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The paradigm of the integration of different types of management information systems in investment and construction company implementing the project approach

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Abstract

The report examines trends in the development, construction project management systems in the overall system of the global network economy. The approaches of system developing the information tools of investment and construction project management of complex infrastructure projects is proved throughout their lifecycle from project initiation to disposal facility.

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1. Introduction

The basis of modern tools of project management methodology provides structuring operations and network planning that have been investigated in the late 50-es of XX century. But now, with the advent of affordable high-performance computer systems, these techniques have found wide application in the construction business. At present, almost all the developers of management software applications offer a wide selection of the range of application

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software. In PPM (Project Portfolio Management) and PM-lines they propose more than 100 programs of various foreign and domestic manufacturers.

2. The paradigm of the integration of different types of management information systems in investment and construction company

Implementation of project management is based on the famous circular management model, in which the simulation of long-term projects is fulfilled, and then their performance with the support of the automated control systems is carried out, is monitored (controlling) with the adjustment model of the project or the development of new, more effective projects. Information adjustments, as a rule, are subject to all the processes involved in this project. This generalized model is set at the level of the most important project management features and is a closed loop self-regulation. It is unique for all areas of business automation and opens system-organizing control function¹. This paradigm is consistent with the concept of a unified Enterprise Performance Management and in practice can be supported by CPM (EPM, BPM) –systems².

In the investment-construction business PPM strategic management system and PM tactical management system until recently has been separated from control of technological processes of the lower level in the hierarchy governing information systems. So, the construction design was performed using computer-aided design (CAD), for example, "AutoCAD 3D", or "COMPASS". The process of realizing the construction of the object was accompanied, as a rule, by using PPM and PM-systems, "Primavera Project", "Spider Project", and operational and tactical control was carried out in the ERP-system "1C: Enterprise 8", or "SAP R/3". The simulation of projects and processes was undertaken using BPMS systems such as "ARIS", "BizAgi", "PiterSoft: process Management" on 1C platform: "Enterprise 8", the Prognoz Platform etc. The strategic concept of the process management of BPM organization (Business Process Management) using BI tools could also be implemented in conjunction with BPMS-systems ARIS and ERP systems "SAP AG R/3. After completion of the construction project construction project itself has functioned separately and subsequent automation of business processes involving that object, was done in specialized systems.

In modern conditions the formation of a global network (electronic) economy, in the conditions of intensification of information processes in the control loop (fig. 1), there is a need for a system of automation of all management processes throughout the life cycle of the created a useful product (object). So, the concept of the fourth industrial revolution "industry 4.0" and "Internet of things" appeared. These concepts imply "smart" ability of all inanimate complex objects optimally to serve man throughout his life cycle. In high-tech industries to manage the life cycle of the manufactured product representing a complex system (missile, airplane, car, ship, etc.), PLM (Product Lifecycle Management) systems are used.

The emergence of the PLM information models in management allows you to quickly and effectively align and optimize the lifecycle management of useful product with business and technological processes, and also with the resources in the specified schema.

In the investment-construction business, by analogy with PLM systems appeared the concept of a BIM- technology (Building Information Model) based on the information modeling of the building object, covering the whole life cycle of this object. The development of BIM technologies in the construction business, as a special case, firmly established the concept of information BLM – life cycle management of the building. In the investment-construction business, by analogy with PLM systems appeared the concept of a BIM-based building information modelling object, covering the whole life cycle of this object. The development of BIM technologies in the construction business, as a special case, firmly established the concept of information BLM – life cycle management of the building. The use of BIM technologies is the backbone of new, leaner design and construction methods such as Integrated Project Delivery (IPD) and Virtual Design and Construction (VDC).

Denote the life cycle of the construction object in the proposed paradigm the horizontal temporal process. In the end, the spatial three-dimensional 3D CAD model of a construction object (building) becomes a fourth horizontal dimension. In the fourth dimension information model is constantly changing, supplemented, reflecting the current state of the object (building) from the beginning of its design, then construction and ending to its disposal (demolition). Sometimes a 4D model in time (3D plus time) can be complemented with a fifth dimension, i.e. the ranging information, or specifications. Therefore, in some sources it is possible to meet the designation 5D.

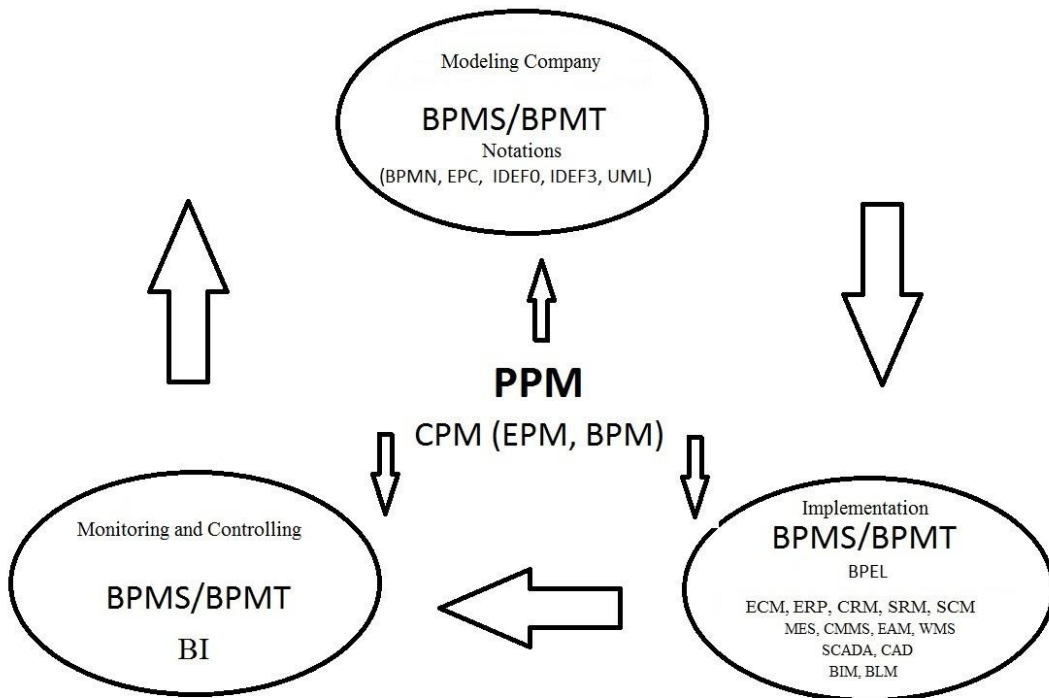


Fig. 1. Paradigm use of various types of management information systems investment and construction company implementing the project approach.

Currently there is no established conceptual framework in dimension D, but the direction of the new concept already fully formed. Now BIM technologies show their effectiveness in the implementation of investment and construction projects, as increase in the speed, volume, quality construction, save the budget funds and increase the responsibility for the service units to consumers throughout the life cycle of the object. The effectiveness of supporting "smart" product throughout its life cycle has already been confirmed in many sectors of the economy. Thus, complex technical products (airplanes, cars, ships, etc.) are often sold to consumers at the cost, and the profit the company receives for the account of the after-sales support, as well as by utilizing the overage, product. And these trends are one of the main features of modern and future network economy.

The construction business is no exception, and, increasingly, the emphasis on profit is transferred to the operation of construction objects. There are already positive examples of implementing such investment projects in the form of highways, railways, pipelines. In some cases, the completion of the product life cycle (disposal) may be more costly than all previous stages.

As example, the radiation-hazardous construction and investment projects in nuclear energy, such as nuclear power plant construction can be given. In the world there is just no experience decommissioning large reactors³. And in the near future, serious environmental problems will represent the elimination of worn-out power generating units. When the dismantling will be required to transport and bury the many thousands of tons of highly radioactive waste⁴. To estimate economic costs in this case is not yet possible. It is obvious that the construction of such repositories for radioactive waste will require huge investments, which in the future will be associated with constant energy, material and human costs. Moreover, these costs in the foreseeable future will only grow. The decay period of most radio nuclides in the waste is hundreds and thousands of years. It is clear that the implementation of such radiation-hazardous construction and investment projects should take into account of all life cycle of construction object together

with the environmental projects (draft regulations, draft sanitary protection zones, implementation of modern methods in radiation monitoring projects and the use of modern environmental technologies, etc.)

In the vertical hierarchy of control systems BIM (BLM) technology is used at the bottom tier, as a replacement for CAD, but during the whole life cycle of building object. It should be noted that BIM-modern technologies aim to cover not only production processes and product life cycle, but also take on the role of operative, operatively-tactical and even strategic management in construction companies. There is a tendency of splicing PPM and PM systems with BIM-systems, that is, the inner content of the new concept of structural design covered not only CAD, but also construction and investment projects in a broad understanding of the project activities.

3. Conclusion

The aspiration of system using a vertical of information flow from strategic management to management of technological processes and products is becoming more apparent. Such vertical diffusion solution of the tasks in management information systems, as well as horizontal aggregation of these tasks across time reflects an important characteristic of information management in the formation of network economy⁵.

Analytical information system for company strategic management accompany "smart" product throughout its life cycle and beyond. Classic PPM-systems are limited in time and stop information support of the product after its production. Transaction management systems, generally vary throughout the life cycle of the product. Thus, in the production process can be used in some information systems, e.g. ERP, and the process operation and product recovery more. BIM-system, by definition, accompanied by "smart" product throughout its life cycle and is increasingly involve in this process, the elements of strategic management. The ability that BIM provides to design, construct and operate a building virtually will prove to be an important instrument to increase productivity and quality. The improvement of the efficiency and transparency of the building construction will attract domestic and foreign institutional investors. This representation is conditional, but it allows qualitative assessment of the trends of development of the paradigm of management of investment-construction projects in the General system of the global information network management.

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