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OPTIMIZATION OF STATE REGULATION IN THE FIELD OF SAFETY AND SECURITY OF BUSINESS: A LOCAL APPROACH

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Abstract. The main purpose of the study is to optimize local aspects of state regulation of ensuring the safety and security of enterprises in the context of sustainable development in a particular region. For this purpose, a new methodical approach was presented using simulation optimization of the processes of ensuring safety and security of security of enterprises in the context of sustainable development. The study focuses on enterprises and their safety and security systems security in the context of sustainable development. The relevance of the study is given by the fact that most enterprises in many regions suffer from ineffective regulation at the local level. At the same time, in most cases, state regulation does not take into account all aspects of safety and security in the context of sustainable development. The research methodology involves the use of a modern method of process optimization modeling. As a result, a model for optimizing local aspects of state regulation of business safety and security for a specific, selected region in the context of sustainable development was presented. The research has limitations and they consist of the selection of only one region and the consideration of local aspects of enterprises of certain socio-economic systems. Prospects for further research will be devoted to expanding modeling and taking into account a larger number of enterprises in the context of sustainable development.

Keywords: security, business, model, state regulation, local aspects.

JEL Classification: L53, H12, M10.

Introduction

In the last decade, in many countries, attention has sustainable development of an enterprise is a complex concept that depends on a large number of economic, environmental, and social factors. In the context of solving the problems of comprehensive modernization of the economy, the problem of maintaining and assessing the sustainable development of an enterprise becomes relevant, since different modernization strategies have different effects on the indicators of sustainable development of an enterprise. In this regard, the article discusses the main modernization strategies and their impact on the indicators of sustainable development of the enterprise.

At present, enterprises should build an enterprise management system based on sustainable development, because it is such management that helps to ensure its financial stability, competitiveness, efficient functioning in the market, and organization of production focused on reducing harmful emissions into the atmosphere and reducing the material intensity of manufacturing products, improving jobs workers and the growth of the social level of the population. It is the current mechanism of sustainable development that allows enterprises not only to easily adapt to environmental changes but also to constantly develop.

In today's world, with increasing globalization and technological innovation, businesses are faced with new

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security challenges, including cyber threats, financial risks, and changes in the legislative field. This calls into question the effectiveness of existing models of government regulation, requiring their adaptation and optimization. The local approach in this optimization is especially important because it allows taking into account regional characteristics, cultural contexts, and the specifics of local markets. This approach provides greater flexibility and efficiency in responding to local challenges and needs. Moreover, given the rapid changes in the economic environment and increasing competition, the need for business stability and protection is an integral part of sustainable development. Effective government regulation can help not only ensure safety but also stimulate investment, innovation, and economic growth. Also in the context of social responsibility and ethical practices, streamlined government regulation can help strike a balance between business needs and the interests of society, building trust and social sustainability.

The basis of sustainable development of enterprises is a combination of three components, namely economic, social, and environmental. The economic component of the sustainable development of an enterprise includes the state of financial resources, their distribution, and use, which ensure the development of the enterprise based on profit growth, and maintaining solvency in the face of changes in the external environment. The social component of the sustainable development of the enterprise includes the direction of the enterprise's activities to increase the standard of living of the population and employees of the enterprise as a whole by improving working conditions, increasing wages, and raising the level of staff qualifications. External factors, including negative, in particular, limited large energy resources, act to build confidence in the national economy, and the rational use of labor should serve as an incentive to use the need for innovation to increase the potential return on domestic and external import resources, as well as ensure economic standards. production and consumption of a sustainable economy as a whole.

The crisis phenomena of recent years, which the automatic levers of a market economy are not able to overcome, pose the task of finding a state in the local regulation of the economy and ensuring its stable development before science. Business regulation to ensure safety and security is the distribution of natural, material, financial, intellectual, and other resources under the needs of society, carried out through a combination of two complementary and interacting mechanisms: a market economy and state regulation. The problem of the role and place of the state in the development of the engineering sector has been the subject of discussion among scientists from many schools of economic theory from the moment economic science was singled out as a separate branch of knowledge until today. Stable local development is impossible without the formation of effective economic regulation and the development of optimal government decisions. The current stage of development contributes to the creation of new, relevant to the present approaches to the formation of effective state regulation of security and safety. That is why there is a need for optimization through proper information management.

In the era of digitalization and globalization, businesses face a wide range of challenges, including cyber threats, intellectual property, customer protection, and global competitiveness. Effective government regulation must take these changes into account by introducing modern safety and security standards. A local approach to government regulation allows taking into account the unique economic, cultural, and social characteristics of the region. Different regions may differ in levels of development, business priorities, and security challenges. For example, regions with developed technological infrastructure may require more stringent cybersecurity regulations, while agricultural regions may emphasize physical security and environmental conservation. Given rapid technological innovation, the importance of adaptability in government regulation is growing. Businesses need a regulatory environment that promotes innovation and does not hold back technological development. At the same time, the state must provide the necessary level of protection and security, especially in the field of digital technologies.

The main purpose of the study is to optimize local aspects of state regulation of ensuring the safety and security of business in a particular region. The object of the study is the enterprise and the system of ensuring safety and security in the context of sustainable development. The structure of the article allows you to achieve goals since it involves a detailed review of the literature on the research topic, a description of the methodology, coverage of the main research results and their discussion, and presentation of conclusions.

Today, the issues of proper state regulation of enterprises in the context of sustainable development in the regions have not been resolved. The key goal within the framework of the current goal is the local level of optimization due to new methodological approaches.

The structure of the article provides a description of the main research methods, a review of the literature for the purpose of the article, coverage of the main results of the study and their discussion, and conclusions.

1. Literature review

An analysis of the literature (Khalina et al., 2019; Petryshyn et al., 2022), regarding the current state of enterprise in the context of sustainable development, gives reason to say that, despite some positive trends in recent years, a set of problems in the industry has not been overcome. The lack of a well-thought-out strategy for the transition period to market relations on the part of the state led to the fact that most enterprises of the engineering complex found themselves in the conditions of the need for self-financing and, in the absence of practical experience in operating in market conditions, were forced to

exist in survival mode without proper security. The result of this was the loss of market positions, the collapse and bankruptcy of many companies, the outflow of trained personnel, and the critical moral and physical aging of technologies and equipment.

As noted in the scientific and practical literature (Chatterjee et al., 2003; Kryshtanovych et al., 2022c), the reorientation of the engineering sector to an intensive, advanced development path implies the need to solve a set of interrelated and interdependent problems in the legislative, regulatory, financial, economic, educational, personnel and other areas, which necessitates the study of state regulation in the context of ensuring the development of the engineering sector of the economy in the context of sustainable development.

According to the majority of scientists (Shang, 2020; Ekeocha, 2018), the complexity of the development of complex engineering in the context of sustainable development lies in the fact that in the short term, it is necessary to solve four main tasks simultaneously: intensive modernization; training and retraining of personnel potential with the formation of new engineering, technical and managerial personnel capable of ensuring innovative development; creation of local conditions to increase the investment attractiveness of enterprise engineering and ensure the inflow of private investment in the engineering sector to ensure safety and security; ensuring sales of products in a highly competitive environment.

Fakiha (2021) focuses on the importance of security strategies in business organizations, especially in the context of cyber threats. This study highlights the evolving security challenges in the digital era and the need for adaptive strategies to protect business interests. In turn, the work by Mishchuk et al. (2021) discusses the security of the strategic economic interests of mining and metallurgical enterprises in post-industrial conditions. This study indicates that security issues have a direct impact on the investment attractiveness of these sectors, highlighting the link between economic stability and security measures. Adding to this discourse, Hammouri (2023) focuses on modeling the operation of criminal law functions in the context of safety and security development. This research is key to understanding how legal frameworks and their implementation shape the security landscape for businesses. Finally, a study by Iskajyan et al. (2022), highlights the importance of the information environment factor in assessing the economic security of a country in the digital economy. This research highlights the relationship between information management and economic security, highlighting a critical area for state regulation and policy development.

Research by Yakushev et al. (2023), focuses on the assessment of financial and economic security of innovative enterprises in the field of hospitality and tourism. The authors analyze various aspects affecting the stability and sustainability of these enterprises, including financial risks, competitiveness, and innovative activity. This research is important for understanding how financial security affects overall business stability in the context of local characteristics.

In addition, the work of Khalatur et al. (2023), draws attention to anti-crisis management as a basis for the formation of a financial mechanism for the sustainable development of agrarian business. The authors consider key strategies of anti-crisis management that can contribute to financial stability and long-term development of the agricultural sector. This aspect is particularly relevant in the context of government regulation, as it provides approaches to risk and crisis management that are critical to business security.

As noted more than once in the literature (Rushchyshyn et al., 2021), modernization of plants is required, their technical re-equipment using modern technologies, and a significant increase in the quality of machines due to this, their competitiveness. State regulation of the engineering sector in the context of sustainable development should be manifested in the adoption of special laws and regulations that allow plant owners to establish the production of highly efficient machines and their systems for all sectors and areas of the national economy, instruments and apparatus, high-speed electronic computers of new generations, production of communication systems, controls, automation.

To this end, it is planned to accelerate the restructuring of the complex based on an increase in production volumes in priority sectors: rocket and space, aircraft construction, shipbuilding, information and telecommunication systems, heavy engineering, agricultural engineering, instrument making, and electrical industry. It should be emphasized that engineering needs foreign investment and the use of advanced technologies in the production process.

Not infrequently, scientists (Chen & Zhang, 2015; Cao et al., 2018; Zybareva et al., 2022) note that a progressive tool for introducing fundamental changes in the specialization of engineering enterprises in the context of sustainable development through innovation should be the formation and implementation of technological platforms that are formed based on public-private partnership and aimed at strengthening the interaction and cooperation of business, science, and states to promote scientific developments to the market.

However, given the significant scientific attention in the leading professional and practical literature, today the issue of determining the correct information basis for optimizing local aspects of state regulation of the development of the engineering sector in the context of sustainable development in the regions to ensure safety and security remains relevant today, this is what our article is devoted to.

In general, the literature review showed that scientists and practitioners are actively exploring both the state regulation system and its optimization at the local level. However, this rarely happens in the engineering sector of

the economy. We also have problems with the fact that there are not always effective modeling methods in the literature, and so on. In addition, gaps also exist within the security and safety framework.

2. Methodology

The research methodology in front of the database is replaced by one of the similarity methods of structural analysis and modeling methodologies (SADT).

The designers assumed that system stability was growing and the need for them was very high. The growth in depth and complexity of patterns is a reality. This premise had to be taken as inevitable. But the misdetermination of an optimization model is inevitable: it is the result of the inadequacy of methods for creating systems. The thesis was soon put forward: with the study of methods of analysis, the key to the evaluation of systems, cost-effectiveness, performance, and reliability. To solve the problems with the formation of a system of a wide profile, new methods were required, specifically designed for patients with symptoms of the stage of the process. The application of SADT comes from this belief. Methods such as SADT, at the initial stages of the development of socio-economic systems, arise much better to understand the likely problem (in our case, this is the information basis for optimizing local aspects of state regulation of safety and security of the engineering sector in the region).

The widespread use of SADT has shown that it can be combined with other structural methods. This includes the use of SADT descriptions as diagrams linking various methods, and graphical applications to describe the features of the information base to optimize local aspects of state regulation of safety and security engineering sector in the region with a high level of detail. Thus, the inadequately discovered time systems caused the creation of the SADT graphical modeling language, and its increased use of transforming SADT into a complete methodology capable of improving the quality of products, accelerating the stage of forming an information basis for optimizing the local aspects of state regulation of safety and security engineering sector in the region.

The SADT structural analysis and design methodology is implemented in various simulations: IDEF0, DFD, IDEF3. We chose IDEF0.

Using the graphic language of IDEF0 technology, the simulated system assumes the presence of interconnected functional blocks in the form of a set. IDEF0 models include complex and concentrated concentration, which is quite understandable for different departments. It should be noted that the IDEF0 note is recommended for use by many local business security structures in regions. The IDEF0 standard is intended to create functional models that reflect the structure and functions of the system, as well as information flows for the information basis for optimizing local aspects of state regulation of safety and security engineering sector in the context of sustainable development in the region.

Above all, the IDEF0 method is known for its ability to clearly define and structure processes, making them understandable and easy to analyze (Kryshtanovych et al., 2022a). This feature is important in the context of optimizing state regulation of safety and security, where it is necessary to take into account the multiplicity of processes and the connections between them. Another important advantage of the IDEF0 method is its ability to integrate various data and information, critical for developing an optimization information base. This allows you to include different types of information, from statistical data to expert assessments, ensuring comprehensiveness and depth of analysis.

The choice of the SADT methodology is not accidental and its advantage is that optimization paths can be demonstrated in an efficient and novel way: graphical (Kryshtanovych, 2022b). That is, in a modern graphic language, to highlight how we see the process of optimization, security and business security. In steps, this can be depicted as follows: we define optimization actions; we present their conditional "movement" to ensure the key goal.

For a better understanding, one should choose a specific region in which the engineering sector is developing and local regulation is in place to ensure its safety and security. We chose Pomeranian Voivodeship in Poland, which is famous for its significant share of the engineering sector in the economy. All authors live in this region and are interested in its development and security.

Next, we formulate an integral construction model and determine the point of view from which to build the model, then, based on this, we will select information for display in the model. All this will be described in detail later in the text in the section on the main results of the study.

3. Results of research

Thus, it should be established that the main goal of modeling will be designated as L0 – Optimization of local aspects of state regulation of safety and security of the engineering sector. In this case, it should be achieved and enabled through certain processes, which will also be part of the model (Ln). Graphically, this should be represented in the form of a process node for achieving L0 (Figure 1).

In addition, auxiliary elements of the model should also be presented, which allow achieving optimization of state regulation of safety and security of the engineering sector in the region. This can be represented as a black box (Figure 2).

For example, R denotes the desired socio-economic effect, which we want to get as a result of modeling. It can be changed and adjusted depending on the results of each optimization process and the state of the engineering sector in the region. M represents auxiliary mechanisms that accompany the execution of each process of achieving L0. Everything is controlled by the elements marked as K.

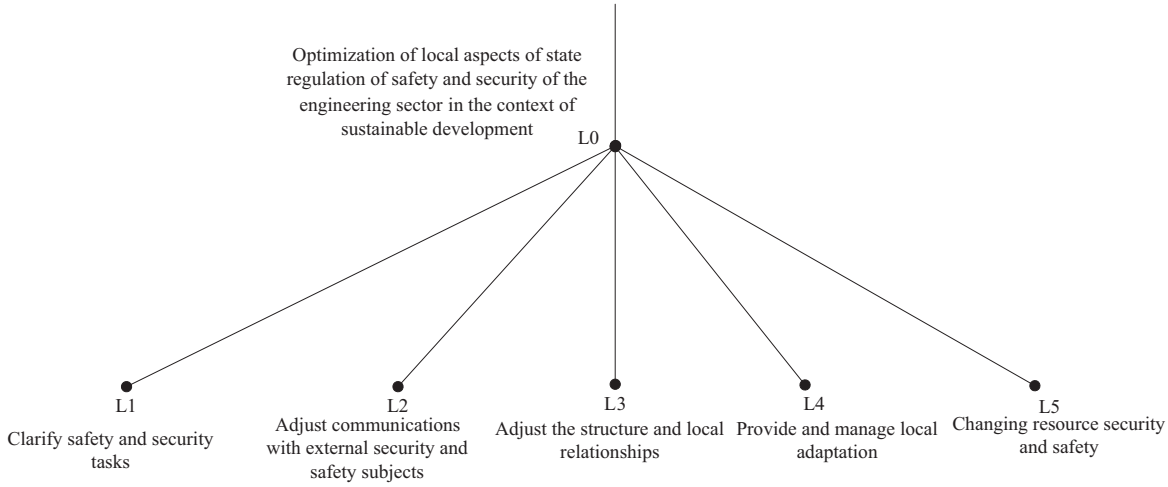

Figure 1. Processor node reaching L0 (source: developed by the authors)

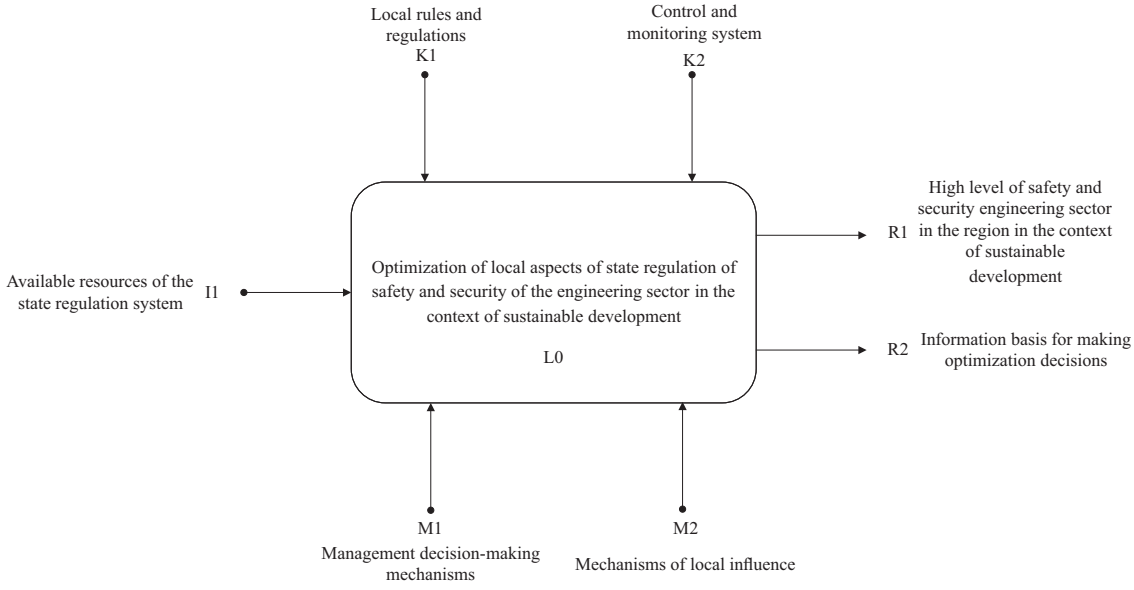

Figure 2. Box of elements to achieve optimization of state regulation of safety and security engineering sector in the region (source: developed by the authors)

Thus, we will form the basic process model of the informational basis of optimization of the state regulation of safety and security of the engineering sector in the region (Figure 3).

Let's consider each stage of the proposed model for optimizing local aspects of state regulation of safety and security engineering in the region's sector:

L1. Clarify safety and security tasks. The engineering sector is an integral part of the higher-order system, that is, enterprises in the region. Changes in activities should be consistent with the development of the sustainable development strategy of the enterprise by clarifying individual regulatory tasks as guidelines for the implementation of adaptation procedures. Another vector when adjusting tasks for security actors should be the effectiveness and forecasts of a possible further change in the level of security due to the dynamics of the external and internal environment in the region in the context of sustainable development. The result of this stage is an updated list of tasks for security actors, which determines the directions for further local changes in the engineering sector.

L2. Adjust communications with external security and safety subjects. Based on the fact that today only a small part of engineering enterprise can effectively counteract internal and external threats, the best option for optimizing business security is considered to be a combination of one's efforts with the capabilities of external security and safety subjects in the context of sustainable development. Optimization should include refinement of interaction with law enforcement agencies by searching for new points for matching interests. Formalization of the results of this stage is carried out in the renewal of cooperation agreements.

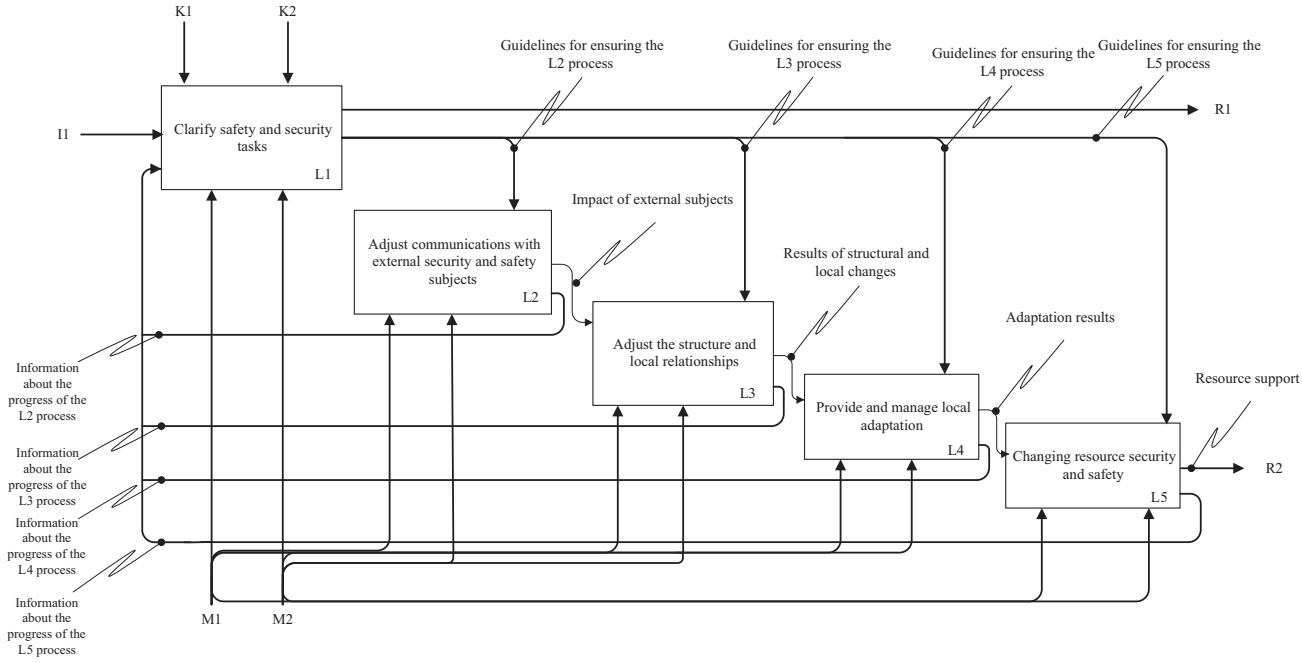

Figure 3. The basic process model of the informational basis of optimization of the state regulation of safety and security of the engineering sector in the region in the context of sustainable development (source: developed by the authors)

L3. Adjust the structure and local relationships. Adaptation involves making changes not only to the structure and functional responsibilities of employees of the state regulation service but also clarifying and adjusting the tasks of employees of specialized safety and security units that are involved in the operation of the system, and the development and implementation of protective measures. Separately, the issues of improving the skills of security service employees, acquiring new knowledge, holding events for the exchange of experience, and mastering new technologies of the engineering sector in the region at the local level are considered. Such comprehensive work to optimize state regulation in the context of sustainable development should be carried out with the approval and support of the management of engineering enterprises. The results of this phase are to update the local provisions for the implementation of security activities in the context of sustainable development.

L4. Provide and manage local adaptation. The ability of subjects of safety and security to maintain the level necessary for functioning and development is determined by their ability to respond to local changes, which is difficult to implement without appropriate adjustment of certain parameters in the region. Adjustment is subject to parameters in respect of which changes have occurred or may occur, provoked by the dynamics of the external and internal environment of the engineering enterprise in the context of sustainable development. Based on the complexity of implementing any local changes in systems where a certain number of people interact, guided in their actions by personal interests, and at the same time burdened by the need to achieve the interests of higher systems, in particular engineering enterprise, adaptation must be thoroughly prepared, planned, resource supported and provide for minimal risks of obtaining the expected results. The results of the implementation of local adaptation procedures are the basis for further safe changes in the activities of the engineering enterprise in the context of sustainable development in the whole region.

L5. Changing resource security and safety. The implementation of the updated tasks requires not only a change in the internal organization and interaction with external security actors but also the adjustment of resource support to change the size of each type and the overall structure to maintain the ability to implement management local decisions. The basis for the implementation of this stage should be the analysis of the effectiveness of the use of resource support in the past, the identification of problems, and possible solutions. It is important to achieve efficiency in allocating the necessary resources, that is, at those moments when they are needed and in the required quantity and quality for the engineering sector in the region in the context of its sustainable development.

Certain numbers from 1–5 are a convention for better visualization of the model. The SADT methodology and the IDEF0 technique were applied in the development of the model in the most straightforward way. The rules for constructing the model and the structure are based on IDEF SADT in the formation of the figures presented in the work.

Separately, it should be noted that the proposed modeling results were presented to the local leadership of state regulation of engineering enterprises in the selected region (Pomeranian Voivodeship in Poland). In general, the leadership included 20 people, of which more than half

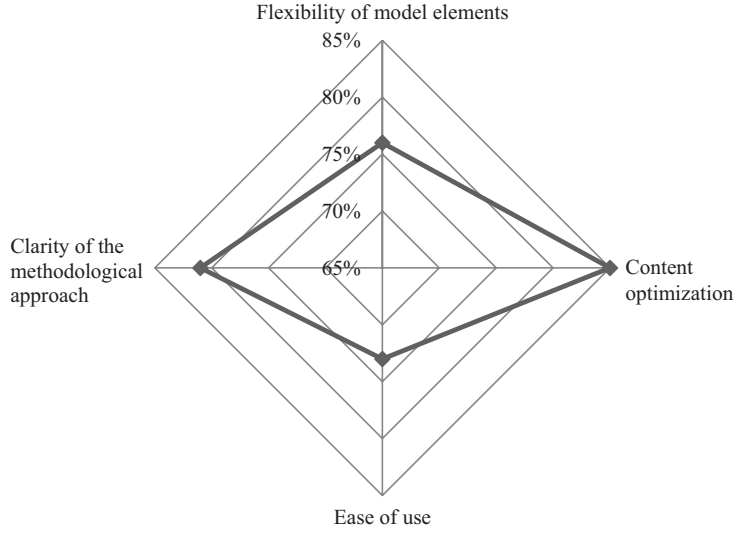

Figure 4. The results of the interview with the management of the local regulation of ensuring the safety and security of the engineering sector in the context of sustainable development in the region (source: developed by the authors)

noticed the convenience, flexibility, and optimization of the proposed model (Figure 4).

In general, this kind of survey does not claim to be an expert one, however, the existence of the possibility of presenting our research results to practicing local government regulatory services in the region may be the first step towards the practical implementation of the model. In practice, the model can be used for top management of engineering companies or within the framework of the state regulation system.

4. Discussions

Discussing the results of the study, compare them with existing and similar ones. Some scientists and practitioners (Urba et al., 2022; Sylkin et al., 2018; Kryshtanovych, 2021), for example, offer a comprehensive method for assessing the feasibility and effectiveness of investing in engineering enterprises in the context of their priority activities. This method is aimed at ensuring the adequacy and reliability of the assessment of investment opportunities for the engineering of an enterprise in the context of its priority activities.

Other scientists (Sylkin et al., 2019; Gumulya et al., 2022) establish that all engineering enterprises have the potential to restore active work, however, attempts to improve the condition of such enterprises should be directed to other areas, in particular, service maintenance and the formation of a dealer network of well-known and effective domestic and foreign manufacturers of equipment.

As scientists (Matsuura, 2019; Alazzam & Alshunnaq, 2023) actively publish, given a retrospective review of the activities of engineering enterprises in the context of sustainable development, several dependencies have been identified that affect investment: an increase in the level of profitability leads to an increase in its weight of influence on the volume of loans granted, that is, an increase in profitability leads to an increase in investment attractiveness.

In addition, there are a number of other scientific works (Saleh et al., 2020; Al Azzam, 2019; Rachmi & Mochtar, 2021) using a similar methodology, but within the framework of other studies. For example, it has significant attention in the framework of ensuring sustainable development or ensuring a specific type of security, for example, financial or economic.

However, when discussing our research results, it should be noted that the significant difference is our use of the functional modeling method IDEF0, within the framework of the developed scientific and methodological approach, ensured the consistent construction of a model for optimizing local aspects of state regulation of the development of the engineering sector in the context of sustainable development for a particular region for its safety and security.

An important direction for further research is the interaction between government regulation and innovative technologies in the context of business protection. This may include studying the impact of digitalization and artificial intelligence on the security of business operations and developing appropriate regulatory mechanisms. Another promising direction is the analysis of international experience and its adaptation to conditions. This may include a comparative analysis of different regulatory approaches in different countries and an assessment of how they can be effectively integrated into local contexts.

Conclusions

Summing up, it should be noted that the problems of security and development of engineering enterprises in the context of sustainable development are directly related to the country's economic development strategy. First of all, this is the lack of structural restructuring of the industry

with an increase in knowledge-intensive industries; improper creation of modern technological equipment for all sub-sectors of the engineering sector to reduce energy, resource, and labor intensity of production; decrease in the competitiveness of products; availability of product orientation to the needs of the domestic market, and not the possibility of entering the world market; lack of greening of production, which implies the production of resource-saving and environmentally friendly types of equipment.

The engineering sector is one of the priorities in the economic complex of the country. The engineering sector is the leading branch of the entire industry, its supporting structure for the development of the economy. This is due to the supply of products to all sectors of the economic complex, as well as the introduction of scientific and technological progress in them for regional development.

It should be concluded that the safety and security of the industry are ensured due to the significant scientific and technical potential based on research institutions and universities that provide qualified labor resources in this area, as well as the improvement of the material and technical base, especially at the local level.

As a result, a model for optimizing local aspects of state regulation of business safety and security in the context of sustainable development for a specific, selected region was presented. The research has limitations and they consist in the selection of only one region and the consideration of local aspects of business engineering of certain socio-economic systems. Prospects for further research will be devoted to expanding modeling and taking into account a larger number of engineering enterprises.

As a result, the modeling technique based on IDEF and SADT was shown to work. Thus, it was possible to see how to optimize at the local level through modern methods. The proposed model can be used in practice for the strategy of local development of safety and security in the context of sustainable development.

Key limitations related to the fact that only one specific country was selected as the focus of the study. Changes and differences are possible when using the proposed methodological approach for other countries.

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