Principal components of implementation of “university-3.0” transformation in the development of innovative-entrepreneurial activities of modern higher educational institutions

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Abstract. Research of factors of support of innovative-entrepreneurial activities in higher education plays an important role in identifying problems in the management of innovation and entrepreneurship and its economic incentives. Because of the research, the importance of factors supporting innovation and entrepreneurship in higher education was assessed, the principal components of the development of innovation and entrepreneurship as a factor of competitiveness of higher education institutions, “University-3.0” transformation were identified and transformation model was developed.

1. Introduction
Identification and solution of problems of management of innovative-entrepreneurial activity of higher education institutions and directions of its economic incentives requires the study of factors of support of innovative and entrepreneurial activity of educational institution. In order to find a solution to this problem and assess the level of importance of the influencing factors, we have carried out a survey among managers and experts in the field of scientific, technical and innovative activities of higher education.

2. Problem statement
During the determination of importance of factors supporting the development of innovative-entrepreneurial activities in higher education, a comparative analysis of the first 10 factors, which were highly evaluated by executives and experts, allows a full assessment of the situation (table 1).

3. Questions of the research
Because of the research, representatives of both groups surveyed assessed the importance of factors supporting innovative-entrepreneurial activities in higher education, and these assessments were divided into ranks according to the arithmetic mean, taking into account the variance and average deviation.
Table 1. Comparative assessment of the importance of factors supporting innovative-entrepreneurial activities in higher education in point of view of managers and experts.

| Rank | Management staff | Experts |
|------|------------------|---------|
|      | Factor           |         |
| 1    | Existence of environment supportive to innovative-entrepreneurial activities | Influence of employees strive for take a degree (doing doctoral work) on innovative activities |
| 2    | Support for innovation initiatives by management | Support for innovation initiatives by management |
| 3    | The presence of individuals in the community who promote innovation and entrepreneurship | Existence of environment supportive to innovative-entrepreneurial activities |
| 4    | Increased opportunities to use creative potential | Opportunities for professional development |
| 5    | Influence of employees strive for take a degree (doing doctoral work) on innovative activities | Existence of appropriate material and technical resources |
| 6    | Opportunities for professional development | Existence of scientific schools |
| 7    | Availability of appropriate material and technical resources | The presence of young employees in the team supporting innovative activities |
| 8    | Availability of scientific schools | Increased opportunities to use creative potential |
| 9    | Confidence in the importance and necessity of innovation and entrepreneurship | Existence of a clear valid plan of innovation and entrepreneurship and its open discussion |
| 10   | Correlation of teachers' achievements in innovative-entrepreneurial activities with their position in educational activities (increasing the position of innovative teacher in relation to teacher who does not have an innovative approach) | The presence of individuals in the community who promote innovation and entrepreneurship |

Analysis of obtained results indicate that the majority of respondents, both managers and employees, identified organizational, economic and social factors as conditions that support innovative-entrepreneurial activities in higher education (table 2). These criteria indicate the urgency of improving the mechanisms to stimulate innovative-entrepreneurial activities as a factor in increasing the competitiveness of universities. These factors include the need for an environment that supports innovative-entrepreneurial activities; the need for management to support innovation initiatives; increase opportunities to use creative potential; availability of appropriate material and technical resources, etc. It should be noted that managers and experts agree on the identification of important factors that support innovation and entrepreneurship in higher education. Of the 40 criteria presented to them, eight factors, which had a significant impact, were in the top ten by managers and experts.

Analysis of the conditions assessed in the questionnaire, which affects the support of innovative-entrepreneurial activities, indicates that in the point of view of managers, the creation of an environment conducive to innovative-entrepreneurial activities in higher education is the most important, while it is highly rated by experts (third place). In our opinion, this is the case in order to implement the principles of “University-3.0” concept in higher education, to implement the processes of their transformation and management of innovative-entrepreneurial activities, that is, to encourage the creation and introduction of innovations, development of scientific entrepreneurship mechanisms, improvement of structures,
innovative-entrepreneurial activities, development of culture are a topical issue. However, innovative reforms in higher education require the presence of management personnel who have the skills to innovate and do business, and who are able to apply the support of innovative management in practice. This view is confirmed by the factor “Support for innovation initiative by management”, which is second only to the importance of both parties, because only a leader who encourages innovation can lead the team to new achievements and change.

Representatives of both parties confirmed the supportive effect of the factor “presence of innovators and entrepreneurs in the team”; only its importance was given the 3rd place by the managers, while the experts gave 10th place. This situation also requires the formation of highly qualified managers in this field, who can be a personal example. Similarly, experts from both sides (managers - 4th place, experts - 8th place) praised the criterion of “Increasing the capacity to use creative potential”. This situation also indicates the urgency of realizing the creative potential, taking measures to demonstrate, improving the mechanisms.

According to experts, employees seeking a degree in innovation have a significant impact (1st place). This criterion was rated 5th place by managers. This once again indicates the need to improve the mechanisms to encourage teaching stuff to obtain academic degrees and titles (all educators in higher education should be engaged in scientific activities), and to implement their scientific achievements in practice (in the form of innovation and entrepreneurship).

The next supporting factor (6th place) in the point of view of managers is “Opportunities for professional development”. Experts rated the supportive effect of this factor much higher (4th place) because it is a central function of innovation management. Improving the mechanism that encourages teachers to strive to improve their professional skills will ensure that they are constantly aware of innovations in the field of engineering and technology and use them in their activities. At the same time, according to experts (4th place) and to managers (7th place), the development of innovative-entrepreneurial activities, according to the survey, depends in many respects on the “Availability of appropriate material and technical resources”.

Another important factor is “availability of scientific schools”, which is highly rated by both leaders (8th place) and experts (6th place). In our opinion, in the management of innovative-entrepreneurial activities, it is important to rely on the strongest scientific fields and directions in the educational institution, as well as to strengthen the tradition of “mentor-follower”.

According to experts, “the presence of young employees in the team to support innovative activities” is an important supporting factor (7th place). Logically, making or adapting to changes by older employees is probably a difficult process. Therefore, it is necessary to manage a system of formation of a talented reserve of personnel on the basis of upbringing, support, wide involvement of students in innovative-entrepreneurial activities in the team, with a modern thinking, creative approach, not afraid of danger.

Managers recognized “Confidence in the importance and necessity of innovation and entrepreneurship” (9th place) as an important psychological factor supporting innovation and entrepreneurship development. At the same time, for experts, the factor “Availability of clear well-founded plan of innovation and entrepreneurship and its open discussion” was assessed in 9th place. These two factors complement each other as supportive criteria, and innovation and entrepreneurship contribute to the successful transformation of confidence, leading to enhanced competitiveness, improving the quality of the educational process, and the development of the higher education system as a whole. One way to build trust in employees is to have a clear plan, the effectiveness of its activities, and its transparency. This means that management must not only set clear goals, but also promote a strategy to achieve these goals, and how each team member benefits from it.

This confidence is also achieved by increasing the position of the innovative teacher in relation to the non-innovative approach teacher, i.e. by raising the status of teachers in the teaching activities who bring additional income to the university with their knowledge and entrepreneurship (rated 10th in the point of view of managers). The point is that an employee’s conscientious attitude and efficiency to work depends not only on the material benefits of the job, but also on a fair assessment of each
employee’s contribution to the overall job. Therefore, in our opinion, it is expedient to give preference to the volume of teaching load of teachers, which contributes more to the competitiveness of higher education, bringing additional income.

From the point of view of respondents, the main components of the development of innovative-entrepreneurial activities as a factor of competitiveness of universities, the implementation of “University-3.0” transformation are as follows (table 2).

**Table 2.** Principal components of “University-3.0” transformation in higher education (based on survey of respondents).

| Principal components of transformation | Model of transformation | Factors and conditions |
|----------------------------------------|-------------------------|------------------------|
| Defining clear goals of innovation and entrepreneurship, the availability of appropriate material and technical base | Goals | Definition of clear well-founded plan based on innovation and entrepreneurship, developing strategies and programs. Managers need to not only envision clear goals for innovative-entrepreneurship activities, but also understand clear strategies and programs to achieve them; creation of appropriate material and technical base, scientific laboratory, small innovative enterprise, technoparks |
| Improving the organizational structure of higher education, development of innovative-entrepreneurship infrastructure in accordance with the goals | Mechanism | Forming an appropriate structure for the successful implementation of the set goals. In the process of transformation, it is important to create units that ensure the implementation of strategies and programs for the development of innovation and entrepreneurship and development of infrastructure; to determine their tactics in accordance with the strategy, to develop mechanisms for their implementation, to define the powers and responsibilities of each department and to introduce procedures for management and coordination of transformation, defining their place and role in the development of innovative-entrepreneurship activities in higher education; improving the system of promotion and development of managerial staff |
| Develop a culture that enhances innovation-entrepreneurial motivation, supports the activities | Culture | Formation of a culture that supports the development of innovative-entrepreneurial environment, the development of a sense of collective responsibility, the development of teamwork; confidence in the need for innovation and entrepreneurship in higher education, support for innovation initiatives by management, the introduction of an effective system of motivation of scientific and creative activities of employees, reducing the workload of those engaged in these activities; develop confidence in their own success, promote the activities of managers in the field of innovation and entrepreneurship, strengthen confidence in the ability of each employee to influence the process of transformation |
| Development of innovative-entrepreneurial knowledge and skills in university staff, wide involvement of students in this activity | Qualification | Creation of conditions for professional development of employees, increase of opportunities for employment of creative potential, reduction of work stress, implementation of measures to strengthen labor discipline; development of mechanisms for the exchange of experience in innovation and entrepreneurship, |
cooperation with foreign universities in this area,
improvement of information retrieval and exchange
systems;
promotion of scientific schools, encouragement of young
employees, research staff who support innovative-
entrepreneurial activities in the community, the
introduction of mechanisms to support their innovative-
entrepreneurial activities even after obtaining a degree
and title;
organization of trainings to increase the knowledge and
skills of professors and teachers in the field of scientific
entrepreneurship, wide involvement of students in
scientific and entrepreneurial activities, improvement of
the mechanism to ensure the continuity of scientific and
entrepreneurial activities

Independence of higher
education institutions, which
assumes timely adaptation of
internal environmental factors
to changes in external
environmental factors

Independence

Lack of autonomy in the introduction of new types of
activities in higher education, in particular innovation and
trepreneurship, strict state control over educational,
scientific and entrepreneurial activities, and financial
dependence create certain difficulties. Giving
independence in the joint implementation of educational,
research and innovative entrepreneurial activities, the
development of normative documents of the educational
process;

Optimizing the organizational structure in accordance
with the activities, the creation of new departments, the
formation of staff, the selection of areas and specialties for
training, the transfer of powers to universities based on
their capabilities;

awarding academic degrees and academic titles,
developing cooperation with business, expanding
independence in the provision of additional services;
introduction of a contractual procedure between the state
and higher education institutions regulating financial
relations related to the provision of educational and
scientific services;

cooperation with manufacturers, regional issues

4. Objective of research

Based on the results of analysis of generalized questionnaire data, the principal components of
“University-3.0” transformation management system have been identified.

To ensure the accuracy of the results obtained various mathematical statistical tools have been used.
The main objective of the research based on data collection and its processing is to assess the level of
importance of factors supporting the development of innovative-entrepreneurial activities in higher
education and to develop a new model of transformation.

5. Methods of research

With a view to identify the factors that support innovative-entrepreneurial activities in higher education,
we created a questionnaire using the theoretical and methodological developments of N. P. Belyatskiy,
A. V. Ignatov, M. V. Petrovich, R. S. Sedegov, Burdakova, G., Byankin, A., Usanov, I., Pankova, L.,
Pardo-Garcia, C., & Barac, M. [1,2,3,4,5,7] and others. We developed the questions by dividing them
into organizational, economic, social, and personal factors. In our opinion, the management, information
and technology system in modern higher educational institutions requires the inclusion of organizational
factors [6].
The list of supporting factors have been formed, criteria have been developed in the questionnaire, and each respondent was asked to evaluate the level of influence of the factor that positively affects innovative-entrepreneurial activity in higher education from zero to five points according to the following classification.

- 5 points - factor has a very strong effect
- 4 points - factor has a good effect
- 3 points - factor has little effect
- 2 points - factor has very little effect
- 1 point - the factor has no effect at all.

During implementation of this research questionnaires, probability theory and mathematical statistics, economic analysis, modeling and forecasting, economic-mathematical modeling, factorial and comparative analysis, and ranking and expert evaluation methods have been used.

6. Conclusion

Development of innovative-entrepreneurial activities plays an important role in increasing the competitiveness of higher education institutions. In addition, devoting much attention to the factors and conditions reflected in the advanced model of transformation in development of innovative-entrepreneurial activities as a factor of competitiveness of higher education institutions, in turn, is an important factor in development of innovative-entrepreneurial activity.

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