

# Integration of planning systems with risk management systems on large enterprises

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## ABSTRACT

The article describes the strategic management methodology based on the use of key performance indicators system, recommendations for its further development are given. The necessity of integration above-mentioned methodology with the methodology of risk management systems is justified for large companies. The main conceptual states and stages of key performance indicators system and risk management system integration are given. Integration processes are illustrated by the example of a particular large company. Conceptual states and integration stages of key performance indicators system with risk management system are considered. Specific organizational and technical measures for implementation of above-mentioned systems at the nuclear industry enterprises are described as well.

Key performance indicators for risk management system are proposed to be laid for introducing enterprises' performance management. The results of theoretical and empirical research, the described tools and approaches can be used in other industrial enterprises, regardless of their business.

## KEYWORDS:

strategic management, key performance indicators system, risk management system, key performance indicators system and risk management system integration.

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## 1. INTRODUCTION

The basis of the new industrial society (Industry 4.0) is a developed, high-tech and cost-effective industrial production, involving the widest possible use of information technologies in production (Tolkachev, 2017; Bodrunov, 2018). Modern corporations and companies will need to comply with a number of conditions for the transition to it. The first condition is organic development and introduction of modern advanced information technologies into their functional activity. At the legislative level, the goals of the development of advanced digital systems of production management, inventory and communications are defined (Decree, 2018; Order, 2017). Having advanced information technologies in itself is not a source of long-term sustainable business leadership. Advanced information technologies provide only a short-term competitive advantage, become obsolete fairly quickly and can as rule be easily and relatively cheaply copied by competitors (Milper, 2010).

The second condition is to build and improve the company's culture of current functional activities and medium-term planning. This will require a radical reengineering of business processes, taking into account advanced innovations in technology, focusing on the development of knowledge, training and retraining of employees aimed at improving their intellectual potential and, as a result, ensuring the effectiveness of business processes, the creation and configuration of new organizational and management mechanisms, etc. Successful implementation of the second condition is designed to provide medium-term competitive advantages.

The third condition is the development and implementation of effective strategies for the company's development. The main emphasis should be on their dynamic ability to constantly update and create new business processes in a changing environment, successful strategic management of innovations, taking into account the best international practices, etc. The implementation of the third direction allows to determine the sources and mechanisms of long-term strategic competitive advantages.

Current functional activities, medium-term planning and strategic development require the application of appropriate methodologies, regulations and tools (Trifonov, 2014). In practice today the balanced scorecard is widely used (BSC) (Introduction, 2006; Kaplan, Norton, 1992), less popular are the concept and

methodology, mainly represented in the international and national standards and in international standards of organizations, which allow to establish and implement a holistic risk management system (Brykalov, Balyberdin, Trifonov, 2018a). It should be noted that both types of methodologies were developed and implemented at large enterprises almost independently from each other. In our opinion, these methodologies should be organically combined and complement each other within a single management system at the enterprise.

The purpose of the study is to justify the need and feasibility, as well as the development of conceptual provisions and recommendations for the integration of planning systems with risk management systems at large enterprises in the transition to Industry 4.0.

## 2. THEORETICAL AND METHODOLOGICAL APPROACHES AND RESEARCH METHODS

### 2.1. DEVELOPMENT OF A BALANCED SCORECARD

The BSC allows to link strategic management with management at the tactical and operational level, to express the mission and strategy of the company as a system of clearly defined goals, specific tasks and specific indicators, to take into account when planning not only quantitative but also qualitative indicators and factors, to provide monitoring and control over the implementation of goals and objectives at all levels of management, etc. The BSC methodology can provide a kind of compromise between a focus on maximum financial performance and a focus on reasonable (within certain rules and legal norms) social justice. The flexibility of the BSC methodology makes it a very active tool that allows taking into account the specifics of the company, the competitive environment, technological aspects of development, the external environment and other factors. Initially, the BSC included four groups of key performance indicators (financial indicators, customer satisfaction and loyalty,

quality of internal business processes, training and growth of employees).

In the transition to Industry 4.0, the development of high-tech industrial production, four groups of indicators must be necessarily complemented with two more – advanced technologies (including information technologies) and knowledge and innovation potential (development and modification of knowledge and innovation). In addition, taking into account the specifics of the functional activity of the enterprise, the impact of this activity on the subjective environment and the social environment, the indicators related to the environment, society, organizational and management potential can be included.

## 2.2. THE CONCEPT OF BSC IMPLEMENTATION AT THE NUCLEAR INDUSTRY ENTERPRISES

The concept of strategic management of the nuclear industry enterprises of the State Corporation "Rosatom" provides a comprehensive application of a single approach at all levels of management of the hierarchical structure:

- the level of the nuclear industry (State Corporation "Rosatom") – the financial responsibility center of the first level (FRC-1);

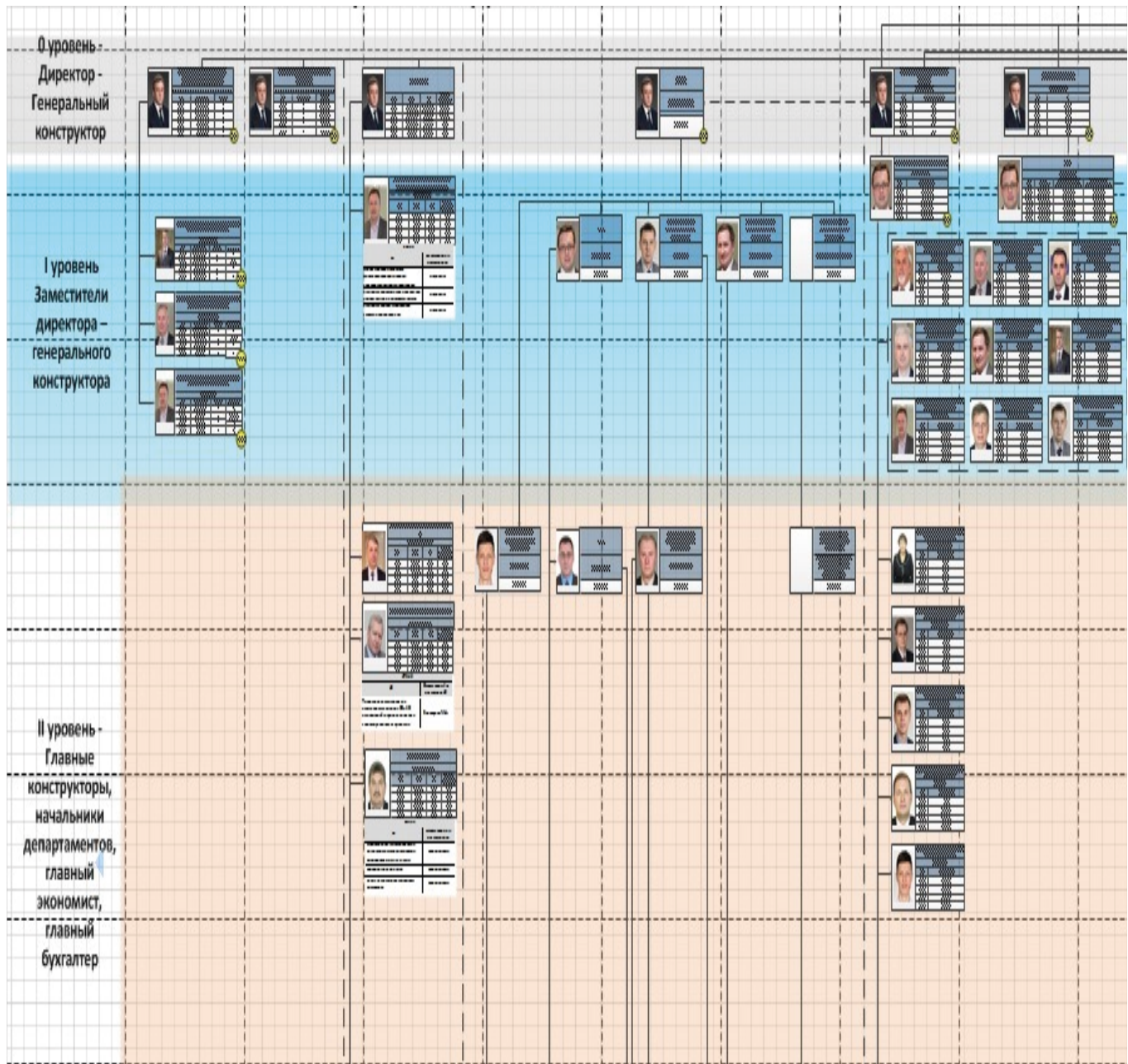


Fig. 1. Objective tree of the FRC-3

- the level of divisions ("Atomenergomash" JSC, "TVEL" JSC, "Concern "REA" JSC, etc.) – the financial responsibility center of the second level (FRC-2);
- level of industrial enterprises ("OKBM Afrikantov" JSC, etc.) – the financial responsibility center of the third level (FRC-3) (Brykalov, 2016a).

For all organizations included in the management of the State Corporation "Rosatom", the approaches and tools for the decomposition of strategic goals are fixed by local regulations (Order 2016, Order 2017). The latter makes it possible to focus the attention of managers and available resources on achieving strategic goals at all levels of responsibility. Decomposition of objectives allows determining the priority directions of investment projects aimed at improving production and economic performance at the points of greatest impact on improving the efficiency of the structural unit of the enterprise/State Corporation as a whole in the current period and in the long term.

To apply a systematic approach to the deployment strategy and goal-setting in organizations of State Corporation "Rosatom" the unified tools of the strategic objectives decomposition (UTSOD) are being implemented:

the objective tree, maps the key performance indicators (KPIs), X-matrix, and data center.

An objective tree is a key tool for the decomposition of goals, it defines and visualizes the economic meaning of the company's activities and mechanisms to improve operational efficiency in the current period and in the long term. In the State Corporation "Rosatom" decomposition of goals is carried out from top to bottom: from the FRC-1 to FRC-2 and further to the FRC-3. Decomposition is possible at the formation of new business lines (new FRC-3) or in other cases by the decision of the management of FRC-1. Responsibility for achieving the decomposed goals of the CFD-3 falls on the Head of the higher level of management, in particular, the Director of the enterprise of FRC-3 or on his/her deputies in the areas. Taking as a basis the logic of enterprise management and its organizational role model, the leaders of the FRC-3, carried out the decomposition of goals and related indicators of the FRC-3 to the next vertical management levels, which, in turn, decompose the resulting goals further. Thus, the decomposition of goals and indicators within a single enterprise of FRC-3 is performed up to the Head of the production unit (department), the leader of a small group, forming a single objective tree (Fig. 1).

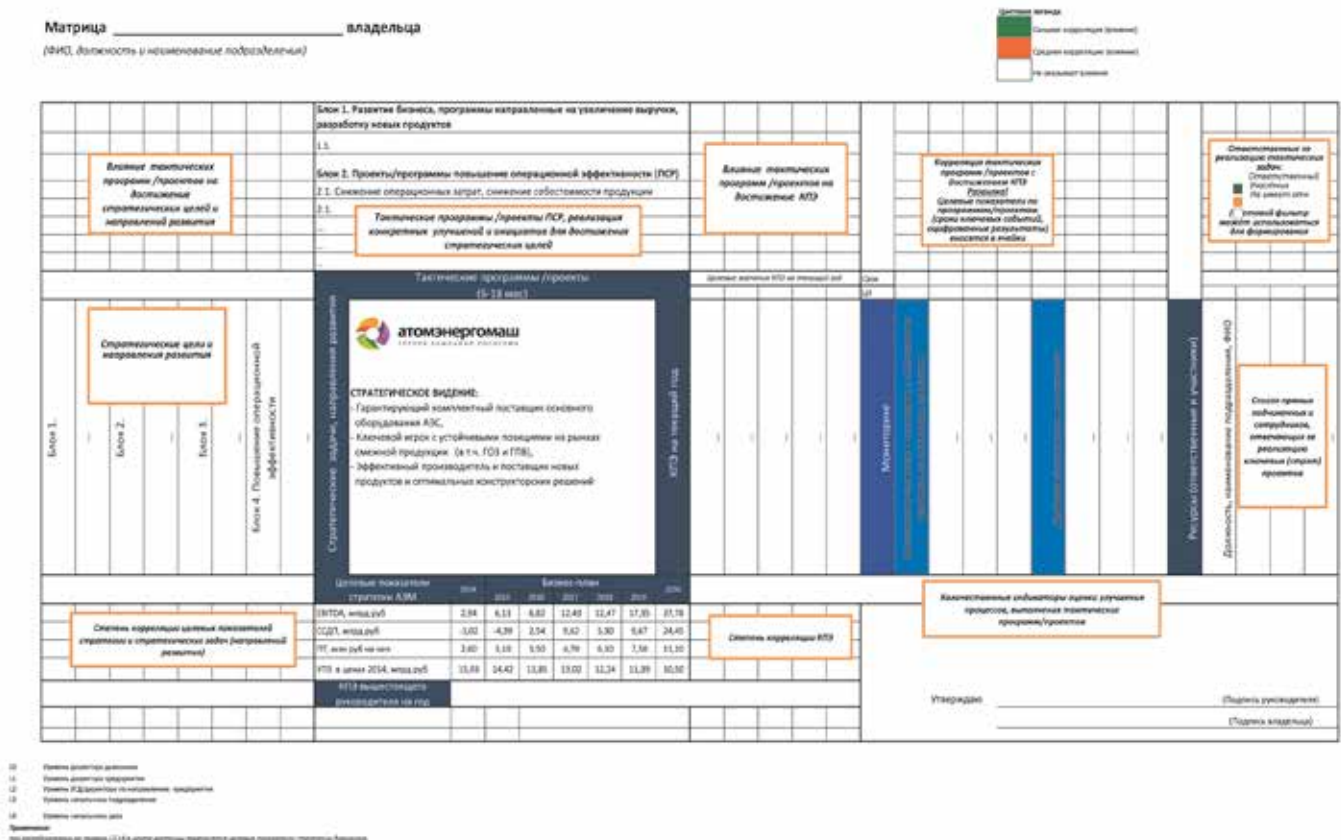


Figure 2. X-matrix



The owner of the KPI map		Surname, name, patronymic			Position (subdivision number)			Name of organization		
Ser. No. of KPIs	Name of KPI, KPI unit of measurement	KPI achievement levels			The weight of KPIs, %	KPI type (continuous, discrete, lowering, cutting-off)	The actual level of achievement of key performance indicators	The weighted coefficient of achievement of key performance indicators	Signatures in assessing the achievement of key performance indicators	
		Lower level	The target value of the KPI	Upper level					Signature	Full name, position
					The resulting factor of achievement of key performance indicators					

Fig. 3. Standard KPI card of the head

X-matrix is an individual tool of the Head of each level of management. He/she creates a matrix on his/her own in order to form or take into account current programs, projects, investment activities and initiatives aimed at achieving decomposed to him/her strategy target values for FRC-2 (Fig. 2). With the help of X-matrix the manager can timely detect and identify the risks of achieving key indicators.

The X-matrix is recommended to the leaders in order to carry out:

- control of KPI execution by direct subordinates;
- control of completeness and sufficiency of programs, projects, investment actions, initiatives necessary for performance of strategic tasks;
- monitoring and control of implementation of programs and projects in the area of responsibility of the manager;
- evaluation of the quality of project management application;
- organization of the current information panel of the Head.

Effectiveness evaluation of the activities carried out by senior management setting KPI to managers and assess their performance with the use of KPI card.

KPIs of the heads of the organizations included in the management circuit are being established in accordance with the goals, strategies and long-term development program of the State Corporation "Rosatom" and are based on compliance with the basic principles of assessing the effectiveness of employee performance management:

- decomposition principle: KPIs should be established in such a way that the achievement of KPI of lower-

ranking employees ensured the KPI achievement of higher-ranking employees;

- focus principle: recommended values are indicated in the KPI map for the concentration of efforts on the key priorities of activities: the minimum number of KPI – 3, the number of cutting-off (KPI, in the failure of which the total coefficient of performance of all KPI is considered to be zero) and lowering (KPI, which have no weight, but have a percentage of reduction), KPI in total – no more than 4;
- balance principle: KPIs should be agreed among themselves, the achievement of one KPIs should not automatically ensure or exclude the achievement of other KPIs;
- the principle of conformity to the SMART criteria;
- ambition principle: KPIs should be focused on the growth of financial and production results, the target values of KPIs for the next and subsequent years are set on the basis of the leading dynamics in the main indicators;
- periodicity principle: KPIs are established for one calendar year, the analysis of KPIs achievement by the heads of the organizations is carried out at least once in half a year;
- the principle of the validity of the assessment of KPIs achievement: to calculate the actual values of the KPI, the data of accounting, management and statistical reports are used, including reports on the execution of business plans, the activity program, the investment program (Order 2017).

At the enterprise, the KPI system extends to a level that is determined by the specifics of the enterprise's activities, affiliation and current position in the industry, the volume of work and the policy of the enterprise management.

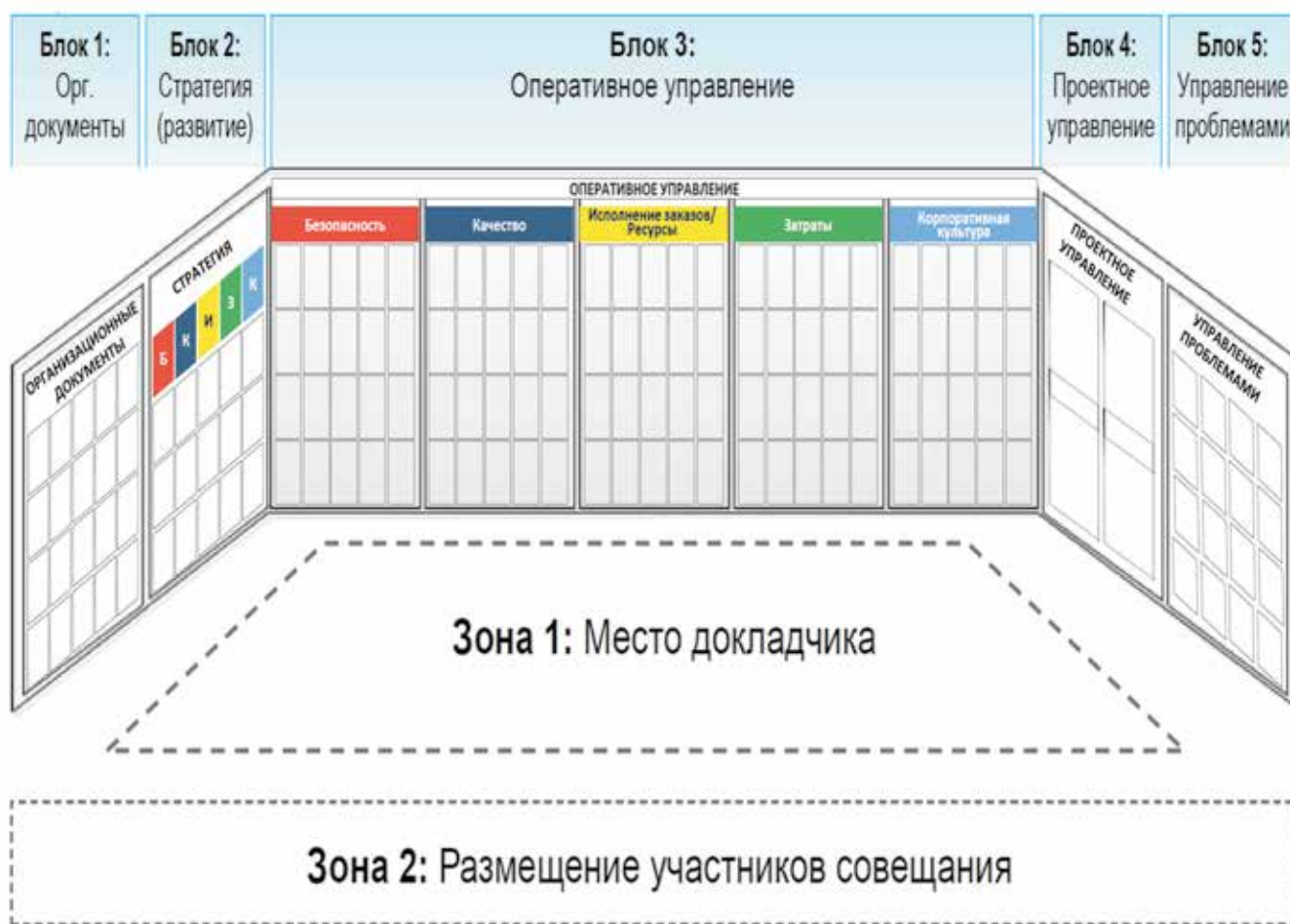


Fig. 4 InfoCenter of the Enterprise Manager level

The proposed method of the KPI system formation for the heads of the nuclear industry enterprises (Brykalov, 2014) formulated the requirements and principles for the formation of KPI maps of managers at all levels of management at the nuclear industry enterprises, which include:

- the optimal number of KPIs;
- the minimum weight of each indicator;
- the purpose of the command indicator;
- the presence of cutting-off and lowering indicators, etc. (Fig. 3).

Important additional specific indicators are formed in the KPI maps of the heads of enterprises: the implementation of the State Defense Order (SDO), the increase of the utilization coefficient of installed NPP capacity, safety performance activities (frequency rate of injuries with temporary loss of working capacity, personnel exposure in excess of 50 m<sup>3</sup>V), and others.

Lowering and cutting off KPIs are used in exceptional cases, only for KPIs that reflect the results of activities in the field of radiation, industrial, environmental safety,

labor protection, as well as the performance of state tasks.

According to the analysis of the application of a balanced scorecard in relation to the organizations of the nuclear industry (Brykalov, 2015), as the KPI of the head of the organization of the nuclear industry can be:

- the implementation of the SDO;
- portfolio of foreign orders for 10 years;
- revenue from product sales in the domestic market;
- revenue from sales of products in the foreign market;
- portfolio of orders for innovative products
- performance of contractual obligations;
- free cash flow;
- labour productivity;
- NPP installed capacity utilization factor;
- rate of injury with temporary disability;
- the personnel exposure over 50 m<sup>3</sup>V etc.

With the aim to respect the principles of ambition and validity of the assessment of achievement of KPIs for heads of organizations of the State Corporation "Rosatom", a matrix for the roles separation is being

developed, which shows which workers are responsible for the ambition of KPIs target values and the confirmation of such achievement, the owner of the KPI maps is unable to set himself a target value and to confirm the level of KPIs performance.

Information centers (InfoCenters) are recommended to be implemented as an additional tool for the decomposition of goals used for visual management of production, economic and management processes in organizations. InfoCenter allows to identify problems and increase the speed of management decision-making through effective production meetings and quick communications, forms quality channels of constant feedback for managers of different levels of management (Fig. 4).

### 2.3. DEVELOPMENT OF RISK AND OPPORTUNITIES MANAGEMENT SYSTEMS AT LARGE ENTERPRISES

The current market environment is characterized by a high degree of uncertainty. As a rule, it is very difficult to take into account, foresee and describe in advance the dynamics of all processes occurring in the company and enterprises. In addition, the external environment is characterized by high turbulence: trade wars, localization of markets, various sanctions, tightening of customs barriers, etc. In these circumstances, many companies have realized the need to develop and implement in everyday practice integrated risk and opportunities management system (R&OMS), allowing to take into account the risks and manage them at all levels of management – from strategic to operational and technical.

The development of methodologies for constructing R&OMS was delayed in relation to the development of management systems methodologies and, in particular, the methodology of the BSC. The undoubted advantage of R&OMS is the reliance on carefully curated recommendations and requirements of international and Russian standards (FERMA, COSO ERM, GOST R ISO 31000–2010, GOST R ISO 31010:2011, GOST R 51897–2011, etc.). However, most often the complex R&OMS was eventually built as a relatively isolated module (block) in the general management system. In addition, modern enterprise information systems of the ERPII or SAP/R3 (especially in their early versions) class, covering with the complex automation all functional activities and management of companies, as a rule, did not provide for requirements for risk accounting.

The observed weak links of BSC methodologies and methodologies of building R&OMS hinder the development of companies in the long and medium term. It is particularly important to consider and analyze+ risks when assessing the mission, goals and objectives covered by the planning system. From this point of view, R&OMS should be quite rigidly tied to the various stages, elements and mechanisms of the company's planning system, in particular to the methodology of the BSC.

### 2.4. CONSTRUCTION OF RISK MANAGEMENT SYSTEM AT NUCLEAR INDUSTRY ENTERPRISES

Risks and opportunities management in organizations in the management circuit of State Corporation "Rosatom" is carried out in order to ensure compliance with the requirements of ISO 9001:2015 and is regulated by local regulations [Regulation on the risk management system]. The experience of implementing R&OMS at a large industrial enterprise of the nuclear industry is proposed to consider the example of "OKBM Afrikantov" JSC).

"OKBM Afrikantov" JSC (Nizhny Novgorod) – a large research and production center of the State Corporation "Rosatom", it consists of a multidisciplinary design team, its own research, experimental and production bases. The company has key competencies and produces a full range of works and services on the horizon of the life cycle of reactor equipment and the equipment of various types for nuclear power plants. "OKBM Afrikantov" JSC takes part in solving the tasks of the State Corporation "Rosatom" and divisions of the nuclear industry [Public annual report, 2018; Brykalov, 2016].

The process of building R&OMS in the organization is carried out taking into account:

- recommendations of COSO ERM, FERMA international standards;
- requirements of Russian standards GOST R 51897–2011, GOST R ISO 31000:2010, GOST R ISO 31010:2011, series GOST R 51901, GOST R 56275–2014, etc.;
- requirements of local regulations of State Corporation "Rosatom" in the field of risk and opportunities management;
- the best Russian practices in risk and opportunities management of organizations in the circuit and outside the circuit of the State Corporation "Rosatom".

The process of risk management in the organization includes the management of project risks (specific risks under each contract within the framework of key projects) and operational risks (risks of subdivisions, united in different areas of activity into different functional systems).

The risk management process is a cycle that is repeated monthly (quarterly), it includes the processes of identification, analysis, evaluation, risk management and monitoring of risks of the organization.

Initiation and regulation of the project risk management process are included to the competence of the Project Manager, risk management of operating activities – the competence of risk owners in the areas of activity and/or managers of functional systems.

The effectiveness of R&OMS is determined on the basis of an annual self-assessment, as a confirmation the following is identified:

- compliance with regulatory requirements;
- achievement of the current and medium-term KPIs of the organization;
- involvement of personnel in the risk management process;
- successful completion of audits of quality management systems (according to ISO 9001:2015, ISO 14001:2015, ISO 45001:2018).

The process of R&OMS deployment in the organization revealed problems of organizational, technical and social nature, hindering the full implementation of this process:

- weak risk-based thinking in the organization;
- the absence of introduced into commercial operation the risks and opportunities management automated system, the implementation feasibility of which was reasonable and planned in your organization for coming years [Brykalov, Netronin, Balyberdin, etc., 2018b);
- lack of clearly defined and regulated project management process;
- absence of R&OMS integration processes into strategic and operational management processes, as well as in quality management system processes.

Risk and opportunities management processes are necessarily to be taken into account when developing and/or updating quality management system standards: the standard of the environmental management system, standards in the field of industrial safety and labour protection, the standard for project management, etc.

At the same time, R&OMS is not yet integrated into the processes of strategic and operational management, is not taken into account in the decomposition of goals and the development of KPI maps, which, in our opinion, is one of the main constraints for the further development and improvement of R&OMS in the organization.

## 2.5. THE CONCEPT OF BSC AND R&OMS METHODOLOGIES INTEGRATION

In our opinion, modern management, especially at the strategic level, needs methodologies for R&OMS construction, and these methodologies need to be organically introduced and integrated into existing and projected mechanisms and organizational management schemes. In particular, the considered methodology of the BSC should undergo such a transformation. Modern corporate information systems should also include blocks for automation of R&OMS at all levels of management.

Options and approaches to the integration of the BSC methodology and risk management systems are outlined schematically and in a fairly general form [Implementation, 2006].

We list the main conceptual provisions for the integration of the BSC and R&OMS in more detail and specifically:

- Analysis and accounting of risks and opportunities corresponding to the formulated strategy of the company. This analysis should consider the risks and opportunities of the external and internal environment of the company.
- Detection, identification and structuring of risks and opportunities for the full set of the company's strategic goals.
- Detection and construction of cause-effect relationships and chains between strategic goals and risks in order to track their impact on each other.
- Identification and specification of all factors and indicators used to measure objectives and risks.
- Setting target values for each factor and indicator and their thresholds, if not reached, the corresponding risks may arise. Thresholds of factors and indicators are most often appropriate to establish by the methods of expert evaluation.
- Development of measures, the implementation of which should ensure the achievement of goals and reduce the likelihood of risks occurrence.
- Monitoring of the implementation process and preparation of internal management reports.
- Definition of personal responsibility of employees for the achievement of target values of the established indicators and minimization of the corresponding risks and threats, construction of coordination system of the purposes and employee incentive programme.
- Inclusion of implementation indicators of measures to prevent/minimize risks, as well as indicators of efficiency (effectiveness) of R&OMS into the KPI maps of enterprise managers.
- Adjustment and updating of the integrated system in accordance with the changing dynamics of the company, the emergence of new strategic management tools, the emergence of unforeseen risks and threats, etc.

The BSC is significantly expanded and enriched by providing additional information on the risks impeding the development, introduction and implementation of a well-designed and documented strategy. Conversely, R&OMS methodology is organically integrated into the continuous process of strategic management at all levels of management.



The relationship between the LTIFR risk with the organization's goals

Strategic objective	Risk	Risk factor	F+unctional system in which there is a risk
Increase of safety level in the organization (achievement of zero coefficient of frequency of injuries with temporary disability)	Exceedance of injuries frequency ratio	Non-compliance with safety requirements and rules; low safety culture	All functional systems
The increase in package orders for 20%	Reputational risk	Reducing the level of trust in the enterprise	Personnel management, quality management

### 3. RESEARCH RESULTS AND DISCUSSION

Within the framework of the concept of the BSC methodology integration and the R&OMS methodology at a large industrial enterprise of the nuclear industry, it is proposed:

- to identify, analyze and assess the risks of non-achievement (of indicators) for each strategic goal (indicator) on the basis of the formulated strategy of the company, to identify and describe new opportunities to improve the strategy indicators, to develop action plans in order to prevent/minimize the occurrence of strategic risks;
- to perform a continuous analysis of risks and opportunities of the external and internal environment of the company, monitoring the political situation in the country, as well as in the countries in which the company conducts business, the results of this analysis should be included in the document of the integrated management system "Context of the organization" (Brykalov, 2019);
- to take into account measures to prevent/minimize the risk of not achieving strategic goals in the objective tree of the organization and to decompose these measures to the managers of the appropriate level of management;
- to identify and describe in detail the risks of non-fulfillment of the strategy and opportunities to improve indicators simultaneously with the development and approval of the strategy of the organization (preferably in one document) and immediately to include them into the consolidated register of risks of the organization in the section of strategic risks; assessment of the risk significance level should be maximum;
- to include performance indicators of these activities into KPI maps of relevant managers for the monitoring over the implementation of activities

designed to prevent/minimize the risk that strategic objectives will not be achieved;

- to establish measurable performance indicators of R&OMS and to include them into the KPI maps of relevant managers for the monitoring over the effectiveness of the R&OMS in the organization:
  - o indicator of personnel involvement in the risk management process – the number of personnel involved in the risk management process in various roles (risk owner, expert, risk coordinator) – at least 10% of the organization's staff;
  - o reducing the number of risks – at least 5% annually;
  - o quality indicators of planning and risk management:
    - the ratio of the realized (unidentified) risks to the identified risks;
    - percentage of risks that have decreased to an acceptable level;
    - number of outstanding activities for the year, approved in the risk register;
    - number of outstanding measures on the reduction of the probability of risk realization with a negative outlook (high probability of realization);
  - o indicator of integration into the quality management system – successful completion of audits of quality management systems (according to ISO 9001:2015, ISO 14001:2015, ISO 45001:2018) without comments in the field of risk management

When decomposing the risks of achieving strategic goals, it should be taken into account that a specific strategic goal can be associated with several risks related to different functional systems and activities of the organization, and, conversely, a specific risk (risk factor) can be associated with several strategic goals.

The risk of exceeding the rate of injuries with temporary disability of more than zero may lead to the fact that the strategic goal of improving the level of safety and increasing the orders package by 20% will not be achieved (a high rate does not allow the organization to obtain accreditation and participate in large tenders due to the occurrence of penalties, reducing the image of the organization) (see table).

This approach will allow the management of the organization to start managing the implementation of the strategy in advance, considering it not only as a general concept of the enterprise development but also as a specific project.

## CONCLUSIONS

The transition to Industry 4.0 will inevitably require companies to introduce fundamentally new management tools and methodologies. The creation and implementation of a methodology that integrates the concept of building and implementing a system of balanced performance indicators and the concept of building and implementing a risk and opportunities management system for large enterprises are currently extremely relevant and in demand. Such an integrated methodology can significantly improve the quality of management decisions of strategic, tactical and operational nature.

## REFERENCES

1. Bodrunov S. D. (2018). Rossijskaya promyshlennost' na fone mirovoj // Trudy Vol'nogo ekonomicheskogo obshchestva Rossii. T. 211. № 3. S. 29–35. [Bodrunov S. D. (2018). Russian industry against the background of global industry. *Works of the Free economic society of Russia*. 211 (3):29–35. (In Russ.)].
2. Brykalov S. M. (2019). Kontekst organizatsii: metodicheskie i prakticheskie podkhody k razrabotke i realizatsii (na primere promyshlennykh kompleksov i predpriyatij) // Kachestvo i zhizn'. № 2. S. 13–15. [Brykalov S. M. (2019) Context of the organization: methodical and practical approaches for development and realizations (on the example of industrial enterprises) // *Quality and a life*. 2:13–15. (In Russ.)].
3. Brykalov S. M. (2014). Metodika formirovaniya klyuchevykh pokazatelej effektivnosti rukovoditelej predpriyatiya atomnoj otrasli (sistemy kart KPE) // *Ekonomika i predprinimatel'stvo*. № 10. S. 337–341. [Brykalov S. M. (2014). The technique of establishment of key performance indicators for chief executive of nuclear enterprises (KPI system). *Economy and business*. 10:337–341. (In Russ.)].
4. Brykalov S. M. (2016). Novyj podkhod k povysheniyu effektivnosti predpriyatij mashinostroitel'nogo diviziona Goskorporatsii «Rosatom» (na primere AO «OKBM Afrikantov») // Nauchnaya shkola F. F. Yurlova: sbornik nauchnykh trudov. Nizhnij Novgorod: Nizhegorod. gos. tekhn. un-t im. R. E. Alekseeva. S. 41–51. [Brykalov S. M. (2016). The new approach in increasing the efficiency of Rosatom's machine-building division (on the example of «OKBM Afrikantov») JSC). In: Yurlov's scientific school: the collection of proceedings. Nizhny Novgorod: NSTU of. R. E. Alekseev. 41–51. (In Russ.)].
5. Brykalov S. M. (2015). Sbalansirovannaya sistema pokazatelej i klyuchevye pokazateli effektivnosti: terminologicheskij analiz, problemy i napravleniya razvitiya // *Ekonomika i predprinimatel'stvo*. № 5. S. 570–575. [Brykalov S. M. (2015). Indicators' balanced systems and key performance indicators: the terminological analysis, problems and areas for development. *Economy and business*. 5:570–575. (In Russ.)].
6. Brykalov S. M., Balyberdin A. S., Trifonov V. YU. (2018a). Rekomendatsii po postroeniyu sistemy upravleniya riskami v promyshlennykh kompleksakh i predpriyatiyakh s uchedom trebovanij mezhdunarodnykh i rossijskikh standartov // *Ekonomika i menedzhment sistem upravleniya*. № 3. S. 19–27. [Brykalov S. M., Balyberdin A. S., Trifonov V. Yu. (2018a) Recommendations for risk management implementation at the industrial enterprises in the light of international and Russian standards. *Economy and management of control systems*. 3:19–27. (In Russ.)].
7. Brykalov S. M., Netronin I. V., Balyberdin A. S. i dr. (2018b). Podkhody k vnedreniyu avtomatizirovannoj sistemy po upravleniyu riskami i vozmozhnostyami v promyshlennykh kompleksakh i na predpriyatiyakh // *Upravlenie riskom*. № 4. S. 29–35. [Brykalov S. M., Netronin I. V., Balyberdin A. S., etc. (2018b) Approaches for Risk management automated system implementation at industrial enterprises. *Management of risk*. 4:29–35. (In Russ.)].
8. Vnedrenie sbalansirovannoj sistemy pokazatelej (2006)/Per. s nem. M.: Alpina Biznes Buks. 477 s. [KPI system implementation (2006)/Transl. from German. M.: Alpina Business books. 477 p. (In Russ.)].
9. Mil'per B. Z. (2010). Innovatsionnoe razvitie: ekonomika, intellektual'nye resursy, upravleniya znaniyami. M.: Infra-M. [Milper B. Z. (2010). Innovative development: economy, intellectual resources, managements of knowledge. M.: Infra-M. (In Russ.)].
10. Polozhenie o sisteme upravleniya riskami Goskorporatsii «Rosatom», vvedennoe v dejstvie prikazom ot 11.11.2015g. №1/1067-P [Regulation about risk management system in Rosatom State Corporation. 11.11.2015. №1/1067-P. (In Russ.)].
11. Prikaz Goskorporatsii «Rosatom» ot 01.08.2016 №1/702-P «Ob utverzhdenii Edinykh otraslevykh metodicheskikh rekomendatsij po formirovaniyu i primeniyu instrumentov dekompozitsii tselej». [The Order of Rosatom State Corporation from 01.08.2016 №1/702-P «About the statement of Uniform branch methodical recommendations for implementation and application purposes decomposition tools». (In Russ.)].
12. Prikaz Goskorporatsii «Rosatom» ot 11.01.2017 №1/3-P «Ob utverzhdenii Edinoj otraslevoj politiki upravleniya effektivnost'yu deyatelnosti rabotnikov Goskorporatsii «Rosatom» i ee organizatsij». [The Order of Rosatom State Corporation from 11.01.2017

- №1/3-P «About the statement of Uniform branch policy of employees' work efficiency management in Rosatom State Corporation and its organizations». (In Russ.).
13. Publichnyj godovoj otchet AO «OKBM Afrikantov» <http://www.okbm.nnov.ru/media-center/interactive-applications/public-annual-report/> [«OKBN Afrikantov» JSC annual report. *OKBN Afrikantov» JSC* (In Russ.)]. <http://www.okbm.nnov.ru/media-center/interactive-applications/public-annual-report/>.
  14. Rasporyazhenie Pravitel'stva Rossijskoj Federatsii ot 28 iyunya 2017 goda №1632-r «Ob utverzhdenii programmy «TSifrovaya ekonomika Rossijskoj Federatsii» // Konsul'tantPlyus. [The Order of Russian Federation Government from June, 28th, 2017 №1632-p «Statement of the program «Digital economy in Russian Federation». *ConsultantPlus*. (In Russ.)]. [http://www.consultant.ru/cons/cgi/online.cgi?req=doc\\*base=PNPA\\*n=31888\\*004784500774527972](http://www.consultant.ru/cons/cgi/online.cgi?req=doc*base=PNPA*n=31888*004784500774527972).
  15. Tolkachev S.A. (2017) Kachestvennye izmeneniya global'nogo industrial'nogo landshafta // Trudy Vol'nogo ekonomicheskogo obshchestva Rossii. T. 207. № 5. S. 170–200. [Tolkachev S.A. (2017). Qualitative changes of a global industrial landscape // Works of the Free economic society of Russia. 207 (5):170–200. (In Russ.)].
  16. Trifonov Yu. V., Veretennikova A. A. (2014) Dinamicheskaya transformatsiya teorii strategicheskogo upravleniya // Menedzhment v Rossii i za rubezhom. № 3. S. 3–9. [Trifonov Yu. V., Veretennikova A. A. (2014) Dynamic transformation of the strategic management theory// Management in Russia and abroad. 3:3–9. (In Russ.)].
  17. Ukaz Prezidenta RF ot 07.05.2018 N 204 (red. ot 19.07.2018) «O nacional'nykh celyakh i strategicheskikh zadachah razvitiya Rossijskoj Federacii na period do 2024 goda» // Konsul'tantPlyus. [The Decree of the President of the Russian Federation from 07.05.2018 № 204 «National purposes and strategic targets for country's development for the period till 2024». *ConsultantPlus*. (In Russ.)]. [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_297432/](http://www.consultant.ru/document/cons_doc_LAW_297432/).
  18. Kaplan R., Norton D. (1992) The Balanced Scorecard – Measures that Drive Performance. Harvard Business Review. Vol. 70. P. 71–79.

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