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**THE EFFECTIVENESS OF TRAINING UKRAINIAN HIGHER
EDUCATION EXECUTIVES IN REGULATING THE ACTIVITIES IN THE
SPHERE OF TECHNOLOGY TRANSFER: ORGANIZATION AND
RESULTS OF EXPERIMENTAL VERIFICATION**

The processes of the modernization of today's society require that management competence not only in the sphere of higher education, but in all forms of social management be systematically increased. The proper maintenance of these conditions involves the creation of a comprehensive model of training higher education executives to regulate the activities in the field of technology transfer. In this context, the methodology of evaluating the effectiveness of this training is of topical significance.

The effectiveness of training higher education executives in regulating the activities in the field of technology transfer can be verified only by an experimental study, as this design allows the introduction of purposeful changes into the process of the advanced training of executives, including its content and techniques.

The methodological issues of the innovative development of education are reflected in the works of V. P. Andrushchenko, H. O. Androshchuk, N. V. Vasylenko, L. M. Vashchenko, V. M. Heyts', L. I. Danylenko, T. I. Yevtukhov, V. H. Kremen', O. A. Mokiy, O. Ya. Savchenko, D. V. Tabachnyk, et al. [1 – 3]. The scholars examine the implementation of innovation policy in education, including the development of innovative infrastructure and technology transfer network in Ukraine on the basis of the effective use of research and technological, as well as intellectual potential of higher educational establishments. Special attention is given to the management of innovation processes in the context of the Ukrainian integration into the EU, information management and analysis for technology transfer, etc.

Various aspects of technology transfer are actively studied also by scholars from neighboring (G. G. Andreyev, N. V. Astaf'yev, V. V. Titov, et al. [5 – 6]) and far-abroad countries (Cohen, G., McAdam, R., Keogh, W., Wright, M. [7 – 9]).

The purpose of the article is to describe the methodology and results of the experimental verification of the effectiveness of training higher education executives in regulating the activities in the sphere of technology transfer.

The experimental research design covered the main components of the educational process in the system of continuing pedagogical education, providing the theoretical and practical training of higher education executives in regulating the activities in the sphere of technology transfer and the formation of competencies defined by the author.

The objectivity and reliability of the research was assured by the adherence to the following requirements:

- clear definition of the categories of individuals who are responsible for the activities in the sphere of technology transfer or management of these activities,
- development and application of the testing methods appropriate to evaluate the course of the experiment and make conclusions,
- mutual enrichment of the participants of the experiment in the process of the technology transfer proper, and
- introduction of a variety of educational techniques that provides practice-oriented approach to the training of higher education executives.

The study and analysis of position descriptions, as well as the surveys conducted among higher education executives served as a basis for the definition of the categories of those individuals who are responsible for the control and management of technology transfer activities. Among these are: universities' vice-rectors for research, chairs of departments, heads of research units, heads of technology transfer, innovation and intellectual property units (e.g., technology transfer centers, departments responsible for intellectual property and commercialization of research, intellectual property sector, etc.).

The purpose of the experiment was to:

- verify the effectiveness of the proposed training program developed to teach higher education executives to regulate the activities in the sphere of technology transfer in the system of continuing education, as well as of new approaches to the organization of the educational process using interactive teaching methodology that would ensure practical value of the training,
- define and substantiate the criteria and indicators of the higher education executives' readiness to regulate the activities in the sphere of technology transfer, and
- systematize and generalize the method and the results of the experiment, develop the guidelines for improving the training of higher education executives in regulating the activities in the sphere of technology transfer.

The experiment was conducted continuously from 2011 to 2013. Among the distinctive features of the study was the broad geographic representation of participating higher educational establishments and senior executives: 22 regions of Ukraine and 55 higher educational establishments (19 technical, 13 classical, and 23 humanitarian universities).

The sample consisted of 212 individuals: 41 rectors, 55 directors of institutes (deans of faculties/schools), 19 deputy directors of institutes (deans of faculties/schools), 96 chairs of departments, and 1 head of a research unit; 128 males and 84 females.

The majority of participants were over 50 (36,3%) and over 60 (31%) years of age; only 12,5% were over 40 and 11,3% under 40 years of age.

In order to determine the baseline level of the innovative competence of the higher education executives who participated in the experiment, they were offered a survey, which consisted of fifteen questions, nine of which were open. The same survey was conducted also after the completion of the training program.

To assess and interpret the survey results, the author proposed an evaluation checklist that included: components of the innovative competence (legal, administrative, psychological, and communicative), defining features of each component (knowledge, skills, and awareness), sources and methods of evaluation,

the description of the levels of innovative competence for each component. During the experiment, an evaluation technique proposed by L. Vashchenko [1] was used.

The text below describes each component in detail.

Legal competency.

The defining features of the legal competency shall be the following:

- knowledge of the normative and legal framework regarding the regulation of the activities in the sphere of technology transfer,
- skills of: the analysis of the normative and legal acts regulating technology transfer activities, the legal resolution of technology transfer issues; the development and execution of contracts, and
- awareness of the legal knowledge and skills necessary to regulate the activities in the sphere of technology transfer.

The sources and methods of legal competency evaluation were:

- survey, and
- case-study (at the beginning of the study of the legal framework of the innovative activity, a review of the situation that required legal opinion and resolution was proposed).

The levels of legal competency:

- adaptive (the individual has a vague idea about the existence of a law that regulates technology transfer),
- basic (the individual knows the law in general, but does not know how to apply it to certain situations),
- sufficient (the individual is knowledgeable about technology transfer legal framework, can apply legal norms to specific situations, and is aware of the types of contracts used in the process of technology transfer), and
- creative (the individual has an extensive knowledge of technology transfer legislation, can not only apply the relevant norms of legislation to certain situations, but also analyze and propose changes to the law, and has the ability to execute technology transfer contracts).

Administrative competency.

The defining features of administrative competency shall be the following:

- knowledge of: the distinguishing features of the higher education executives' management in the sphere of technology transfer, current status of universities in terms of technology transfer,
- skills of: selecting priority (successful) innovations that may be the object of technology transfer, analyzing the challenges of the development of a university in terms of innovation processes, measuring the outcome of technology transfers against certain criteria; selecting appropriate administrative techniques to regulate technology transfer in universities; analyzing the experience of foreign universities in the sphere of technology transfer to adopt it to Ukrainian realities,
- awareness of: the place, role, and importance of innovative activity in and for the operation and development of higher educational establishments, the need for regulating technology transfers in universities, for the presence within a higher educational establishment of a structural unit regulating technology transfers; the interconnection between and among the effectiveness of the university, its development, and technology transfer as a new philosophy of the university.

The sources and methods administrative competency evaluation were:

- survey,
- observation, and
- conversation.

The levels of administrative competency are:

- adaptive (activities in the sphere of technology transfer are not regulated, attempts to regulate them are declarative),
- basic (the powers in the sphere of technology transfer are institutionalized, but the corresponding activity is intermittent, irregular),
- sufficient (the leadership and management of a university are aimed at its innovative development, a corresponding unit within its structure has been established, the regulation of the activities in the sphere of technology transfer is systemic, the number of implemented innovations is increasing), and

- creative (the top executive of the system of higher education is focused on the development of the higher educational establishment as an innovative institution; an innovative environment is being created; teaching and research staff are engaged in continuing professional development, the higher educational establishment operates as an innovative organization).

Socio-psychological competency.

The defining features of socio-psychological competency shall be the following:

- knowledge of: the basic principles of the psychology of management, personal strengths and weaknesses, persuasion and influence technology, conditions for executives' personality development, and team building practices,
- skills of: applying the knowledge in the psychology of management to practice, influencing and persuading people, forming both positive self-image and the positive image of the university, designing professional and personal development, building interpersonal relations, interacting with others and working in teams, creating effective, creative teams, and
- awareness of: the need for personal and professional development, the importance of recruiting professionals able to work in a team.

The sources and methods of socio-psychological competency evaluation were:

- survey,
- observation, and
- conversation.

The levels of administrative competency are:

- adaptive (psychological readiness to regulate the activities in the sphere of technology transfer is low; in the context of management activities, the principles of the psychology of management are applied situationally, without proper theoretical framework; management is inert),
- basic (psychological readiness to regulate the activities in the sphere of technology transfer is sufficiently developed, but the executive's awareness of his/her own strengths and weaknesses is low, personal development is inconsistent),

- sufficient (psychological readiness to regulate the activities in the sphere of technology transfer is sufficiently developed, the university's executives works on the development of both personal image and the image of the institution; at the same time, the professional development of the staff and the executive him/herself is inconsistent), and

- creative (high level of psychological readiness to regulate the activities in the sphere of technology transfer, use of psychological interventions, systematic and systemic work on the professional development of the staff and the executive him/herself).

Communicative competency.

The defining features of communicative competency shall be the following:

- knowledge of: the basic principles of communication, negotiation, a foreign language, and persuasion technology;

- skills of: written and oral communication in one of the major European languages (English, German, Italian, French, Spanish) and in the language of the country of residence; producing relevant formal documents, interacting and cooperating with a wide range of people (colleagues, subordinates, customers) in the course of professional activities in the sphere of technology transfer, and

- awareness of: the importance of proper communication to regulate the activities in the sphere of technology transfer, to search for potential customers, to promote innovations and their commercialization.

The sources and methods socio-psychological competence evaluation were:

- surveys,
- conversation,
- presentations, and
- testing.

The levels of administrative competency are:

- adaptive (communication sometimes provokes conflicts, prevents commercialization of innovations),

- basic (communication between the executive and subordinates is more effective than with external customers),
- sufficient (the external communication with customers, investors, and others is effective more often than not), and
- creative (leadership, free competent communication in an interactive mode with a wide range of experts in the sphere of technology transfer and the commercialization of innovative products).

In order to determine the levels of innovative competence of higher education executives at the initial stage of the experiment and after its completion, matrix modeling was applied (Mescon M., Albert M., Khedouri F.) [4].

Graphic representations of the levels of innovative competence of higher education executives were created using a technique proposed by L. Vashchenko [1]. The stages of the innovative competence development are on the axis of coordinates X, Y and indicate the dynamics of changes: “spontaneity – purposefulness”, “uncontrollability – control”. Quantitative calculations of the levels range from 0 to 1.

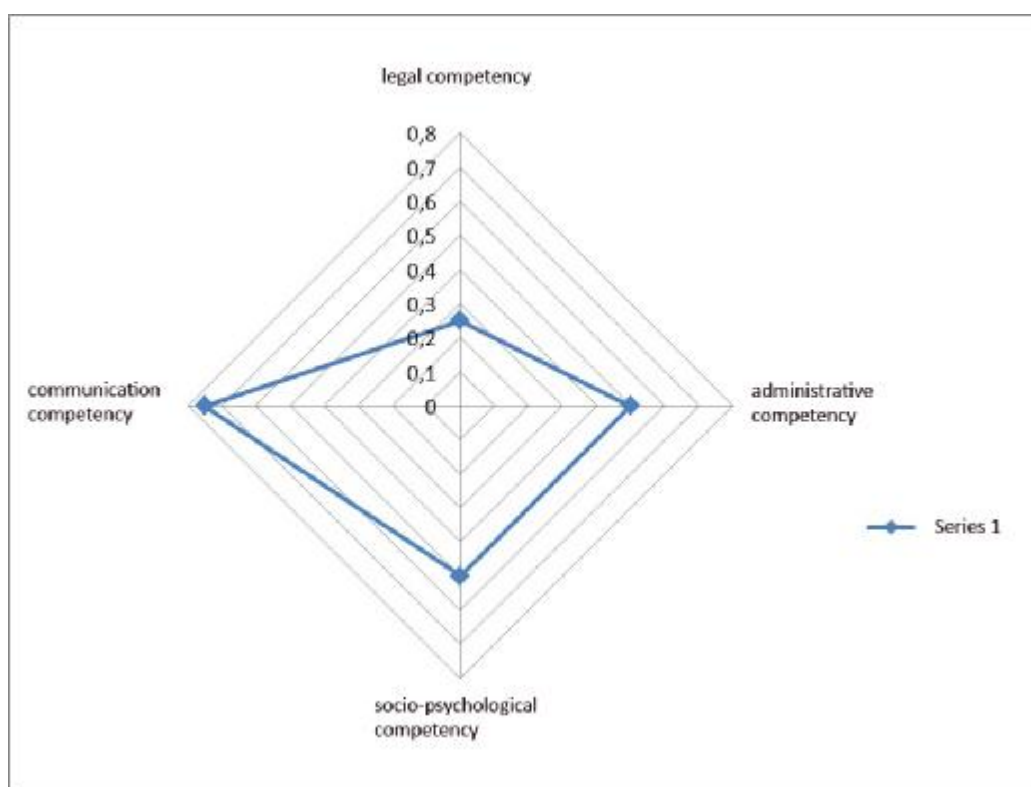


Fig. 1. The level of innovative competence of participant A before the experiment

Thus, the adaptive level of innovative competence is 0 – 0.25, the basic level – 0.26 – 0.5, the sufficient level varies from 0.51 to 0.75, the creative level – 0.76 – 1. This matrix was created for each individual. In particular, the level of innovative competence of participant A was defined as: legal competency – 0.25, administrative competency – 0.5, socio-psychological competency – 0.5, communicative competency – 0.75 (fig. 1).

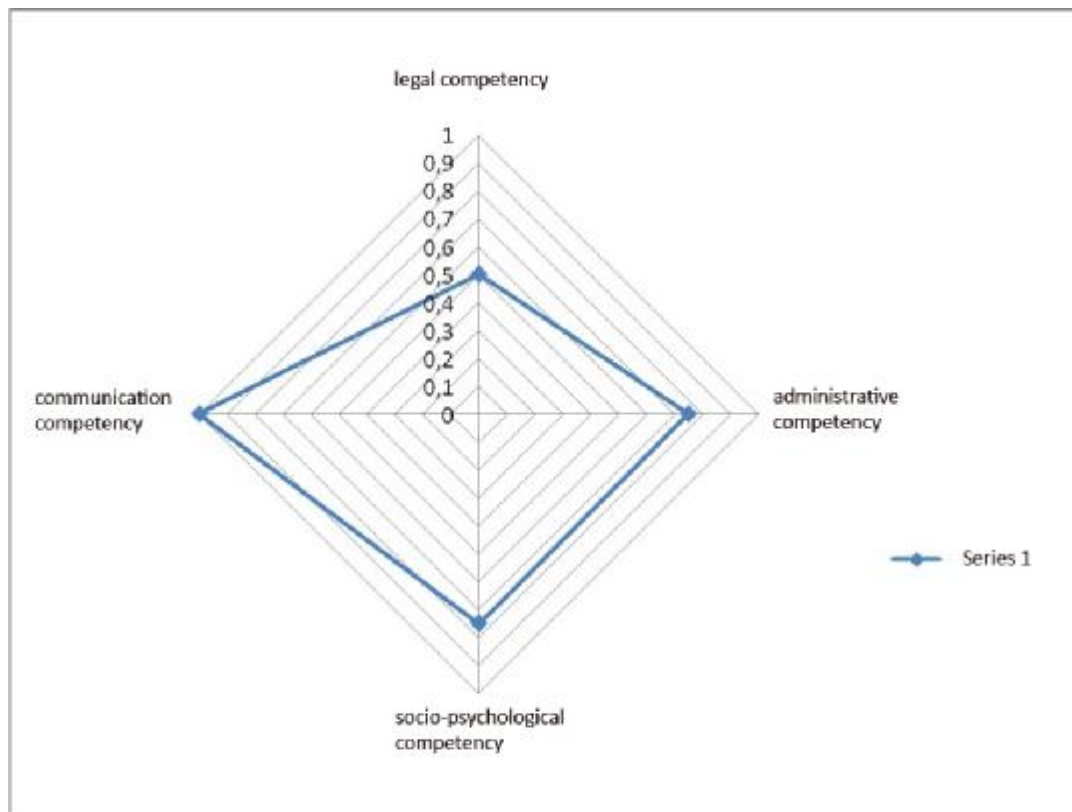


Fig. 2. The level of the innovative competence of participant A at the end of the experiment

The level of innovative competence at the beginning of the experiment is calculated as a simple average: $(0.25 + 0.5 + 0.5 + 0.75) / 4 = 0.5$ (basic).

At the end of the experiment, the level of innovative competence of participant A is $(0.5 + 0.75 + 0.75 + 1) / 4 = 0.75$ (sufficient) (fig. 2).

Thus, at the initial stage, the number of people who had an adaptive level of innovative competence was 123 (45.8 %), basic level – 68 people (32.1%), sufficient level – 18 (8.5%), and creative level – 3 (1.4%).

During the formative phase of the experiment, higher education executives underwent advanced training according to the authors' program aimed at the development of innovative competence in regulating the activities in the sphere of technology transfer.

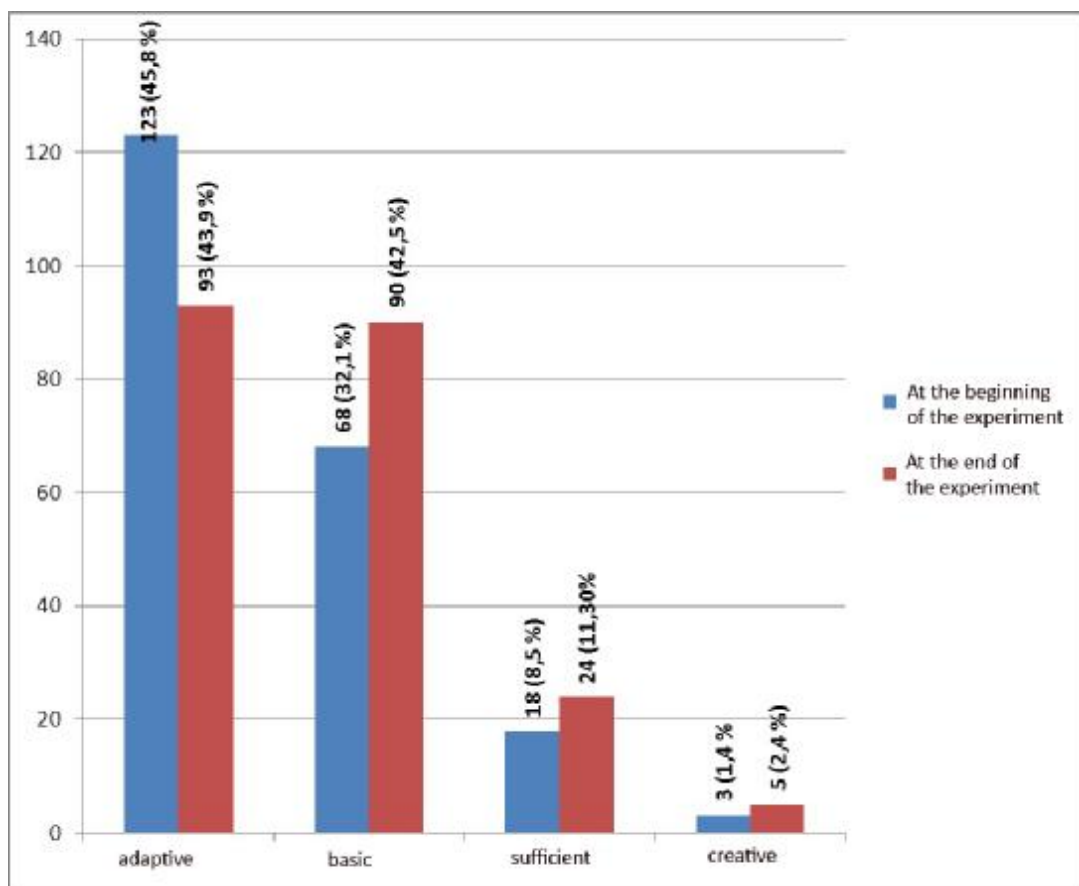


Fig. 3. Number of people by level of innovative competence

As a result of the experiment, upon the completion of training, the number of participants who had the adaptive level of innovative competence was 93 (43.9%), basic – 90 (42.5%), sufficient – 24 (11.3%), creative – 5 (2.4%). The comparison of results of the experiment is presented in fig. 3.

Thus, after the experiment, the number of participants with the adaptive level of innovative competence decreased by 30; at the same time, the number of

individuals with basic (from 68 to 90 people), sufficient (from 18 to 24 people) and creative levels (from 3 to 5 people) increased.

Gradually assuming the role of the centers of entrepreneurial innovative activity aimed at the introduction of national innovative scientific technologies, products, and innovations in various spheres of economy, Ukrainian higher educational establishments are to become active participants of the process of technology transfer. Today, higher educational establishments of Ukraine need qualified personnel in the sphere of the management of technology transfer and innovation. However, the level of the professional competence of higher education executives, who are expected to combine educational, research, and management activities, is insufficient. The challenge of training such professionals is to combine the in-depth knowledge in education, public administration, psychology, sociology, economics, and management. The core of this training is the development of the competencies necessary for the successful regulation of the activities in the sphere of technology transfer. Legal, administrative, psychological, communicative competencies were identified as the components of the innovative competence of higher education executives.

During the experimental verification of the effectiveness of training higher education executives in regulating the activities in the sphere of technology transfer, empirical methods, including surveys, interviews, tests, conversations, direct and indirect observation, assessment and self-assessment, pedagogical experiment, statistical analysis of the results, and a curriculum trial, were used.

The results of the experimental verification of the effectiveness of training higher education executives in regulating the activities in the sphere of technology transfer suggest that, for the innovative competence of higher education executives to be effective, certain conditions should be maintained. These conditions are the following: the content of education, andragogical principles-based forms and methods of teaching/learning, resources of higher educational establishments, student population of higher educational establishments, and communication measures. The resources of higher educational establishment are: 1) faculty capable of providing

appropriate training (their qualification, experience, etc.), 2) material and technical base, 3) necessary educational and methodology materials (textbooks, course materials, etc.), and 4) a special course designed to train higher education executives in regulating the activities in the sphere of technology transfer.

Finally, the content of such education and its andragogical principles-based forms and methods are to define the specific organizational conditions of training higher education executives in regulating the activities in the sphere of technology transfer.

Further research into training higher education executives may examine their motivation to regulate the activities in the sphere of technology transfer, as well as the organizational support of innovative activities in higher education.

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Вороненко О. В. Ефективність підготовки керівників системи вищої освіти України до регулювання діяльності у сфері трансферу технологій: організація та результати експериментальної перевірки

Передумовою успішного здійснення трансферу технологій є забезпечення відповідної підготовки керівників системи вищої освіти до регулювання діяльності у сфері трансферу технологій. Саме від їхньої професійної компетентності залежать вирішення завдань, що виникають у процесі комерціалізації результатів науково-дослідних робіт. У статті автор розкриває методику організації експериментальної перевірки ефективності підготовки керівників системи вищої освіти до регулювання діяльності у сфері трансферу технологій у процесі підвищення кваліфікації. Методика проведення такого дослідження ґрунтується на врахуванні взаємозв'язку всіх елементів системи підвищення кваліфікації, взаємозв'язку зовнішніх та внутрішніх чинників функціонування системи та їхнього впливу на підготовку керівників системи вищої освіти до регулювання діяльності у сфері трансферу технологій. Для оцінювання та інтерпретації результатів експерименту автором запропоновано

технологічну карту оцінювання, яка включає: складники інноваційної компетентності, її ознаки за кожним складником, джерела, методи вимірювання та опис рівнів сформованості. Рівні сформованості інноваційної компетентності визначено на основі застосування закономірності матричного моделювання. Результати експериментальної перевірки свідчать про ефективність підготовки керівників системи вищої освіти до регулювання діяльності у сфері трансферу технологій.

Ключові слова: трансфер технологій, інноваційна діяльність, експеримент, ефективність підготовки, керівники системи вищої освіти, інноваційна компетентність.

Вороненко А. В. Эффективность подготовки руководителей системы высшего образования Украины к регулированию деятельности в сфере трансфера технологий: организация и результаты экспериментальной проверки

Предпосылкой успешного осуществления трансфера технологий является обеспечение соответствующей подготовки руководителей системы высшего образования к регулированию деятельности в сфере трансфера технологий. Именно от их профессиональной компетентности зависят решения задач, возникающих в процессе коммерциализации результатов научно-исследовательских работ. В статье автор раскрывает методику организации экспериментальной проверки эффективности подготовки руководителей системы высшего образования к регулированию деятельности в сфере трансфера технологий в процессе повышения квалификации. Методика такого исследования основывается на учете взаимосвязи всех элементов системы повышения квалификации, взаимосвязи внешних и внутренних факторов функционирования системы и их влияния на подготовку руководителей системы высшего образования к регулированию деятельности в сфере трансфера технологий. Для оценки и интерпретации результатов эксперимента автором предложено технологическую карту оценки, которая включает:

составляющие инновационной компетентности, ее признаки по каждой составляющей, источники, методы измерения и описание уровней сформированности. Уровни сформированности инновационной компетентности определено на основе применения закономерности матричного моделирования. Результаты экспериментальной проверки свидетельствуют об эффективности подготовки руководителей системы высшего образования к регулированию деятельности в сфере трансфера технологий.

Ключевые слова: трансфер технологий, инновационная деятельность, эксперимент, эффективность подготовки, руководители системы высшего образования, инновационная компетентность.

Voronenko O. V. The Effectiveness of Training Ukrainian Higher Education Executives in Regulating the Activities in the Sphere of Technology Transfer: Organization and Results of Experimental Verification

To ensure a successful technology transfer, it is important that managers of higher education be properly trained in regulating the work in this field. It is their professional competence that ultimately defines the solution of the problems arising as a result of the commercialization of scientific research.

The article describes the methods of the experimental verification of the effectiveness of training higher education executives to regulate activities in the field of technology transfer as part of their continuing education. The methodology of this study requires looking at the interaction of all of the elements of the system of continuing education, the interconnection among external and internal factors of the system and their impact on the training of higher education managers to lead technology transfer initiatives. To evaluate and interpret the experimental results, the author offers an evaluation checklist that includes: components of innovative competence, its characteristics for each element, sources, methods of evaluation and description of the levels of its development. The levels of the innovative competence development are defined on the basis of the patterns of matrix modeling. The

experimental evaluation of the program of training higher education executives to regulate the work in the field of technology transfer proved its effectiveness.

Key words: technology transfer, innovative work, experiment, effectiveness of preparation, higher education executives, innovative competence.

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