

Scientific article


UDC 330.47

DOI: <https://doi.org/10.57809/2022.2.2.2>

IMPLEMENTATION OF PROJECT AND PROCESS MANAGEMENT IN MINING ENTERPRISES

Andrey Zaitsev¹  

¹ JSC «Polymetal», St. Petersburg, Russia

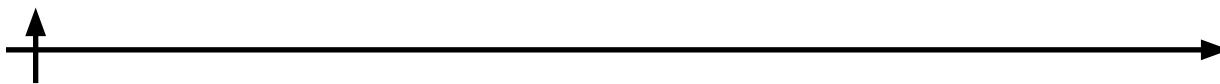
 azaitsev72@mail.ru

Abstract. The article considers and justifies the necessity of project and process approach in development of mineral deposits. Each approach has a number of advantages and disadvantages, and in practice is applied separately. This often leads to the fact that they not only do not complement each other, but in the case of illiterate use, thereby reducing the efficiency of both the mine development and the management of the mining enterprise as a whole. The authors propose to change this situation by combining the project and process approach and considering these approaches as a single management system. The proposed approach (model) allows to build a management system in real conditions for a mining enterprise consisting of both a single mine and a system of deposits (hub). Its universality is that it is applicable to all stages of its development: preparatory, construction and operation. In addition, the methodology allows to assess the contribution of mineral reserves and resources to the total market value of the mining enterprise.

Keywords: mine development, investment, project approach, process approach

Citation: Zaitsev A.Y. Implementation of project and process management in mining enterprises. Technoeconomics. 2022. 2 (2). 12–20. DOI: <https://doi.org/10.57809/2022.2.2.2>

This is an open access article under the CC BY-NC 4.0 license (<https://creativecommons.org/licenses/by-nc/4.0/>)



Научная статья


УДК 330.47

DOI: <https://doi.org/10.57809/2022.2.2.2>

ВНЕДРЕНИЕ ПРОЕКТНО-ПРОЦЕССНОГО УПРАВЛЕНИЯ НА ГОРНОДОБЫВАЮЩИХ ПРЕДПРИЯТИЯХ

Андрей Зайцев¹  

¹ АО «Полиметалл», Санкт-Петербург, Россия

 azaitsev72@mail.ru

Аннотация. В статье рассматривается и обосновывается необходимость проектно-процессного подхода при разработке месторождений полезных ископаемых. Каждый подход имеет ряд преимуществ и недостатков и на практике применяется отдельно. Это часто приводит к тому, что они не только не дополняют друг друга, но и в случае неграмотного использования снижают эффективность как разработки шахты, так и управления горным предприятием в целом. Авторы предлагают изменить эту ситуацию, объединив проектный и процессный подходы и рассматривая эти подходы как единую систему управления. Предлагаемый подход (модель) позволяет построить в реальных условиях систему управления горным предприятием, состоящим как из одного рудника, так и из системы месторождений (хаба). Его универсальность заключается в том, что он применим ко всем этапам его разработки: подготовительному, строительному и эксплуатационному. Кроме того, методика позволяет оценить вклад запасов и ресурсов полезных ископаемых в общую рыночную стоимость горнодобывающего предприятия.

Ключевые слова: разработка месторождений, инвестиции, проектный подход, процессный подход

Для цитирования: Зайцев А.Ю. Внедрение проектно-процессного управления на горнодобывающих предприятиях // Техноэкономика. 2022. Т. 2, № 2. С. 12–20. DOI: <https://doi.org/10.57809/2022.2.2.2>

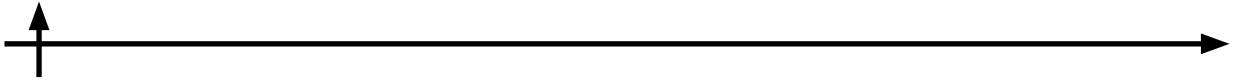
Это статья открытого доступа, распространяемая по лицензии CC BY-NC 4.0 (<https://creativecommons.org/licenses/by-nc/4.0/>)

Introduction

The development of mineral deposits is an organizationally complex and costly activity. This imposes a certain responsibility on the subsoil user and requires him, on the one hand, to invest significantly in launching and on the other hand, to be flexible and appropriate to the time and nature of the management system. Increasing competition caused by rising prices for mining products, development of complex and hard-to-reach deposits, resulting in an increase in unit capital costs, is a powerful incentive to improve the management system.

The development of an approach (model) of the management of the mine individually and of a mining enterprise, which would allow a potential investor to effectively manage all resources, is of great importance both in our country and abroad.

Existing hierarchical practices tend to try to interact and resolve issues through reports and letters to management, committees and meetings, without trying to establish a clear system and algorithms of decision-making. This approach, based primarily on the functions of the division and performer, is suitable for a small organization. But over time, an organization can grow and grow organizationally, and therefore needs a systematic approach to management. These are two approaches: project and process management. This raises the question: Which of the approaches to be applied at the mining enterprise,



which one is preferred given the stages of development of the mine.

The mining enterprise is a complex and dynamic system. As a rule, it may include several mines implemented within the framework of projects, and in turn several sites where repetitive processes occur continuously: extraction, transportation, processing (Dychkovskiy et al., 2018). At the same time, mining operations change in time and space, so the activity of the operating enterprise can be characterized by two types of activity:

1. recurring processes.
2. single processes that will no longer repeat in this form.

The first type of activity is a process, the second one is a project. That is, the business process, unlike the project, is a certain kind of conveyor to perform certain functions, whereas the project is repeated only once (Aguilar-Savín, 2004). Thus, managing a company's activity means managing its processes (Process Management) within the project. In practice, it is quite common for project activities to become project activities and vice versa.

Thus, for the effective management of the mining enterprise in the implementation of projects, clearly defined processes are necessary. This work is devoted to finding the optimal combination of process and project management approaches in the implementation of mining projects.

Materials and Methods

In order to understand project and process management, it is necessary to define their definitions.

The concept of a business process, like a project, is interpreted differently, but in this case it can be based on the definition given in ISO 9000: Process is a set of interconnected and interacting operations (actions) that transform inputs into outputs (Karapetrovic, 1999). Processes can be standardized because any methodology contains the following controls: initiation, planning, execution, analysis, management, completion. The approach, when the resources and activities of an organization are managed as a process, is called a process. In practice, a functional approach is most often used when the functions of the entity are the objects of control. However, in the case of a process approach, the objects of control are processes that focus on achieving intermediate results. The most commonly used standardized methodologies, including project management processes, include: PMI PMBOK, OGC PRINCE2 and APM APMBOK.

There are several definitions of the concept of the project, but the most comprehensive is the following: The project is a set of measures and activities aimed at changing a system by achieving certain goals, under resource and time constraints (The Open Group, 2018; Amalia et al., 2017; Ilin, Levina, Iliashenko, 2017). In other words, the project is a unique process, consisting of a set of one-time activities, as a result of which a unique product is created. Projects can be divided into two categories: development projects and ongoing projects. The projects of the first category are aimed at the creation of new assets, which can include the construction of processing facilities and the development of new mines. In turn, the projects in the second category are aimed at modernization and reconstruction of already existing assets as well as active processes of the management system. In essence, each project is a unique activity and can differ in the scale, complexity, composition and number of participants, terms of implementation, goals and tasks, object of investment activity, requirements for quality and ways of its provision. When the project is managed, it is a project approach.

For some elements, the project and the business process are similar (see table 1).

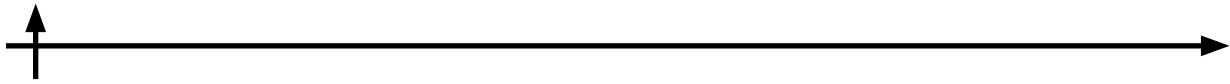


Table 1. Compare common project and process elements

Element	Process	Project
activity	repeating	one-time
term	unlimited	limited
content	implementation	planning, implementation, control, completion
assignment	converting resources to a product	creation of new assets, development of existing projects and functions, converting resources to a product
uniqueness	missing	present

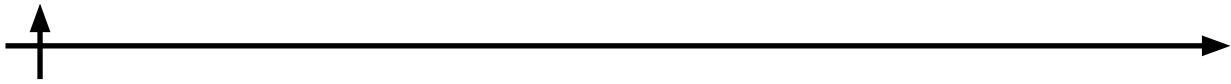
Conclusion: Process management focuses on the implementation stage and project management at all stages of the life cycle.

The composition of the organization's processes and projects depends on the nature of its activities. A trade organization, for example, is process-oriented because its activities are based on purchase-sale processes. And it may not change for years. At the same time, the construction organization, rather in its activity, is guided by the project approach. As a rule, a new construction facility may differ in its location and complexity (Levina et al., 2018; Bril et al., 2017; Dubgorn et al., 2018). But there are organizations where the project and process approach will work together. Such organizations include mining enterprises. This enterprise is a unique project by definition, as each mine is created by nature itself and cannot be repeated. The mines or group of mines form a project, the management and development of which is based on a process basis. In this case, the mining management model can be considered as a process-based project model. In terms of the tasks to be solved, the project defines the development strategy of the organization, while the process is a tactical tool for its implementation. Thus, processes are a project component and the process approach complements the project approach. In this case, we can see the addition and promotion of two approaches. A well-built management system can create synergies.

Many researchers (Lankhorst, 2017; Ermolina et al., 2015; Zaychenko et al., 2018; Burke, 2013) explicitly note the need to include in the enterprise architecture a component responsible for working with changes and transformations. The TOGAF emphasizes that the enterprise architecture among other elements should include "transition processes to implement new technologies in response to changing business needs." Because the enterprise architecture is a dynamic management tool, it requires a built-in mechanism for change management that differs from routine operating processes. These arguments prove the necessity of introducing the project slice into the model of the business architecture of the enterprise.

Results

The efficiency of any enterprise is based on the choice of its process management tools. One such management tool is the value chain. The value chain is a strategic analysis tool aimed at detailed analysis of the business for strategic planning purposes. The author of the concept is Professor Michael Porter, who has determined that it is the value chain that is the best helper in the choice of the strategy of enterprise development (Mozota, 1998; Ilin et al., 2014; Maydanova et al., 2018). This is because the concept allows us to understand what is happening in the organization, who is responsible for it, and what is the final product. Analysis and reorganization of the value chain allows to determine the efficiency of the business model of the enterprise/project as a whole, to analyze the processes separately, to highlight the necessary modernization, to increase the competitiveness of the enterprise, its profit, and return on capital. Based on the results of the analysis, the decision can be made to create additional value chains



as well as to make changes to the organizational structure of the enterprise.

The process of development of the mine involves the following value chain based on the stages of its industrial development (presented in fig. 1).

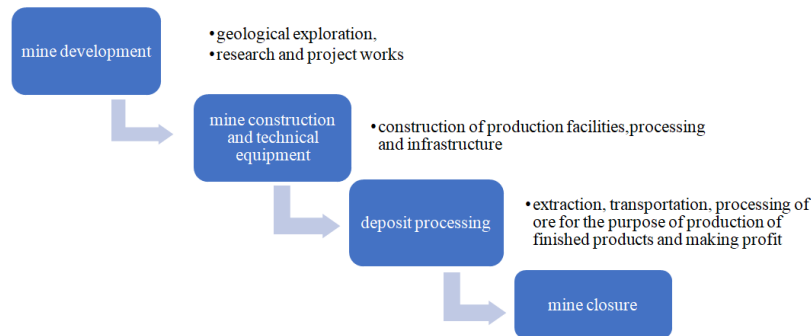


Fig. 1. Industrial development stages

The figure showcases a process of four stages, each of which can be considered separately. This is a simplified scheme, since during the mine's processing, the processes specified in the scheme can be carried out, for example, at one of its sites. Each step is independent but not independent. The fact is that without exploration it is impossible to determine the value and value of the mine itself. The absence of reliable information on reserves and potential resources of the deposit, mining-geological, mining and technical conditions and other conditions, it is impossible to make decisions on its industrial development, to start designing, construction, extraction and processing. Each of these processes has a responsible functional manager, thus it directly influences the result of the organization's activity as a whole. On the one hand, the area of his responsibility ends where his business process ends, on the other hand, the activity of one unit can affect the other, and lead to the reduction of its performance. In this regard, in the mining enterprise it is particularly necessary to coordinate the actions of all the participants of the process. In the project approach, each project has a manager who is responsible for the final result. At the same time, not only the functional units responsible for the main processes under the scheme 1, but also the units supporting the activities of the enterprise in the areas of personnel management, logistics, technology development and infrastructure can participate in the project.

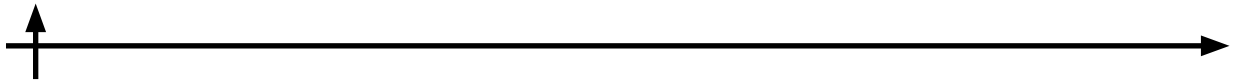
Analysis of investment projects shows that these are complex and long-term projects, implementation of which requires management in order to be effective implementation.

Business project management methodology can be considered at the main stages of the project life cycle (Labuschagne et al., 2005; Orlova et al., 2018; Ilin, Iliashenko, Borremans, 2017; Meredith et al., 2017):

3. Development of project proposal;
4. Project planning and preparation;
5. Project implementation;
6. Close the project.

Thus, the life cycle stages fully reflect the development stages of the mine. The lifecycle involves tracking and directing the project at all stages of the life cycle before its completion to achieve the intended outcome.

In addition to the current activities the company regularly implements development projects, it seems advisable to create a permanent unit in the organizational structure responsible for the implementation of project activities - a project office. To manage such projects, it may be much easier to apply



the appropriate project office model.

A team of project executives led by the project manager is formed by the project office from among the company's employees or external specialists depending on the directions and competences required for project implementation.

The supervisor of the project office is the person responsible for allocating resources for the project implementation. These powers are vested in the head of the company.

The head of the project office is the person who manages its activities in the interests of society in the part of:

7. project activity administration - workflow,
8. project competences management-methodical support.
9. analysis of projects for feasibility of implementation and formation of a balanced portfolio of projects;
10. resource management-planning, allocation, monitoring, monitoring and analysis of the use of resources for current and potential projects;
11. interaction with performers (design, expert analysis), contractors (construction, outsourcing services), representatives of authorities, including when receiving tax benefits within the framework of the project being implemented, for example, TOSER, RIP.

The functional model of the company's project office is presented in figure 2.

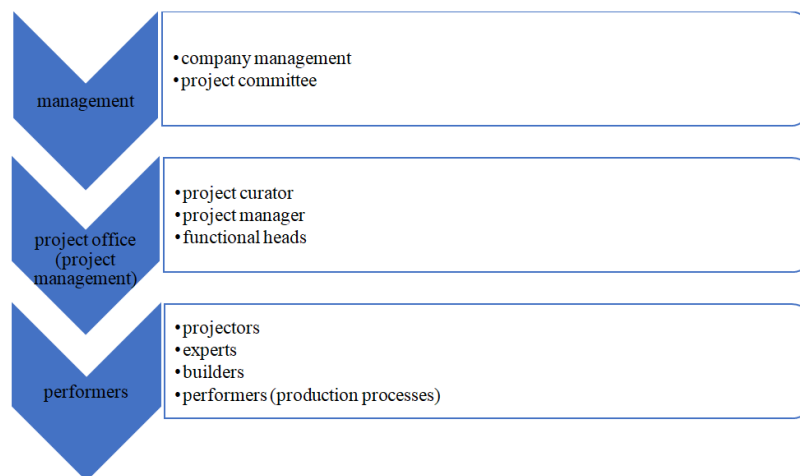
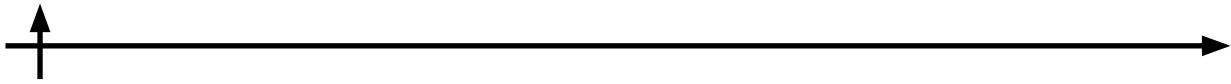


Fig. 2. The functional model of the company's project office

The project office will allow to manage individual projects, portfolio of projects (project programs) in the company. Depending on the size and complexity of the projects, the project office may create project management units of a particular type, such as IT projects. The listed functions must be presented in the project (software) office.

The creation of a process office should help to increase the operational efficiency of the business, as well as for the successful implementation of projects and programs. The main objective of the office is to improve processes, as well as to monitor and build business process performance reports for the relevant process owners and senior management. The process office can be located inside and outside the company, working on outsourcing, which is determined by the scale of the company's organizational structure. In practice, however, there is more often a mixed method of organization, where there is a small internal division that knows the specifics of the enterprise, and external expertise and resources are used to solve certain tasks.

Thus, it can be concluded that project approach combined with process management is the most



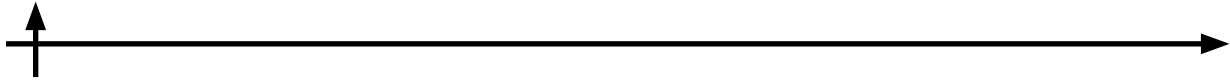
suitable for a mining enterprise.

Conclusions

In previous decades, the project's success has been linked to three variables: cost, time and quality. However, the modern world is not standing still and new variables related to governance are beginning to appear in the projects. They are mainly the result of model studies that have yet to be tested in various organizational and cultural settings. In this regard, it can be argued that in order to achieve the necessary results and sustainable development the enterprise needs to form an effective management system. In this regard, it is most appropriate to organize operational activities as well as ongoing mining projects based on business processes within the project (mines). The development of the enterprise, connected with the development of new mines and construction of processing capacities, is more convenient to build on the project approach. All this in the complex will allow faster development and commissioning of deposits.

REFERENCES

- Aguilar-Saven R.S.** 2004. Business process modelling: Review and framework : Production Planning and Control. *International Journal of Production Economics* 90 (2), 129–149.
- Amalia E., Supriadi H.** 2017. Development of enterprise architecture in university using TOGAF as framework, in: *AIP Conference Proceedings*, vol. 1855 (1), pp. 060004.
- Bril A., Kalinina O., Ilin I.** 2017. Small innovative company's valuation within venture capital financing of projects in the construction industry, in: *MATEC Web of Conferences*, vol. 106.
- Burke R.** 2013. *Project management: planning and control techniques*. New Jersey, USA.
- Dubgorn A., Zaychenko I., Grashhenko N.** 2018. A rationale for choosing the mechanism of public-private partnership for the sustainable development of social infrastructure facilities, in: *MATEC Web of Conferences*, vol. 170.
- Dychkovskiy R., Vlado O., Maltsev D., Caceres Cabana E.** 2018. Some aspects of the compatibility of mineral mining technologies. *The Mining-Geological-Petroleum Engineering Bulletin* 33, 73–82. 10.17794/rgn.2018.4.7.
- Ermolina L.Q.** 2015. Process management as an innovative approach to the management of modern enterprises. *Modern problems of science and education* 1.
- Ilin I.V., Anisiforov A.B.** 2014. Improving the efficiency of projects of industrial cluster innovative development based on enterprise architecture model. *WSEAS Transactions on Business and Economics* 11, 757–764.
- Ilin I.V., Iliashenko O.Y., Borremans A.D.** 2017. Analysis of cloud-based tools adaptation possibility within the software development projects, in: *Proceedings of the 30th International Business Information Management Association Conference, IBIMA 2017-Vision 2020: Sustainable Economic development, Innovation Management, and Global Growth*, pp. 2729–2739.
- Ilin I., Levina A., Iliashenko O.** 2017. Enterprise architecture approach to mining companies engineering, in: *MATEC Web of Conferences*, vol. 106, pp. 08066.
- Karapetrovic S.** 1999. ISO 9000, service quality and ergonomics. *Managing Service Quality: An International Journal* 9 (2), 81–89.
- Labuschagne C., Brent A.C.** 2005. Sustainable Project Life Cycle Management: the need to integrate life cycles in the manufacturing sector. *International Journal of Project Management* 23 (2), 159–168.
- Lankhorst M.** 2017. *Enterprise Architecture at Work: The Enterprise Engineering Series*. Berlin, Heidelberg: Springer Berlin Heidelberg.
- Levina A.I., Borremans A.D., Burmistrov A.N.** 2018. Features of enterprise architecture designing of infrastructure-intensive companies, in: *Proceedings of the 31st International Business Information Management Association Conference (IBIMA)*. 2018. P. 4643-4651.
- Maydanova S.A., Ilin I.V.** 2018. Blockchain as a Tool for Shipping Industry Efficiency Increase, in: *Fundamental and Applied Research in Management, Economy and Trade Conference*, pp. 50–58.
- Meredith J.R., Mantel Jr S.J., Shafer S.M.** 2017. *Project management: a managerial approach*.



John Wiley & Sons, Ltd.

Mozota B.B. de. 1998. Structuring Strategic Design Management: Michael Porter's Value Chain. *Design Management Journal (Former Series)* 9 (2), 26–31.

Orlova V., Ilin I., Shirokova S. 2018. Management of port industrial complex development: environmental and project dimensions, in: *MATEC Web of Conferences* 193 (1), p. 05055.

The Open Group. 2018. *The TOGAF® Standard, Version 9.2.*

Zaychenko I., Ilin I., Levina A. 2018. Enterprise Architecture as a Means of Digital Transformation of Mining Enterprises in the Arctic, in: *Proceedings of the 31st International Business Information Management Association Conference (IBIMA)*, pp. 4652–4659.

СПИСОК ИСТОЧНИКОВ

Aguilar-Saven R.S. 2004. Business process modelling: Review and framework : Production Planning and Control. *International Journal of Production Economics* 90 (2), 129–149.

Amalia E., Supriadi H. 2017. Development of enterprise architecture in university using TOGAF as framework, in: *AIP Conference Proceedings*, vol. 1855 (1), pp. 060004.

Bril A., Kalinina O., Ilin I. 2017. Small innovative company's valuation within venture capital financing of projects in the construction industry, in: *MATEC Web of Conferences*, vol. 106.

Burke R. 2013. *Project management: planning and control techniques.* New Jersey, USA.

Dubgorn A., Zaychenko I., Grashhenko N. 2018. A rationale for choosing the mechanism of public-private partnership for the sustainable development of social infrastructure facilities, in: *MATEC Web of Conferences*, vol. 170.

Dychkovskiy R., Vlado O., Maltsev D., Caceres Cabana E. 2018. Some aspects of the compatibility of mineral mining technologies. *The Mining-Geological-Petroleum Engineering Bulletin* 33, 73–82. 10.17794/rgn.2018.4.7.

Ermolina L.Q. 2015. Process management as an innovative approach to the management of modern enterprises. *Modern problems of science and education* 1.

Ilin I.V., Anisiforov A.B. 2014. Improving the efficiency of projects of industrial cluster innovative development based on enterprise architecture model. *WSEAS Transactions on Business and Economics* 11, 757–764.

Ilin I.V., Iliashenko O.Y., Borremans A.D. 2017. Analysis of cloud-based tools adaptation possibility within the software development projects, in: *Proceedings of the 30th International Business Information Management Association Conference, IBIMA 2017-Vision 2020: Sustainable Economic development, Innovation Management, and Global Growth*, pp. 2729–2739.

Ilin I., Levina A., Iliashenko O. 2017. Enterprise architecture approach to mining companies engineering, in: *MATEC Web of Conferences*, vol. 106, pp. 08066.

Karapetrovic S. 1999. ISO 9000, service quality and ergonomics. *Managing Service Quality: An International Journal* 9 (2), 81–89.

Labuschagne C., Brent A.C. 2005. Sustainable Project Life Cycle Management: the need to integrate life cycles in the manufacturing sector. *International Journal of Project Management* 23 (2), 159–168.

Lankhorst M. 2017. *Enterprise Architecture at Work: The Enterprise Engineering Series.* Berlin, Heidelberg: Springer Berlin Heidelberg.

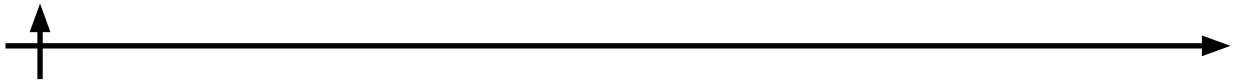
Levina A.I., Borremans A.D., Burmistrov A.N. 2018. Features of enterprise architecture designing of infrastructure-intensive companies, in: *Proceedings of the 31st International Business Information Management Association Conference (IBIMA)*. 2018. P. 4643-4651.

Maydanova S.A., Ilin I.V. 2018. Blockchain as a Tool for Shipping Industry Efficiency Increase, in: *Fundamental and Applied Research in Management, Economy and Trade Conference*, pp. 50–58.

Meredith J.R., Mantel Jr S.J., Shafer S.M. 2017. *Project management: a managerial approach.* John Wiley & Sons, Ltd.

Mozota B.B. de. 1998. Structuring Strategic Design Management: Michael Porter's Value Chain. *Design Management Journal (Former Series)* 9 (2), 26–31.

Orlova V., Ilin I., Shirokova S. 2018. Management of port industrial complex development: envi-



ronmental and project dimensions, in: MATEC Web of Conferences 193 (1), p. 05055.

The Open Group. 2018. The TOGAF® Standard, Version 9.2.

Zaychenko I., Pliin I., Levina A. 2018. Enterprise Architecture as a Means of Digital Transformation of Mining Enterprises in the Arctic, in: Proceedings of the 31st International Business Information Management Association Conference (IBIMA), pp. 4652–4659.

INFORMATION ABOUT AUTHOR / ИНФОРМАЦИЯ ОБ АВТОРЕ

ZAITSSEV Andrey Y.

E-mail: azaitsev72@mail.ru

ЗАЙЦЕВ Андрей Юрьевич

E-mail: azaitsev72@mail.ru

ORCID: <https://orcid.org/0000-0002-3425-1671>

Статья поступила в редакцию 21.06.2022; одобрена после рецензирования 27.07.2022; принята к публикации 01.08.2022.

The article was submitted 21.06.2022; approved after reviewing 27.07.2022; accepted for publication 01.08.2022.