Application of the factor-criteria model as an important component of the economy and organization of metrological support of an educational holding

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Abstract. Enhancing of educational system is characterized with intensification of innovations appliance at organizational processes in accordance to requirements of modern standards. An educational holding becomes the specific form of development for establishments of higher education, and it requires peculiar system for the economy and organization of its metrological support. An important component in such system is an application of specific evaluation that represents state and prospects of educational holding as an object of control. The article discloses characteristics of application of the factor-criteria model as an important component of the economy and organization of metrological support of the educational holding. It suggests parameters for evaluation of effectiveness of management enhancing at educational holding and factor-criteria model for management estimation of development of establishments of higher education.

1. Introduction
Today one of the most important tasks of management for enhancing of establishments of higher education is organization and optimization of their activity in the form of educational holding. It causes specific regulations for development of unified metrological requirements to them insofar as the subject of metrology is the extraction of quantitative information about the properties of objects with a given accuracy and reliability [1]. The educational holding is the complex and dynamic innovative organizational, economic and management structure. To formulate its correct model it is necessary to take into account its connection with metrology that provides comprehensive tools for further control.

2. Materials and methods
The ground for the article was formed on materials of results on specific researches [1-20] and methods of system and process approaches, factor-criteria analysis, economic modeling, expert estimation, quality management and also different conceptions of effective management enhancing.

3. The study of application of the factor-criteria model as an important component of the economy and organization of metrological support of an educational holding
Management effectiveness at educational holding can be evaluated with parameters of implementation quality of development program to education establishment, social tone of process subject of enhancing management, practical readiness of management subject for self-governing improving and reflexivity
intensification of control subject and its susceptibility influences of external control. Nowadays realities at system of higher education require theoretical comprehension of different conceptions and approaches to evaluation of management effectiveness and disclosing indicators, factors and criteria that become base for the mentioned factor-criteria model in the frames of metrology. It considers postulates of systematic, procedural, active and reflective approaches. Parameters that are chosen for model should be evaluated in correlations with peculiar selected factors and criteria according to management enhancing of education establishment development (figure 1).

Figure 1. The parameters for evaluation of effectiveness of management enhancing at educational holding (authors’ research).

The aggregation of parameters comprehensively covers managing processes at development of establishments of higher education in the structure of educational holdings. The suggested factor-criteria
model for evaluation of management effectiveness of educational holding development is grounded on basic qualimetric models of activities.

The systemic indicators of qualimetry at metrology frames include characteristics of in formativeness, optimality, accuracy, evidence and manufacturability. The aim of the model is to develop unified approach for making estimation of management effectiveness at different stages of processes at the educational holding.

There are parameters of the factor-criteria model for management estimation of development of establishments of higher education included into educational holding that are listed at the table 1.

**Table 1.** Factor-criteria model for management estimation of development of hof establishments of higher education included into educational holding (author’s researches).

| Factors (indices) | Criteria (indices) |
|-------------------|--------------------|
| Costs for development of the educational holding (E1) | Distribution of funds for innovative projects (E1.1). Funding for scientific work and experimental activities (E1.2). Distribution of funds for development of fixed assets (E1.3). Distribution of funds for social programs (E1.4). |
| Use of extrabudgetary funds (E2) | Profit from sale of educational services (E2.1). Extra-budgetary financing of targeted programs (E2.2). Renovation work (E2.3). Replenishment of fixed assets (E2.4). |
| Modernization of workplaces (E3) | Creation of automated workplaces for management personnel (E3.1). Creation of automated workplaces for teaching staff (E3.2). Creation of conditions for distance learning of students (E3.3). Re-equipment of classrooms and laboratories (E3.4). |
| Development of library fund (E4) | The number of issues (per student) (E4.1). Supply of textbooks and manuals (E4.2). Supply of literature beyond the program and digital educational resources (E4.3). Development of didactic and methodological funds (E4.4). |
| Costs for social programs (E5) | Promotion and encouragement to experimental activities of teaching staff and students (E5.1). Promotion for gifted students (E5.2). Costs for creating safe working and training environment (E5.3). Costs for improving of health for teaching staff and students (E5.4). |
| Satisfaction of society social order (S1) | Satisfaction of demands from society for new specialties (S1.2). Satisfaction of demands from society for educational services (S1.3). Satisfaction of needs of employers for high-quality graduates (S1.4). Focus on world standards (S1.5). |
| Introducing social innovations into work (S2) | Focus of educational processes and its organization on social transformations in society (S2.1). Establishing relations with public organizations (S2.2). Attracting society to sponsorship (S2.3). Participation of public organizations at solving educational problems (S2.4). |
| Competitiveness of graduates (S3) | Employment of graduates according to their speciality (S3.1). Employment requests for graduates (S3.2). Inviting studentsof senior courses to pedagogical practice and work (S3.3). Suggesting graduates education of higher level (S3.4). |
| Ensuring comfort to the educational holding (S4) | Coordination of team activity through constructive dialogue and mutual understanding (S4.1). Providing and maintaining positive psychological climate (S4.2). Providing social protection, preserving and strengthening of health of students and teaching staff (S4.3). Creation of conditions for productive activity of team of teaching staff and students (S4.4). |
| Creating image of the educational holding (S5) | Effectiveness of image attributes (S5.1). Growth of rating of the educational holding at society (S5.2). Formation of positive public opinion of the educational holding (S5.3). Re-focus public opinion from traditional vision of education to modern one (S5.4). |
Parameters for quality of education

Growth of quality performance indicators (Q₁)
Gradual transition from accumulation of knowledge amount to mastery of self-government of educational processes (Q₁₁). Formation of students’ vital competencies (Q₁₂). Increasing degree of self-determination of graduates (Q₁₃). Focus of education content on students’ needs (Q₁₄).

Pedagogical guidance at civic education of students (Q₂)
Knowledge of the modern theory of education, legislative and regulatory knowledge (Q₂₁). Organizational, technological, diagnostic, prognostic, control and corrective skills (Q₂₂). Persistent socially significant motivation (Q₂₃). Ability of graduates to adapt to environment (Q₂₄).

Increasing self-realization of participants of educational process (Q₃)
Positive dynamics of mutual correlation of educational processes (Q₃₁). High level of students’ success at education (Q₃₂). Positive development of abilities of students and teaching staff at educational processes (Q₃₃). Permanent striving for self-realization and self-improvement (Q₃₄).

Motivation to education and creative activity (Q₄)
The optimal ratio of external motivation to development and self-motivation (Q₄₁). Ability to overcome stereotypes in activities (Q₄₂). Vision of new opportunities for development of educational holding (Q₄₃). Focus of students and teaching staff on achievements and success (Q₄₄).

Effectiveness of educational processes (Q₅)
Current indicators of educational and research activities (Q₅₁). Future indicators of graduates’ competences level (Q₅₂). Level of achievement of requirements of educational standards (Q₅₃). Participation of teaching staff and students at conferences and seminars on problems of modern education development and improving (Q₅₄).

Ensuring the implementation of modern public policy (I₁)
Implementation of the main directions of the State program for the development of education at Russia in the XXI century (I₁₁). Execution of documents that regulate state policy in the field of education (I₁₂). Availability and effectiveness of development program of educational institution (I₁₃). Development and implementation of targeted programs and innovative projects (I₁₄).

Organization of educational process in accordance to programs of regional education development (I₂)
Reflection of regional needs in the network of specialties and curriculum of establishments of higher education of the educational holding (I₂₁). Participation of teaching staff and students in regional education development programs (I₂₂). Participation of teaching staff and students in innovative projects of development of region (I₂₃). Organization and conduct of vocational guidance work among youth (I₂₄).

Adaptability to innovations (I₃)
Perception and acceptance of feelings and needs of others in dynamics and changes (I₃₁). Ability to adapt one’s own behaviour and actions according to needs and feelings of others (I₃₂). Ability to identify and organize effective communications (I₃₃). Introduction of the latest technologies for teaching staff and educating process of students (I₃₄).

Self-government (I₄)
Creation of self-government system (I₄₁). Implementation of self-government technologies based on humanization and democratization (I₄₂). Participation of public organizations of the educational holding at development and implementation of strategy (I₄₃). Establishing partnerships with self-government committees of other educational institutions (I₄₄).

Focus on reflexive control (I₅)
Development of reflexivity of students, teaching staff and administration (I₅₁). Participation of teaching staff and students in summing up of work results of university, faculty and department (I₅₂). Ability to study and understand another
person, accept his point of view (I5.3). Use of reflective approaches in educational processes (I5.4).

Parameters for personnel policy

Methodological and technological readiness for management (P1)  Knowledge and practical use of modern theories of teaching and management processes, also theoretical conceptual legislative and regulatory acts on education (P1.1). Ability to acquire new knowledge at domestic and international experience (P1.2). Understanding of psychological and pedagogical essence and laws of teaching, upbringing and development of youth (P1.3). Applying methods of social and pedagogical research, including diagnosis and forecasting (P1.4).

Development of organizational (corporate) culture (P2)  Creation and development of organizational culture that focused on people (culture of individuality) (P2.1). Development of informational culture of all participants at educational process (P2.2). Forming, support and development of traditions of educational holding (P2.3). Support and development of individual vision of tasks of educational process and its focus on socially significant goals (P2.4).

Ensuring professional growth of teaching staff (P3)  Creation of system of continuing education for teaching staff based on their requests (P3.1). Creation of system of incentives for teaching staff who develops courses and electives and uses them at educational process (P3.2). Enhancing and development of external relations with other educational institutions and scientific centres (P3.3). Conditions for research and experimental work of teachers (P3.4).

High-quality staff (P4)  Involvement of researchers and teachers from other educational institutions (P4.1). Qualification level of teaching staff (P4.2). Organization of work with young teachers (P4.3). Optimality of teaching load (P4.4).

Stress resistance of personnel (P5)  Ability to admit failure and recover quickly (P5.1). Ability to easily switch to different people and topics (P5.2). Ability to stay active in critical situations (P5.3).

Availability of management system (C6)  Compliance of management system to modern legislative and conceptual documents at education (C6.1). Strategic direction of management (C6.2). The presence of targeted programs in management of the educational holding (C6.3). Use of management innovations (C6.4).

Documentation support for changes (C7)  Development of local acts at various areas of innovation (C7.1). Compliance of local acts with regulatory requirements (C7.2). Culture of paperwork (C7.3). Use of local acts at practice of management of the educational holding (C7.4).

Informational support (C8)  Effectiveness of monitoring system of educational institution (C8.1). Use of information and computer technologies at management processes (C8.2). Optimality of promotion of informational flows (C8.4).

Effectiveness of management team (C9)  Cohesion and interchange ability of members of management team (C9.1). Teamwork partnerships (C9.2). Optimal distribution of management functions (C9.3). Implementation of authority delegation (C9.4).

The degree of interaction at management (C10)  Specificity of controlling and controlled subsystems, essence and forms of their interaction (C10.1). Coordination of interaction of all departments (C10.2). Correlation of administrative and public control (C10.3). Interaction of educational institution and social environment (C10.4).

There is algorithm for creating the factor-criterion model at the metrological frames contains three stages: the first one – hierarchical structural diagram of properties of research object is developed; the second one – weight are determined for factors that characterize importance of certain factor among all others; the third one– the results of the factor-criterion modeling are noted to (table 2).
Table 2. Form for results of the factor-criteria model for management estimation of development of establishments of higher education included into educational holding (author’s researches).

| Parameters (P) | Weight (W_P) | Partial evaluation of parameters (E_P) | Factors (F) | Weight (W_F) | Partial evaluation of factors (E_F) | Criteria (C) | Weight (W_C) | Partial evaluation of criteria (C_P) |
|----------------|-------------|--------------------------------------|-------------|-------------|-------------------------------------|-------------|-------------|-------------------------------------|
| -              | -           | -                                    | -           | -           | -                                   | -           | -           | -                                   |

The suggested model allows evaluating future required values, defining current ones and measuring them. Weights let make determination of priorities of desired achievements or transformations. The weights are taken from experts estimation based on average values. Scores are from 1 (weak) to 5 (strong). Integral indicators are given at figure 2.

Figure 2. Integral indicators weights for parameters of the suggested model (authors’ research).

Partial indicators can be also illustrated at the same manner for analysis (from I_1 to C_10 divided into their groups in accordance to goal of analysis and metrological support).

4. Conclusion
There can be made conclusions on information given above. Suggested methodic of integral and partial indicators evaluation of innovative strategy effectiveness for educational holding is based on comparison of achieved indicators of innovative development of higher education establishment to
reference ones. Reference indicators are taken as normatively fixed values that adequately reflect strategic innovative targets of development of educational sphere, national innovation systems as well as world experience.

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