

# THE RISK-ORIENTED THINKING CONCEPT IN THE QUALITY MANAGEMENT SYSTEM OF THE EDUCATIONAL ORGANIZATION

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## Abstract

The article presents the definition of risk-oriented thinking, in view of the applicable requirements of the current version of the national standard DSTU ISO 9001:2015 “Quality Management Systems. Requirements”. The authors analyzed the changes that occurred in the sense of the term “risk” compared to the previous version of the standard, as well as the related requirements. The advantages of the educational organization from the introduction of risk-oriented thinking concept in the quality management system are presented. In order to prevent a purely formal application of this concept, the article presents the author's proposals aimed at formalizing methods and documenting the risk management process. Of paramount importance is the understanding by the staff of the educational organization of the regulatory and legislative requirements for risk assessment and management, the main list of which is presented in the paper. Using the graphical method, the relationship between the Schukhart-Deming PDCA improvement cycle and the components of risk management as principles, structure and process is outlined. The substantive essence of such interaction is the creation of an effective quality management system of an educational organization aimed at achieving the defined goals in the field of higher education. The study identifies elements of the risk assessment and management decision making process. A form has been developed and provided to provide documented identification, hazard analysis and risk assessment of the educational organization. To select the risk assessment method, the authors analyzed the methods outlined in the national standard DSTU IEC/ISO 31010:2013 “Risk Management. General Risk Assessment Methods” and identifies the methods most applicable to the educational organization's quality management system. Examples of scales and matrices of risk assessment in the quality management system of an educational organization are developed, which ensures the clarity and practical application of the methods chosen by the authors of the article. The features of risk-oriented thinking concept, identified and analyzed in the course of the presented study, provide an opportunity for structuring the risk management process and for determining the factors that may influence the achievement of higher education goals.

**Keywords:** DSTU ISO 9001:2015, opportunities, educational organization, risk, quality management system.

## INTRODUCTION

The vast majority of educational organizations in Ukraine, where a quality management system has been implemented and certified according to the requirements of DSTU ISO 9001:2015, the risk-oriented thinking concept is mostly used as a formal act, first of all, due to the lack of complete information and practical examples for using assessment methods in the educational sphere. Therefore, there is a problem of comprehensive analysis of risk-oriented thinking and the identification of features associated with the use of this concept in the quality management systems of educational organizations.

## **PREVIOUS RELATED RESEARCH**

Significant contribution to the study of the theory and nature of risk was made by such domestic scientists as Balabanova LV. [4], Vitlinsky V.V. [5], Granturov V.M. [6] and foreign scientists as Bedford T. [1], Cruy M. [2], Monahan G. [3] and many others. At the same time, the problem of introducing of the risk-oriented thinking concept has not been adequately reflected in the available scientific works in educational organizations, so it leads only to the declared goals in higher education and hinders the development of quality management systems in accordance with the regulatory requirements of the international community.

*The problem definition.* The purpose of this research is to analyze the essence of the risk-oriented thinking concept and determine the features of its application in the quality management systems of educational organizations.

## **RESEARCH RESULTS AND DISCUSSION**

After the review of ISO 9001 standard “Quality management systems. Requirements” by the international organization ISO, and its edition in 2015, “process approach” and “risk-oriented thinking” are the key aspects on which quality management systems (hereinafter referred to as QMS) of enterprises and organizations should be based on[10].

Risk-oriented thinking is the planning and implementation of measures and methods used by an organization to manage and control risks that affect its ability to achieve its intended goals. The risk-oriented thinking concept is based on risk management principles, aimed at assessing risks and opportunities. It should be noted that according to DSTU ISO 9001:2015, risks and opportunities are often identified together, but opportunities are not a positive side of risk. Opportunities are a set of circumstances that allow one to do something, using them or not using them presents different levels of risk.

As stated in the article [11], the term “risk” was also used in previous versions of ISO 9001, but in the form of “corrective and preventive actions”. There was always risk, but there was no systematic and structured approach to assessing and managing it at the level of regulatory requirements. Thus, the QMS of educational organizations, as in 2015, should not just function and implement certain actions before or after the occurrence of a specific danger, but on a permanent basis it should identify, evaluate and take them into account while providing services, analyzing the possible likelihood of failure to meet customer requirements, applicable regulatory and regulatory requirements, etc. The risk-oriented thinking concept according to DSTU ISO 9001:2015 is an integral part of the process approach and is contained in every structural component of the requirements of the standard (see Table 1).

According to the table 1, risk-oriented thinking, introduced in accordance with the requirements of DSTU ISO 9001:2015 in the QMS of an educational organization, allows to reduce the number of policy requirements by focusing on efficiency-oriented requirements.

Table 1. Risk-oriented thinking in the requirements of DSTU ISO 9001:2015

Sections of the standard DSTU ISO 9001:2015	Content requirements for consideration of risks
Introduction (0.3.3 Risk-Oriented Thinking); Appendix A (A.4)	<ul style="list-style-type: none"> <li>– explanation of risk-oriented thinking;</li> <li>– identifying risks and opportunities</li> </ul>
Chapter 4, p. 4.1; p. 4.4	an organization should identify its environment, the needs and expectations of its stakeholders, identify processes and resources, as well as the risks and opportunities that determine them
Chapter 5 Leadership	top management has to: <ul style="list-style-type: none"> <li>– promote the use of the process approach and risk-oriented thinking;</li> <li>– identify and take into account risks and opportunities that may affect the conformity of products (services) and customer satisfaction</li> </ul>
Chapter 6 Planning, p. 6.1	the organization should identify risks and opportunities as the basis for planning, as well as develop actions according to the risks and opportunities
Chapter 7 Maintenance of Management System	the organization has to identify resources, monitor and measure them for the likelihood of results (risks are taken into account whenever the “right” or “appropriate” is mentioned)
Chapter 8 Production	the organization has to manage its operational processes (risks are implied whenever a “required” or “appropriate” is mentioned)
Chapter 9 Performance evaluation	the organization has to measure, analyze and evaluate the performance of the quality management system in place, including the effectiveness of actions taken on risks and opportunities
Chapter 10 Improvement	the organization has to correct, prevent or reduce undesirable effects and, if necessary, update the risks and opportunities identified during the planning

Source: compiled by the authors according to standard DSTU ISO 9001:2015 [10]

According to the results of our previous research of the identified problems, presented in [11], we can state that the introduction of the risk-oriented thinking concept in the QMS of an educational organization:

- allows you to identify risks for all processes of creating an educational service;
- ensures the achievement of higher education objectives;
- improves management;
- establishes a warning culture of improvement;
- assists with effective regulatory and legislative requirements;
- increases the trust and satisfaction of stakeholders in educational services.

At the same time, a formal approach is observed to the use of the risk-oriented thinking concept in the QMS of educational organizations because the standard [10] does not contain policy requirements for formalized risk management’s method. It is not required to provide and storage of documented information about the description of the risk management process from the organization implemented by the QMS.

Organizations themselves have to identify such needs, determine the risks of processes within the QMS, as well as vary levels of the impact of uncertainty on the achievement of their objectives, particularly in higher education.

For an educational organization, the possible risks appear from the context of its activities related to the education, upbringing, development and self-improvement of the individual under the current conditions of autonomy and democratization of the management of the educational process (as an example - the transition to a new system of financing and reduction of the budget component; services and their content to the modern requirements of employers; competition among educational organizations and reduction of the number of entrants), and they are at least political, economic and marketing risks [11]. In particular, according to V.M. Granaturov, “marketing risk is a component of organizational and management risks which determines the possibility of unplanned change of the end result of activity due to deficiencies in the organization of marketing activity” [6].

In order to understand the nature and the practical bases of applying the concept of risk-oriented thinking with the further formalization of the risk management process, it is necessary to use such fundamental documents that determine the applicable requirements for risk assessment:

- DSTU ISO Guide 73:2013 “Risk management. Glossary of Terms”;
- DSTU ISO 31000:2018 “Risk management. Principles and guidelines” (ISO 31000:2018, IDT);
- ISO/TR 31004:2013 “Risk Management - Implementation Guidelines ISO 31000”;
- DSTU IEC/ISO 31010:2013 “Risk management. General methods of risk assessment” (IEC/ISO 31010:2009, IDT).

All these documents, as well as DSTU ISO 9001:2015, and above all the basic one, in the new version of the standard - DSTU ISO 31000:2018, built on the cycle of PDCA improvements by Schuhart-Deming. It is through the interaction of the components of risk management (principles, structure, process (see fig. 1)) and the PDCA cycle that the effectiveness of the QMS based on risk-oriented thinking is enhanced. At the same time, risk management, as well as quality management, is an integral part of the whole management system of an educational organization, not its separate function.

For planning and implementation of activities in order to identify hazards associated with educational services, identify and evaluate risks, control these risks and monitor the effectiveness of such controls, it is necessary to use both technologies and methods for risk assessment, as well as methodologies and tools for improving performance, including such like: FMEA, benchmarking, QFD methodology, method 6- $\sigma$  etc.

In order to apply risk assessment’s methods and management decisions, educational organizations require the development of a specific process that includes the following elements:

- definition of risk conditions;
- risk identification;

- risk analysis;
- risk assessment;
- risk management;
- assessing the acceptability of full residual risk;
- risk management report;
- monitoring and analysis (informing on the provision of educational services).

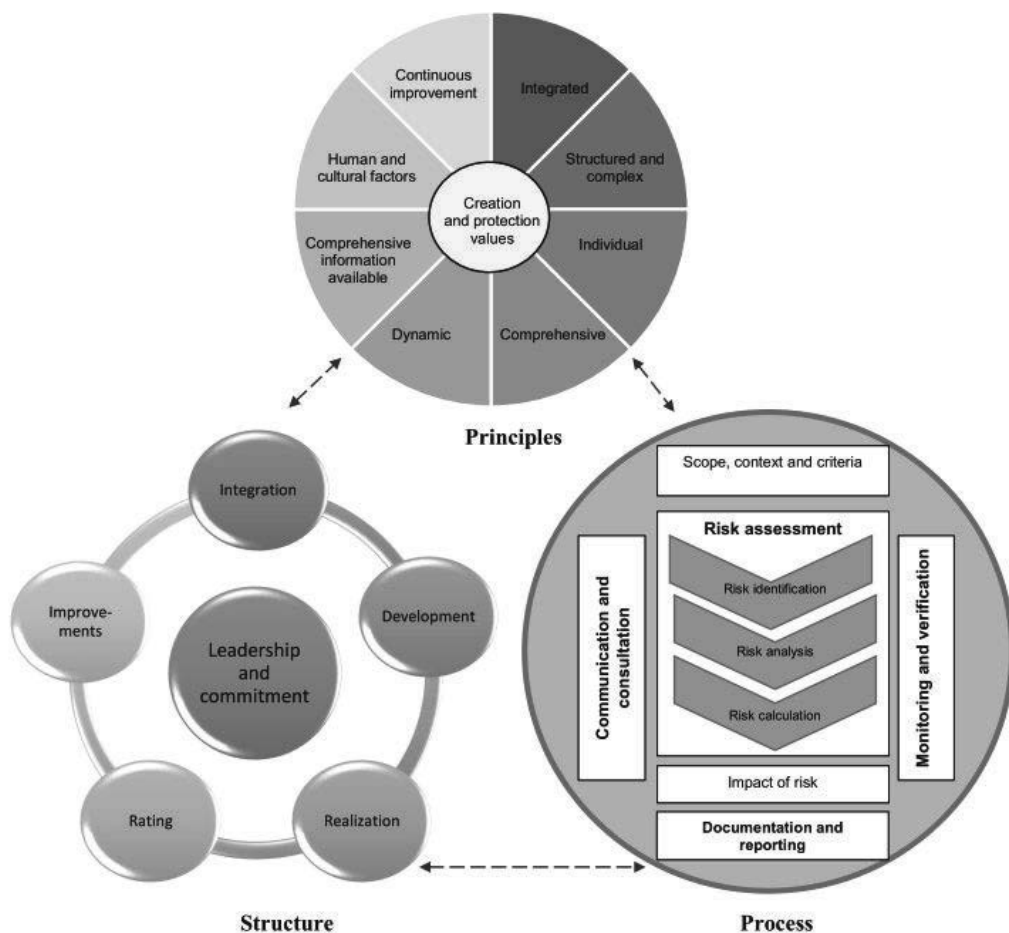


Figure. 1. Basic principles of risk management in accordance with DSTU ISO 31000:2018

Source: compiled by the authors according to the [9]

The management of the educational organization should provide risk management activities with appropriate resources, including trained competent staff, to establish documented risk tolerance criteria based on applicable legal and regulatory requirements, taking into account global educational experience, as well as needs and expectations of relevant stakeholders.

Risk assessment is a periodic process that is hold at least once a year and situationally. The situational assessment is performed in case of possible changes in the processes related to the education of higher education applicants when new sources of risk emerge. Acceptable statistical methods are used in analyzing data and results in risk management activities.

For a particular type of educational activity, the envisaged conditions for providing educational services (audience, program, procedures) and the predicted possibilities for incorrect services are determined. At the same time, all the qualitative and quantitative characteristics are noted and documented that can affect the education.

Documented information on the risk analysis of the educational organization should include:

- description and identification of the analyzed training;
- information about the qualifications of risk analysis professionals;
- a description of the risk analysis and its date.

Experts of educational organizations should develop a list of known and foreseeable dangers associated with the educational process, both in the foreseeable conditions of educational services and in the case of services with disabilities. Predetermined hazards are identified (see Table 2). Consecutive events are also anticipated and recorded that can lead to a dangerous situation.

Table 2. Form for documented identification, analysis of hazardous factors and calculation of risks of educational organization (sample)

No. in order	Potential hazards identified	Dangerous situations	Potential causes, mechanisms of occurrence and dangerous situations	Assessment of educational risk (R)			Is it necessary to reduce the risk	Measures to prevent dangerous situations	Residual risk assessment (R <sub>z</sub> )			Is it necessary to reduce the risk	Notes
				S	P	Risk assessment (R)			S	P	Risk assessment (R)		
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Source: authors' development

The list of dangerous factors in the form of table 2 is the basis for identifying the stages of the process where there is a potential risk of a threat for the effectiveness of educational, students' and workers' health of the educational organization, etc., but at the same time it is possible to eliminate this risk through appropriate management measures or reduce it to an acceptable level.

For each identified hazard, it is necessary, according to the selected criteria, to decide on the acceptability of the risk or to take additional measures to reduce it. Risk

assessment, selection of appropriate methods and quantitative or qualitative assessment scales are performed in accordance with the recommendations and requirements set out in DSTU IEC / ISO 31010:2013 “Risk Management. General methods of risk assessment” (IEC/ ISO 31010:2009, IDT). “Risk assessment involves the comparison of quantified levels of risk with the risk criteria identified during the setting of the environment in order to determine the value of the level and type of risk” [7, p. 8]. It should be noted here that major mistakes in higher education institutions are made when unclear and complex terms are used to denote risks, as well as ambiguous units in which the level of risk is presented in different processes of the QMS. Such errors should be avoided at the beginning of the risk identification, which is ensured by the involvement of competent experts in the educational organization in the risk assessment process.

When it is necessary to choose a risk assessment method in an educational organization, it can be both the simplest and the most difficult in order to apply and process. It is appropriate to use a number of methods in a complex combination, depending on: the purpose of assessment; the specific situation, relevance and suitability of it; availability of information and data; the degree of professional competence of risk assessors; the assessment result which has to be concerted with the risk criteria; obtaining the results in such a form that they can be understood to determine the nature of the risk and how to handle it; ability to reproduce the method, check and trace; the needs of decision-makers; any applicable regulatory and legal requirements.

The risk assessment process consists of the following steps: risk identification - risk analysis (impact analysis - likelihood assessment - evaluation of the effectiveness of controls) - risk assessment. Each step of the process uses a specific method that is detailed and specified in the standard DSTU IEC/ISO 31010:2013 [7].

According to the authors’s analysis of the methods, their applicability during each of the stages of risk assessment and the characteristics presented in Annexes A and B of the standard [7], it is appropriate for the QMS of educational organizations to use consequences / probabilities matrix (hereinafter referred to as C / P) and the ALARP method. The C / P matrix is a means of combining qualitative or semi-quantitative consequences and probabilities in order to obtain a risk level and then rank it at defined scales. The use of the C / P matrix is due to the fact that educational organizations are complex systems where many risks can be identified depending on the stages and processes for providing educational services, and the available data are not sufficient for detailed analysis. In such a case, it is necessary to select and analyze precisely those risks that require immediate response from senior management. The latter one is provided by the criteria of the ALARP method, where the information obtained about risks is divided into three ranges: upper (unacceptable risk); average (acceptable); lower (accepted). The middle range has a moving school for low risks which allows to compare the costs of risk reduction proportionally with the safety advantage (see Figure 2).

The use of the ALARP method and the C / P matrix implies the availability of persons (expert groups) with appropriate competence, as well as the data relevant for making judgments about the consequences and probabilities. A semi-quantitative risk

assessment system should be developed by a group of experts in order to assess the risks and acceptability of the decision as to their eligibility.

The rating scale and the matrix can have different levels, with the most common from 3 to 5. The probability scale should cover the range so that the lowest probability is acceptable for the highest output, as stated in the requirements of the standard [7].

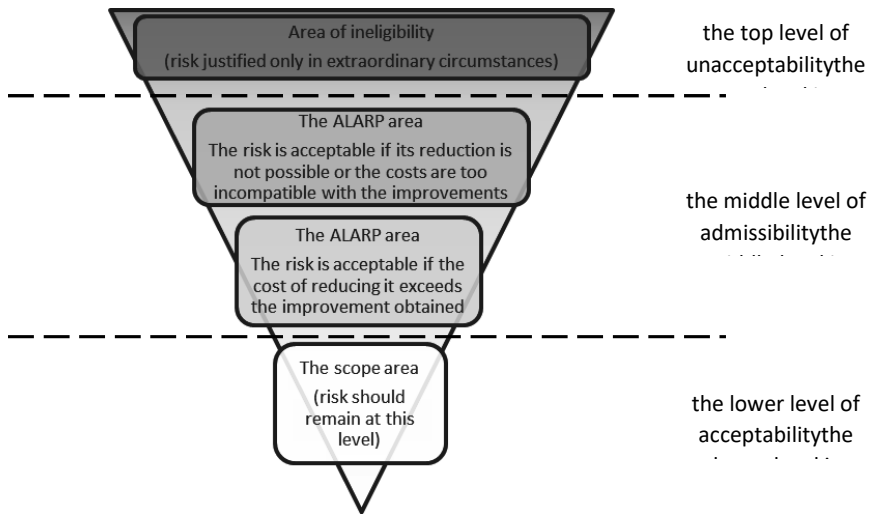


Figure. 2. Breakdown of risks by levels of acceptability or unacceptability  
Source: compiled by the authors according to standard [7].

Examples of constructing such probability scales and levels of risk consequences are given in tables 3 and 4, where P - is the risk likelihood estimation, S - is the degree of risk consequence.

Table 3. The scale of semiquantitative levels of risk occurrence in a QMS of educational organization

Rating	The probability of an onset	Probability range	Definition
P <sub>1</sub>	It is unlikely	$<10^{-6}$	Unlikely but possible
P <sub>2</sub>	Rarely	$<10^{-5} - \geq 10^{-6}$	Probable occurrence
P <sub>3</sub>	From time to time	$<10^{-4} - \geq 10^{-5}$	Single cases are possible
P <sub>4</sub>	Perhaps	$<10^{-3} - \geq 10^{-4}$	Will occur repeatedly
P <sub>5</sub>	Highly probable	$\geq 10^{-3}$	Frequent probability of occurrence

Source: authors' development

Table 4. The scale of qualitative levels of the degree of risk implication in a QMS of educational organization

Rating	The degree of consequence	Definition
S <sub>1</sub>	Minor	Damage borne by the educational organization
S <sub>2</sub>	Moderate	Risks to the reputation of an educational organization
S <sub>3</sub>	Serious	Reducing the effectiveness of the QMS of educational organization
S <sub>4</sub>	Critical	Decrease in success rate of higher education students and quality of higher education
S <sub>5</sub>	Catastrophic	Changes in the context (internal and external environment) of the educational organization

Source: authors' development



The C / P matrix is constructed, giving rise to a risk on one axis and a probability of its occurrence on the other. The matrix is constructed with a certain weight of consequences (probabilities) or symmetrically, depending on the case. An example of constructing such a 5 × 5 risk assessment matrix is given in table 5.

Table 5. The risk assessment matrix in a QMS of educational organization

	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>
P <sub>5</sub>	5	10	15	20	25
P <sub>4</sub>	4	8	12	16	20
P <sub>3</sub>	3	6	9	12	15
P <sub>2</sub>	2	4	6	8	10
P <sub>1</sub>	1	2	3	4	5

Source: authors' development

In the light of the samples presented by the authors, the risk assessment which is in the range of 15 - 25 refers to the unacceptable risk by the ALARP method, which indicates the refusal of an educational service or an appropriate process of the educational organization's QMS, primarily due to the lack of risk management measures. If it is determined that the risk is within this range, then the work of the educational organization should be prohibited from eliminating the impact of the dangerous factor or reducing its impact to at least the average level of the low risk range.

The internal auditors of the QMS who should be scheduled early in the calendar year and provided by the QMS documented information, review the implementation of risk control measures and their effectiveness. Any risk remaining after applying risk control measures is evaluated against the criteria set out in table 4. If residual risk is considered as unacceptable, additional risk control measures shall be taken. All the received information is recorded and documented in the risk management report.

## CONCLUSION

On the basis of the conducted analysis, the article defines the essence of the risk-oriented thinking concept and peculiarities of its application in relation to the QMS of educational organizations which consist in the following:

- process approach and risk-oriented thinking are the basis for building the QMS;
- the QMS performance is achieved through the interaction of the PDCA cycle with the principles, structure, and risk management processes;
- a necessary effective prerequisite for risk-oriented thinking is to formalize risk management methods in the QMS and develop a documented description of the risk management process.

It has been determined that for the risks assessment in educational institutions it is appropriate to use comprehensively the matrix of consequences / probabilities and ALARP method which combine qualitative or semi-quantitative assessments of consequences and probabilities, which provides the possibility of obtaining the risk level with its further ranking on certain scales. The samples of scales and risk

assessment matrices developed by the authors allow experts of educational organizations to use them in practical activities, focusing their efforts on improving the effectiveness of the QMS and satisfaction of customers of educational services. The use of research results presented in the QMS of educational organizations provides an opportunity to structure the risk management process and identify factors that may affect the achievement of higher education goals which are the directions of further research of the article's authors.

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