

Evaluation of the maturity level of sustainable transport enterprise development

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Abstract. The paper considers one of the conditions for ensuring the sustainable development of a transport enterprise, i.e. the correct evaluation of its maturity level. The difficulties are found which are associated with the choice of tools for evaluating the level of maturity of sustainable development achieved by a transport enterprise as a result of implementing its sustainable development. An approach is proposed to integrate the quality management system of a transport enterprise and the concept of sustainable development, which is based on international ISO 9000 standard, which acts as a base for industry standards, and harmonized with GOST R 54598.1-2015. The procedure of evaluating the levels of QMS maturity and sustainable development of the enterprise are considered, which methodological basis is the method for evaluating the maturity of processes by R. Gardner and the maturity matrix of sustainable development in accordance with GOST R 54598.1-2015. The arguments are given to prove the expediency of using the proposed approach in evaluating the level of a transport enterprise maturity for compliance with the criterion of sustainable development and the quality of its processes.

1 Introduction

Nowadays the operation of transport industry enterprises is carried out according to the concept of sustainable development, which declares responsible consumption, including the provision of services related to the arrangement, implementation, monitoring and improvement of transportation of objects for various purposes, thereby laying the foundation for creating a more stable society. At the same time, it is anticipated that the condition for implementing this concept is the integration of its basic principles (goals) into the management system and the correct evaluation of the maturity level of sustainable transport enterprise development.

At the 70th UN General Assembly, within the Summit on Sustainable Development, 17 Sustainable Development Goals (SDGs) were formulated in the paper called *Transforming our World: 2030 Agenda for Sustainable Development*. The 11th goal (paragraph 11.2) in the paper under consideration is directly related to the transport sector and declares the provision of "safe, inexpensive, affordable and environmentally sustainable transport systems" to all interested parties [1].

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In this regard, finding tools for integrating the goals and principles of sustainable development into the overall management system of a transport enterprise is undoubtedly relevant. The interest in the implementation of sustainable development in the transport sector is also caused by the ambiguity of approaches in the scientific community to the definition of methods and procedures for its harmonization with the general management system and evaluating the maturity level of the sustainable enterprise development providing this type of services in this regard.

It seems that an effective tool for implementing the concept under consideration is its integration into the quality management system, which is currently a mandatory tool for ensuring the quality and efficiency of a transport enterprise operating at the market.

In view of this, the analysis of scientific approaches to identifying the model for evaluating the maturity level of a sustainable transport enterprise development, harmonized with its QMS, is of not only theoretical but also practical interest.

2 Materials and methods

The implementation of sustainable development integrated into the quality management system of a transport enterprise implies responsible consumption of transport services. At the same time, achieving this level of consumption is possible through the stability (reliability) of the results of QMS processes, indicating their level of maturity.

The study of scientific approaches to the use of tools for integrating and evaluating the state (level) of sustainable development of transport enterprise QMS has revealed the following difficulties [2-10]:

- the lack of a single generally accepted management system that allows managing sustainable development based on the principle of trinity (economic, environmental and social aspects);
- the use of descriptive procedures for managing and evaluating the state of sustainable development, which affects the reliability level of the information received about the research object;
- the need to adapt a number of existing models, including foreign ones that implement the principles of sustainable organization development, to the specific character of industry management, etc.

The experience of integrating the concept of sustainable development into the QMS has showed that problems exist associated with receiving incorrect information about the level of achievement of organizational stability by a transport enterprise.

The analysis of the requirements of some international and national standards in the field of sustainable development (ISO 20121:2012, ISO 37101:2016, BS 8900-1:2013 (GOST R 54598.1-2015), BS 8900-2:2013 (GOST R 54598.2-2015), etc.) allowed to conclude that the regulatory documents under study contain criteria for determining the maturity level of the organization's management system in this subject area. However, the proposed criteria are not decomposed into indicators relevant for monitoring. At the same time, there are no design ranges of parameter values (rating scale) that make it possible to judge unambiguously the state of the maturity level of the organization's sustainable development. This makes it difficult to apply standards for conducting self-evaluation (audit) and determining the level of maturity of the quality management system and sustainable development of the organization.

Identification of QMS model, which has a mechanism for evaluating the maturity level of its processes, correlated with the mechanism for determining the maturity level of sustainable development of a transport enterprise, is, among other things, one of the problems solved by specialists in the field of quality management. Managers choose a quality system model based on the possibility of a simplified way for integrating it into the overall

management system and the availability of mechanisms in it that allow not only to implement the concept of sustainable development of the enterprise, but also to find the level of its maturity. However, the analysis of scientific references and practices in this subject area revealed the lack of elaboration of the issues under consideration.

Elimination of the identified shortcomings is possible as a result of solving the following tasks:

- identification of QMS model of a transport enterprise that has mechanisms for integrating the concept of sustainable development into the management system;
- development of a procedure for evaluating the maturity levels of QMS and the sustainable development of the transport enterprise.

The methodological basis for conducting research in this subject area are tools and conceptual approaches to implementing transport activities taking into account quality management (process approach, QMS models, process maturity levels, etc.) and the concept of sustainable development.

3 Results and discussion

The solution of the tasks set out in this study is possible on the basis of identification of QMS model, which has mechanisms for harmonization with the concept of sustainable development, including the development of a procedure for evaluating the maturity levels of QMS and sustainable development of a transport enterprise.

3.1 Identification of QMS model of a transport enterprise

A management model based on an integrated set of standards (international or their national analogues), ideally covering all functional areas of activity, i.e. an integrated management system, is preferred within the framework of this study and widely implemented at transport enterprises of the country. The integrated management system provides for the simultaneous aggregation of separate management systems into the general system of the organization, and therefore the organizational and methodological basis of such a model is the main standard and additional international ones harmonized with it.

In practice, the basic standard for creating an integrated management system is ISO 9000 series of international standards (currently ISO 9000:2015, ISO 9001:2015), which regulates the functioning of the quality management system of enterprises and organizations of various industry affiliations and forms of ownership.

In this regard, QMS model of a transport enterprise can be developed on the basis of ISO 9000 international standards or standards integrated with them. In particular, the standard (and QMS based on it) for enterprises of the railway industry ISO/TS 22163:2017 is built on this principle, including the following (Figure 1):

- international quality management standards ISO:9001;
- international standard of the railway industry IRIS.

ISO:9000 series of standards defines the general outline of the quality management system of a transport enterprise: it defines the scope of activity and the overall structure; describes the management system of the enterprise in the context of conceptual principles and specific character of the process approach (planning and implementation of processes, PDCA cycle, risk-oriented thinking); regulates documented information and procedures for its development, application and accounting; examines the mechanisms of resource management, identifies an approach to the interpretation of quality, etc. (Figure 1). Thus, ISO 9000:2015 standard is the backbone in the integrated management system model.

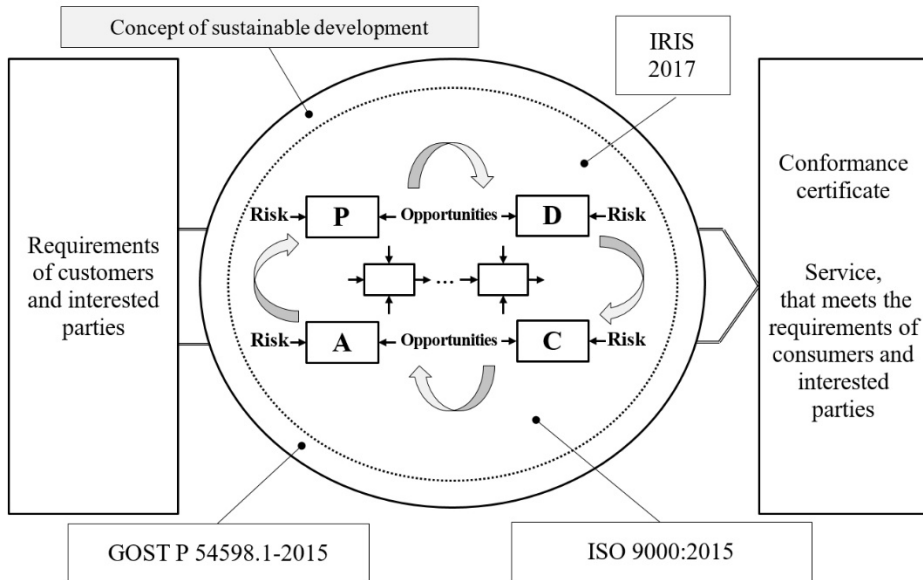


Fig. 1. An example of QMS model of a railway enterprise based on harmonized ISO/TS 22163:2017 and GOST P 54598.1-2015.

If ISO 9000 regulates the functioning of transport enterprise QMS, then IRIS contains rules concerning the evaluation methodology and certification process, requirements for auditors and certification bodies in relation to the railway industry.

Separate standards are integrated into the management system under the following conditions: if they do not conflict with the basic standard ISO:9000. Such standards currently include:

- ISO 14000, which regulates the environmental management system;
- OHSAS 18000, which is the basis for the development of a management system for occupational safety and health of the organization's personnel;
- ISO 27000, forming a management system in the field of information security;
- SA 8000, forming a system of social and ethical management;
- ISO 20225, regulating the system of market research, public opinion and social problems, etc.

It should be noted that standard GOST P 54598.1-2015 Management of Sustainable Development can be quite simply integrated into QMS model under consideration. Part 1. Management (authentic BS 8900-1:2013), which regulates sustainable development activities and methodology that helps an organization to improve the effectiveness and efficiency of its management system. The principles of sustainable development (involvement, management responsibility, transparency, etc.) correlate with the conceptual principles of ISO 9000 series of international standards (employee interaction, leadership, evidence-based decision-making, etc.), which allows considering GOST P 54598.1-2015 standard as a full-fledged element of QMS model of a transport enterprise.

GOST P 54598.1-2015 standard also contains a maturity matrix for the sustainable development of the enterprise. The maturity matrix of sustainable development sets a general approach to evaluating the state of an enterprise: it links the principles of sustainable development with the practice of their implementation, and the ways of interacting with partners and stakeholders with the desired results.

However, the standard does not offer a mechanism for identifying the maturity level of sustainable development of an enterprise, which makes it necessary to carry out further

research in this subject area. It seems that the maturity matrix of the sustainable development of an organization can be integrated with the methodology of evaluating the maturity of processes (QMS) by R. Gardner [10] in order to develop a technique for evaluating the 1 maturity levels of QMS and sustainable development of the enterprise.

3.2 The procedure for evaluating the maturity levels of QMS and the sustainable development of the transport enterprise

The development of a procedure for evaluating the maturity levels of QMS and the sustainable development of a transport enterprise is based on the following assumptions:

- a mature enterprise (QMS) means mature processes, which implies their ability to achieve planned results, including sustainable development;
- the maturity level of an enterprise (QMS) is the degree to which the organization's activities and its results are defined, measurable and reproduced, capable of being resistant to undesirable influences, effective and flexible when changing external conditions and consumer requirements;
- the basis of the procedure under consideration consists of the integrated regulatory and methodological papers: R. Gardner's methods for evaluating the maturity of processes (QMS), GOST R 54598.1-2015.

The transport company regularly monitors the maturity level of its QMS (processes) and the sustainable development of the organization at five levels (Table 1):

Table 1. Scale of evaluating QMS development and sustainable development of the enterprise.

The scale for determining SD maturity	<10 points SD Level 0	10-12 points SD Level I	20-24 points SD Level II	14-20 points SD Level III	18-26 points SD Level IV
Maturity levels	Uncertainty	Certainty	Reproducibility (if the maturity of the QMS / enterprise is of level I)	Ability (if the maturity of the QMS / enterprise is of level II)	Efficiency (if the maturity of the QMS / enterprise is of level III)
Scale for determining QMS maturity	<10 points QMS Level 0	10-18 points QMS Level I	13-21 points QMS Level II	12-18 points QMS Level III	16-24 points QMS Level IV
					Best Practices in its Class

Note: SD – sustainable development of the enterprise; QMS is an enterprise quality management system.

- Level 0 is uncertainty – processes, their parameters, interested parties and consumers, documented information, conceptual principles of sustainable development, etc. are uncertain and unpredictable;
- Level I is certainty – processes, their formalized parameters, interested parties and consumers, documented information, conceptual principles of sustainable development, etc. are defined and fragmentally analyzed, they are managed, including the feedback from process participants;
- Level II means reproducibility – the formalized requirements of consumers are extrapolated into the output indicators of the process and parameters of sustainable development, which are regularly measured, analyzed, documented and adjusted if necessary using statistical methods.

Table 2. An example of the maturity matrix of sustainable enterprise development at level I (certainty).

The maturity matrix of SD at level I (Certainty)		The name of the enterprise:			
The level of the previous examination of the enterprise: The score received by the enterprise at the previous inspection:		Name of the process (type of activity):			
Principles of sustainable development	A sign of maturity	○	⊖	●	The presented objective evidence of achieving maturity
1. Engagement	1.1. Interested parties and consumers of the enterprise are identified and the feedback is established with them	+	-	-	+
	1.2. The requirements of consumers and interested parties of the enterprise, taking into account the aspects of the trinity (social, economic, environmental aspects), are formalized and known by the staff.	-	+	-	+
2. Responsibility of the authority	2.1. The head of the enterprise process identifies the difference between the process and functional management of the departments included in the process; understands the mutual influence of the process parameters under his control and aspects of the trinity.	+	-	-	+
	2.2. The main documents regulating the process for sustainable development has been developed (they contain information about the aspects of the trinity).	-	+	-	+
3. Transparency	3.1. Within the process, some indicators related to the consumers of the process are measured and their fragmentary analysis is carried out.	-	+	-	+
	3.2. The organization regularly publishes up-to-date, impartial and objective information on the achievement (fulfillment) of process indicators related to sustainable development.	-	-	-	-
4. Compliance with ethical standards	4.1. Ethical standards related to the aspects of the trinity are included into the documents (philosophy, quality policy of the enterprise, etc.) and the participants of the process are informed about them.	-	+	-	+
	4.2. The head and participants of the processes are committed to compliance with ethical standards; the compliance with these standards is periodic reported.	-	+	-	+
Evaluation results		○	Complete		3
Score	11 points	⊖	Partially complete		1
≤ 9	non-compliance with level I	●	Fail		0
from 10 to 12	Maturity level I - Certainty	Full name of the expert		<u>Ivanov I.I.</u>	
		Signature		<u>Signature</u>	

- Level III is ability – formalized input and internal process indicators and parameters of sustainable development are constantly measured, analyzed, documented, adjusted and improved if necessary, a risk-oriented approach to process management is implemented, an increase in customer satisfaction and interested parties is recorded;
- Level IV is efficiency – activities that do not add value and confidence in the implementation of sustainable development for consumers of the process (enterprise), etc. are identified and minimized.

The examination uses standard forms –matrices containing a scale (in points) of the maturity level of processes (QMS) and sustainable development of the enterprise. The matrices are filled in by experts on the basis of objective evidentiary material provided by the enterprise. At the same time, each subsequent maturity level (with the exception of the zero and first levels) includes signs of maturity of all previous levels. An example of the maturity matrix of sustainable enterprise development at level I (certainty) is given in Table 2.

The decision on the compliance of transport enterprise QMS with the declared standards, i.e. the ability of QMS to guarantee the quality and implementation of sustainable development principles of transport services, is made on the basis of its audit carried out by experts of authorized bodies.

4 Conclusion

The proposed approach in evaluating the maturity level of a transport enterprise for compliance with the criterion of sustainable development and the quality of its processes, based on the integration of QMS model (where ISO 9000 acts as the basic standard) and GOST R 54598.1-2015, with correct mechanisms for monitoring the current state, reduces the level of uncertainty in obtaining reliable and relevant information.

The development and implementation of the national standard GOST R 54598.1-2015 into the quality management system will contribute to the sustainable success of the transport enterprise as it harmonizes with QMS, regulates the implementation of the concept of sustainable development and adapts to the specific character of domestic management.

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