Algorithm design for management decision-making support in the educational institutions of higher education basing of the application of risk-oriented approach

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Abstract: Current state of the education area requires adoption of such approaches to the management from the educational institutions that enable to respond to the permanent changes in the higher education system in “the real-time mode” while maintaining a high level of the educational services and satisfying all of the interested parties by the quality of training for the specialists in the near future. Authors of the work propose implementation of risk-oriented approach as an innovation which acquired good advantages at the enterprises both in Russia and abroad.

1. Introduction
Professor of the Munich University and London economics school Ulrich Bek said «We do not live in class society, but in that one, of increased historically unprecedented risk, generated by modern epoch” [1]. In the latter years permanent reforms proceed in the educational system of our country. They stimulate scaled changes within the educational institutions of the higher education (EI HE). It means not only legislative, technical but organizational changes as well [2]. However, in spite of all of the “innovations” in this area the level of education in the rising generation (in the classical sense of step-by-step knowledge delivery for various age brackets) invariably decreases. Results of sociological inquiry demonstrate that satisfaction with the general qualification of the new graduates is at rather low level [3].

Thus, EI are ought to “adjust” – to seek such approaches to the management of training of the graduating specialists, which would enable to adopt in a painless manner to the permanently increasing requirements of society in the high-qualified personnel who a capable to work in the conditions of modernization and directly participate in this work.
Management system for the organization involves a complex of all the structural units of the organization, all of the sub-systems and communications between them as well as the processes providing the defined set of operation [4]. The performed analysis of the basic management systems in EI HE demonstrated that their main shortcoming is the time lag: decisions on the changes of the management system are made only after appearance of the explicit deviations from the planned results. The authors propose to eliminate this shortcoming by the implementation of the risk-oriented approach into the actual management systems. This provides an assurance that the risks are revealed, considered and managed in the course of design and realization of the preparedness of future specialists.

2. Risk-oriented approach within the educational institutions of the higher education

Concept of risk is a key idea in the current technical regulations which applies scientific, technical and organizational methods for risk evaluation and its decrease up to the acceptable level [5]. Nowadays sufficient number of the normative documents involving the requirements to the systems of the quality management as a whole and particularly, risk management have been developed and applied: international standards, as well as national standards. However, no one of the actual international and domestic documents provides ready accounting and methodological teaching technique for the determination of the components and indicators of risk, routing or organizational mechanism for providing operation of the complex system for risk management; the documents are intended for the organizations of all the types and thus, they have too generalized form [6]. So, the “enterprises” following the principles of risk-oriented management are enforced to adopt the existing requirements in accordance with specific features of their scope of activity.

Some aspects in the risk management in EI HE (approaches, concepts, conceptual apparatus) are concerned in the works by R.R. Aetdinova [7], T.P. Kostyukova [8], M. A. Latkin [9], I. A. Lysenko, A. L. Pastukhov [10], A. E. Prichinin [11] and others [12, 13]. However, in spite of the scientific significance and a broad set of the problems considered by these authors one should note that they did not account the necessity in providing integrity of the management systems and specific features in the training of the specialists learning at EI HE of different lines of authority.

EI HE are fully competent participants of the economic activity and they inherited different kinds of risk effecting the quality of their operation. Management activities concerning decrease of risks are possible only in relation of the known and ranked dangers. Therefore, when implementing risk-management it is necessary to regularly and systematically reveal the possible threats influencing the educational activity with their following evaluation and decision-making in management directed at the reducing of the identified risks. For example, some distinctions of the risks in the organizational innovations can be analyzed with the use of new standards of the innovation management system, including: collaboration management, creativity management, management of the intellectual property, as well as management of the risk in the application of the new technologies and psychosocial risk management at the working place.

One of the most important tasks for the practical application of risk-oriented approach is the development of the objective and simple in use techniques for risk management in their dynamics. Let us designate the following stages in the incorporation of the risk-oriented approach in EI HE:

- definition of the trends and tasks of risk-management in EI HE;
- revealing and identification of the potential dangers and risks;
- quantitative (probabilistic or frequency) or semi-quantitative (scoring) consistent evaluation of the priority risks using the methods of ranking;
- development and execution of the measures on responding to the identified risks;
- processing and control of the risk, including decision-making and realization of the decisions as well as the evaluation of their effectiveness.

For a systematic application of risk-oriented approach to the management of EI HE the authors propose to use incorporation of the Register of risks in the activity of EI in accordance with the recommendations of State standard of the Russian Federation 51901.21-2012. When incorporating the methods of risk management, it is required:
to analyze the interested parties, internal and external factors influencing on the EI HE factors;
• distinguish and describe the processes of existing management system and their stages (sub-
processes);
• define indicators of the operation effectiveness of the management system as a whole and its
main processes;
• assign the persons responsible for the organization and realization of every stage when
incorporating risk-oriented approach;
• making documentation for all of the established processes, procedures and the applied
techniques.

3. Algorithm of the risk-oriented approach
Risk management process includes the following items:
1. Risk identification;
2. Analysis of risks.
   It involves: evaluation of the probability for realization of the identified risk, evaluation of
significance for the consequences in case of occurrence of the risk realization, determination of the
risk level and estimation of the effectiveness for the current methods of the risk management.
   Quantitative determination of the risk level is rather complicated task connected with the necessity
of acquiring of a great amount of statistically reliable raw data and (or) application of complicated
procedures of theoretical-probabilistic calculations for the rare events. In order to save material and time
resources for the identification well-known qualimetric method was applied. It uses the technique of the
method of expert judgements basing just on the professional knowledge and expertise of the specialists
– the most experiences and competent employees and workers at EI HE.
   Risk evaluation was performed with a chosen pool of the experts according to tach of the
distinguished processes in the existing management system. The value of the level for \( i \)-th risk in \( j \)-th
process is determined by the formula:
\[
LEV_{ij} = \frac{\sum_{k=1}^{n} LEV_{ijk}}{n},
\]
where \( LEV_{ij} \) – is the level of \( i \)-th identified risk in \( j \)-th process;
\( n \) – is a number of experts participating in the estimation of the \( i \)-th identified risk in \( j \)-th process.
3. Completion of the risk register: it is composed in the form of the table of binary relations between
the identified risks of EI HE and the main processes of existing management system where \( n \) is number
of the structural departments of EI take a participation;
4. Development of additional measures for the risk management (if necessary);
5. Integration of the proposed measures into the plans of EI HE departments in accordance with the
directions of work and their use as a basis for strategic planning of EI activity;
6. Monitoring and re-assessment of risks (it is performed no less than once a year).
   The presence of risks register for EI HE enables to rank all of the identified risks. In case if the level
of \( i \)-th identified risk in \( j \)-th process is maximal then the risk is unacceptable. As concerning these risks
the measures on their decrease or the corresponding project changes are mandatory.
   For the risks that are characterized by the level which is not maximal on neither of the chosen
processes involved in the management system, priority of this risk as a whole for EI HE is determined
by the formula:
\[
PR_i = \sum LEV_{ij}.
\]
   An algorithm for decision-making support in the management on the basis of application of the risk-
oriented approach is presented in the figure 1.
1. Selection of experts for risk assessment
2. Preparation of risk register for each of the experts
3. Is risk typical for this process?
   - yes
   - 4. Estimation of probability of risk realization
   - 5. Estimation of significance of risk realization consequences
   - no
   - Transition to the assessment of the following identified risk
4. Determination of the level of identified risk (LEVs) over each of the processes in management system
5. Determination of risk priority
6. Priority of all the identified risks
7. Ranking of the risks
Under conditions of resources limitations (material, financial, personnel) there inevitably appears a situation when it is required to determine priorities, in other words, to decide which of the “equally significant” factors should focus primarily efforts. For unacceptable risks the measures are developed in order to improve the quality of the operative management at EI HE.

They can be focused on the decrease of severity of consequences as a result of risks realization, elimination or reduction in the frequency of the causes of unwanted events.

Risk-management based on the objective appraisals is especially valuable in the conditions of the permanent innovation activity characteristic for the work of EI HE in the current conditions (constant change of requirements and conditions for training of specialists, adaptation of EI to the varying demands of the employers or society as a whole, accomplishment of the permanently updated requirements provided by the regulating agencies, and so on). T. Burns [14] stated that the principle changes in the structure of management independently on the intentions of the manager and quality of the project leads to degradation of an organization that is observed as a destruction of its activity and

**Figure 1.** Algorithm for the management decision-making support basing on the application of risk-oriented approach.
enhancement of political games and conflicts in the struggle for power. Transformation of existing management systems in EI HE proposed by the authors with the use of incorporation of the risk-oriented approach does not imply the global transformations inside EI and it is intended on the optimization of their activity. This can only result in the improvement of the situation concerned with the training of specialists.

Efficiency of incorporation of the risk-oriented approach into the management system of EI HE is stipulated by the impact of the following factors:

1. Informational – an increase of the awareness level of officials and interested parties due to possession with actual and consistent information;
2. Organizational – is represented in the enhancement of the quality of the accepted solutions in the conditions of necessity for analysis of the diverse data;
3. Economical – is revealed in the rational use of facilities, improvement of the “consumer” qualities of the organizational structure and it is comprised in the cost reduction.

It should be noted that incorporation of the risk-management does not require additional financial and material costs: realization of the process for the risk management can be realized by the staff (employees) of EI HE.

4. Conclusions
A man cannot reduce all of the risks to zero. It can be explained as by the permanent incompleteness and relativity of the scientific representations about the risks, as by the limited engineering and economic capabilities of society. However, managing the risks it is possible to decrease a degree of the negative effect of external and internal factors and thus to enhance the effectiveness of activity up to the maximum possible level at the present time.

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