The issue of data quality (and so the personal responsibility of each employee who processes or uses data) is very acute. It is concluded that taking into account the digitalization of private and state-owned enterprises, the demand for CDOs in Russia and around the world will increase every year.

In Russia, the development of human capacity is the main focus of state programs. Within the framework of the national program "Personnel for the digital economy", the educational program "Data-based management (Chief Data Officer in government)" was developed and implemented [18]. Data-based management is the application of methods and technologies for data collection, structuring, and analysis to build new organizational and management models in the organization and region. The areas of practical application of the educational program can be public services, health, education, cadastral registration, culture and tourism, agriculture, social sphere, urban environment.
3.2. Digital transformation of construction in Russia

Digital transformation is a deep reorganization and reengineering of business processes with extensive use of digital tools as mechanisms for process execution. Digital transformation of construction in Russia includes three areas of activity: creation of a state information system for urban planning activities; digitization of all services and procedures; development of information modeling of construction objects. Information modeling is the process of creating and managing data about a construction object at all stages of its life cycle. Data should be used effectively, should be analyzed, and should serve as a basis for generating new data and knowledge.

A modern type of digital data about a construction object is its information model. The Information model of a construction object is a set of interrelated information, documents and materials about a construction object that are generated electronically at stages of its life cycle [19]. The information model includes a digital information model of landscape and a digital information model of construction object. A digital information model is a digital twin that contains up-to-date data about an object over its entire lifecycle. Information modeling of building is called the Building information modeling (BIM). Very often, the abbreviation BIM is used for the name of the modeling of any construction object.

The implementing of information modeling technologies is associated with new business models, new business processes, new business roles, a new organizational structure, and new means of automating architectural and construction works. The necessary resources are software, hardware, network resources and communication tools, libraries of information model components, and specialists in the field of information modeling.

There are three main tasks of managing information modeling of construction object: strategic, managerial, and production. Strategic tasks involve: corporate objectives, research, process + workflow, standards, implementation, training [20]. The head of implementation and development of information modeling technologies in an organization is often called a BIM manager. Experience shows that there is a demand for a universal specialist who understands the business processes of the design and construction organizations, who knows digital tools and technologies for creating, using, and analyzing data from the information model of construction object, who can manage a team of specialists [21,22].

4. Results

As a result of the analysis of functions of CDO and BIM manager, a comparative table was formed (Table 1).

| Table 1. Universal CDO tasks and data management tasks in construction. |
|--------------------------------------------------|--------------------------------------------------|
| CDO                                              | BIM manager                                      |
| Strategy development                             | Development of a strategy of information modeling |
| Digital transformation                           | Implementation of BIM technology                 |
| Defining the information model                   | Defining information modeling processes          |
| Defining the data architecture                   | Defining BIM uses and appropriate set of required data |
| The definition of infrastructure to work with data | Organization of common data environment, engineering data exchange systems |
| Organization of data storage                     | Defining rules for naming, storing, and exchanging data |
| Implementation of data processing technologies   | Analysis of BIM employee competencies, creation of a corporate employee training |
5. Conclusions
The goal of data-based management is to improve the organization's effectiveness. The nature of data that is used in a particular branch of the economy and a particular organization determines the specifics of data-based management. The choice of data-based organization management method is determined by the goals of digitalization of the economy, as well as external factors and trends in economic sectors.

CDO and BIM manager are members of the organization's digital transformation teams. Data analysis based on mathematical methods of data analysis, including the use of end-to-end digital technologies. A comparative description of the activities of the CDO and BIM manager allows us to get a conclusion about the similar nature of the specialist’s activities. BIM manager can become CDO in construction. But to work in public administration additional training is needed.

The differences between universal CDO and BIM manager are the following. The CDO activity is based on the analysis of market research data, the BIM manager activity is based on the goals and requirements of the customer. The goal of the CDO is to monetize data within the organization's activities. The goal of the BIM manager is to increase the efficiency of data for a large number of organizations throughout the life cycle of construction object.

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