

Development of the State University of Infrastructure and Technologies Knowledge Transfer Strategy for Improving the Quality of Higher Education

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Abstract. Successful functioning of the knowledge economy is impossible without qualitative education content. The current state of Ukrainian universities suggests an imperfect mechanism for the commercialization of knowledge and technology, shows the "isolation" of education and science from the needs and expectations of the industrial sector, the labor market, and society as a whole.

The article analyzes new models of university development, which give additional opportunities for the university community to realize intellectual potential. The concept of a market-oriented innovative university based on a "knowledge triangle" is dominant.

The authors of the article have developed a knowledge transfer strategy that involves the interaction of education, science and innovation. Its implementation will ensure the improvement for the quality of educational services, the competitiveness of universities, productivity maximization of development and research, and their commercialization.

In compliance with the suggested knowledge transfer strategy, the authors built the mechanism of an innovative university formation. The latest environment innovations in knowledge formation will result in increasing prestige of the State University of Infrastructure and Technologies, preparation of a highly intelligent human resource that meets the needs of society etc.

Keywords: knowledge transfer, strategy, quality of higher education, "knowledge triangle", mechanism of an innovative university formation.

1. Introduction

The main trend in development of modern higher school is an increase of autonomy of higher education institutions, both in determining content of education and managing university activities. Such approach makes efficient functioning of modern higher education institutions impossible without the development of individual progress strategy of each university. In context of ever-increasing competition in the market of educational services, training of specialists must comply with the requirements of higher education standards and be based on strategies for developing educational process to meet the university's strategic goals. Absence of effective

development strategy leads to obtaining limited performance results of higher education institutions. All efforts which aim at introducing elements of modern quality management into the university system will have formal character. They will only provide the opportunity to receive a certificate on declared offers for private processes. As a rule, such a certificate does not have a determining value for a higher education institution.

Development and implementation of effective higher education progress strategy are of high priorities in modern education in many countries of the world. They are based on mechanisms that allow universities to ensure high quality of educational services, carry out promising research projects and entirely integrate into global scientific and technological space.

Ukraine's integration into the European space causes necessity to revise existing models of higher educational institutions and search for high quality education, ways of financial sources diversification and entrepreneurial mentality development under the influence of competition in educational services market; growth of public expectations regarding university's social responsibility; search for more productive combination of education, research and innovation within university's walls.

The university's mission includes preparing high quality specialists, their personal development by increasing universal human values, civic responsibility, national identity and tolerance, which correspond to the social, economic and cultural needs of Ukraine and international community. The quality of higher education institution should satisfy market, teacher and student's needs; it defines the degree of the graduate suitability for effective work, that is, competitiveness of the university and its graduate in the business environment, which is dynamically changing.

2. Related Work

The modern stage of the world economy evolution is characterized by radical social and economic transformations and the transition of countries - key innovators - to the knowledge economy. This term was introduced into the research review by the Austro-American scientist Fritz Machlup in 1962. This new type of economy is significantly different from agrarian and industrial. Natural and material resources continue to serve as the basis for obtaining economic benefits, but the growth and development of the entire economic system are now provided not by external as much as by internal, intangible factors. The most important of these factors are knowledge and human capital [1]. The main attributes of the knowledge economy include the internationalization of educational and scientific activities, technological changes in the field of education and science, diversification of funding mechanisms for research carried out by universities, increase of competitiveness, dissemination of innovative processes, the need for a new generation of highly educated people who can effectively solve current problems of humanity and take an active part in international social life.

The development of the knowledge economy is a real chance for Ukraine to take a worthy place in the European economic space. Today, the knowledge economy in the

broadest sense includes three main areas: research and development and innovation, education and studying that contribute to the formation of human capital, as well as information and communication technologies [2].

One of the most significant Ukrainian competitive advantages on path to the knowledge economy development is high level of education of its citizens. Thus, 45% of the Ukrainian labor force has a higher education, and this indicator is the fifth among 37 countries [3].

Europe has been able to build an effective system of educational values. It is based on the so-called "Triangle of Knowledge" (education - science - innovation). Such system of values sets the vector for development of European education. And in this sense, European experience is of great value. The result of such vector's compliance is the high level of confidence by world community in the education quality.

The State University of Infrastructure and Technologies (hereinafter - SUIT) is a young and, at the same time, one of the oldest educational establishments of the Kyiv city. It was founded according to the order of the Cabinet of Ministers of Ukraine No. 151-p dated February 29, 2016, by uniting two capital universities - the Kyiv State Maritime Academy named after Hetman Petro Konashevych-Sahaidachnyi (hereinafter KSMA) and the State Economic Technological University of Transport (hereinafter SETUT). Each institution has a similar, but its own origin. The historical formation way of these universities reflects the history of water and rail transport, which always needed qualified specialists for their construction, development, technical re-equipment.

In order to assist in modernizing the system of higher education in the partner countries (neighboring countries), the European Union (hereinafter - the EU) developed the TEMPUS program. The TEMPUS program provides financial support to encourage collaboration and balanced co-operation between higher education institutions in partner countries and in the European Union member states. The program is an annual competition. Grants are awarded on the basis of participation in contests and multi-level assessment submitted in the prescribed format of applications. Since 2014, the program has been transformed into the ERASMUS+ program: KA2. Capacity Building in higher education [4].

The KSMA is the winner of the sixth TEMPUS IV Competition, 2013, hosted by the Executive Agency of the EU - EACEA (Education, Audiovisual and Culture Executive Agency). 171 projects were selected for this competition, 33 of which - with the participation of partners from Ukraine.

During the uniting period of higher education institutions, the KSMA was a partner in the international project TEMPUS "Knowledge Transfer Unit - From Applied Research and Technology-Entrepreneurial Know-How Exchange to Development of Interdisciplinary Curricula Modules".

Under the terms of this project a Knowledge Transfer Unit was created, which fulfilled the following functions:

1. conducting of seminars and trainings:
 - on knowledge transfer;
 - on 3D prototyping;

- on the preparation of grant applications;
- on the protection of intellectual property rights.

2. consultancy:

- on applications for grants in international programs;
- on preparation of proposals to the National Technology Transfer Network (NTTN);
- on patent applications and copyright certificates.

3. marketing researches:

- on discovering R & D with the potential for commercialization;
- on determining the needs of potential industrial partners in research and development.

4. cooperation with industrial partners:

- execution of orders for 3D models design;
- implementation of 3D models.

The course "MODERN CONCEPTS OF KNOWLEDGE TRANSFER" was successfully implemented in the educational process at the Faculty of Management and Technology. Teaching the course "MODERN CONCEPTS OF KNOWLEDGE TRANSFER" allows you to develop activities in accordance with concept of the knowledge triangle "education - science - innovation". Thus, the course developed by the authors allows higher education applicants not only to acquire knowledge and practical skills in the field of 3D printing (scanning), but also to get acquainted with the basics of entrepreneurship, the principles of 3D technologies transfer. Competences gained by the students after familiarization with the course materials allow them to acquire a high qualification of specialists who are in demand on the modern labor market.

KSMA was also a member of the National Technology Transfer Network NTTN.

As you can see, the State University of Infrastructure and Technologies has all the prerequisites for developing an effective Knowledge Transfer Strategy and opportunities for transformation into a competitive innovative higher education institution.

3. Results of the Research

The development research of the State University of Infrastructure and Technologies Knowledge Transfer Strategy is to stimulate the University's modernization activities, carry out reorganization that in line with modern integration and globalization processes, requirements for the transition to a knowledge economy will ensure sustainable University development and contribute to improving the higher education quality.

The main tasks of improving the University performance include:

- ensuring a clear separation of functions, powers and responsibilities of management departments, transparency in the activities of the University, its structural subdivisions;
- maximum encouragement to the training of young people - candidates (PhD) and Doctors of Science for the University needs, the integration of young scientists in the University management;
- strengthening the role of the University Academic Council, academic councils of institutes and faculties in making management decisions and control over their implementation;
- developing a modern flexible system of strategic and operational management of the University, introducing modern information technology of document management, control over the implementation of management decisions, reducing the number of internal paperflow, list of compulsory affairs for faculties and departments, decreasing various forms of reporting;
- improving in-service training for academic teaching staff; introducing off-the-job internship for teaching staff (advanced training) in the leading research institutions, universities of Ukraine and abroad;
- initiation of a Distance Learning Center to be responsible for both preparatory and organizational work related to the large-scale introduction of distance learning;
- expanding the functions of the Knowledge Transfer Unit;
- attracting investments into development of initiatives to achieve outstanding results;
- introduction of flexible educational programs, curricula and information technology training, identification and opening of new areas and specialties for the training of specialists;
- providing the learning process with the latest laboratory equipment and materials;
- integration of higher education and research;
- University's integration with educational institutions of different levels, scientific institutions, creation of educational-scientific-production complexes;
- providing free multichannel access to world educational and research resources via the Internet in all University premises;
- applying some modern information and computer technologies in the educational process and university research library; to meet this goal, creating laboratories for preparation and saving of electronic courses, equipment for distance lectures and teleconferences;
- modernization of the educational process structure to achieve the status of the research university, start and implementation of educational programs at the international and national levels that meet the modern requirements of scientific research and labor market, ensuring the academic autonomy of the main educational structural divisions;
- ensuring participation of the University's scientists in perspective, practically important scientific research, Ukrainian and foreign scientific competitions;
- entry into the National Technology Transfer Network NTTN;

- transformation of a higher education institution into an innovative university.

Implementing the culture for internal quality assurance of the knowledge triangle "education-science-innovation" at the State University of Infrastructure and Technologies will cover a wide range of phenomena that regulate and determine the internal university life based on the emerging consensus, tradition, and academic habits. These include the level of centralization and delegation of management powers, readiness for innovation and experiment, the nature and variety of financial and non-financial incentives, the level of collegiality in decision-making, the conditions and prospects of professional personnel development. Healthy culture of quality is not only an environment for full academic and scientific communication, but it can also become a priceless symbolic capital of the university, its business card and even a competitive advantage in the search for students, international partners and synergies with the labor market. The culture of internal quality assurance is a very practical means of improving management, enhancing academic quality and even financial benefits for the University's activities.

The State University of Infrastructure and Technologies has a high potential for generating new knowledge, the possibility of efficient technology transfer to the economy, the implementation of a wide range of fundamental and applied research on the latest scientific and technological basis, the availability of progressive systems for training and retraining the highest qualification personnel. In order to realize this potential, the authors created a mechanism for the formation of an innovative university based on implementation of the Knowledge Transfer Strategy, taking into account these trends in development of competitive universities [5]:

- system integration of research and education activities;
- deepening of regional and international cooperation;
- implementation of interdisciplinary research and doctoral studies;
- coordination of actions with representatives of business in the training of specialists;
- developing modern infrastructure of scientific and innovative activity;
- ensuring the highest quality of scientific and educational activities.

Knowledge transfer is organizational systems and processes which help knowledge, including technology, experience and skills, pass from one side to the other, leading to innovation in the economy and the social sphere [6].

Knowledge Transfer Strategy is a strategy that is built on the development of a knowledge transfer system and culture, the implementation of effective mechanisms for managing interaction between the university and external customers, as well as the formation of a qualified team in the field of knowledge transfer for successful social and economic development of the University (Fig. 1).

1. Prerequisites. When uniting of KSMA and SETUT, the State University of Infrastructure and Technologies has the opportunity to use the achievements of both institutions of higher education. KSMA had successful experience in Erasmus+ projects, created the Knowledge Transfer Unit, implemented a training course on the basis of this unit operation, was also a member of the NTTN National Technology

Transfer Network. The SETUT collaborated with research institutes. This is the basis for implementation of the Knowledge Transfer Strategy and guarantee of positive changes towards the formation of an Innovation University.

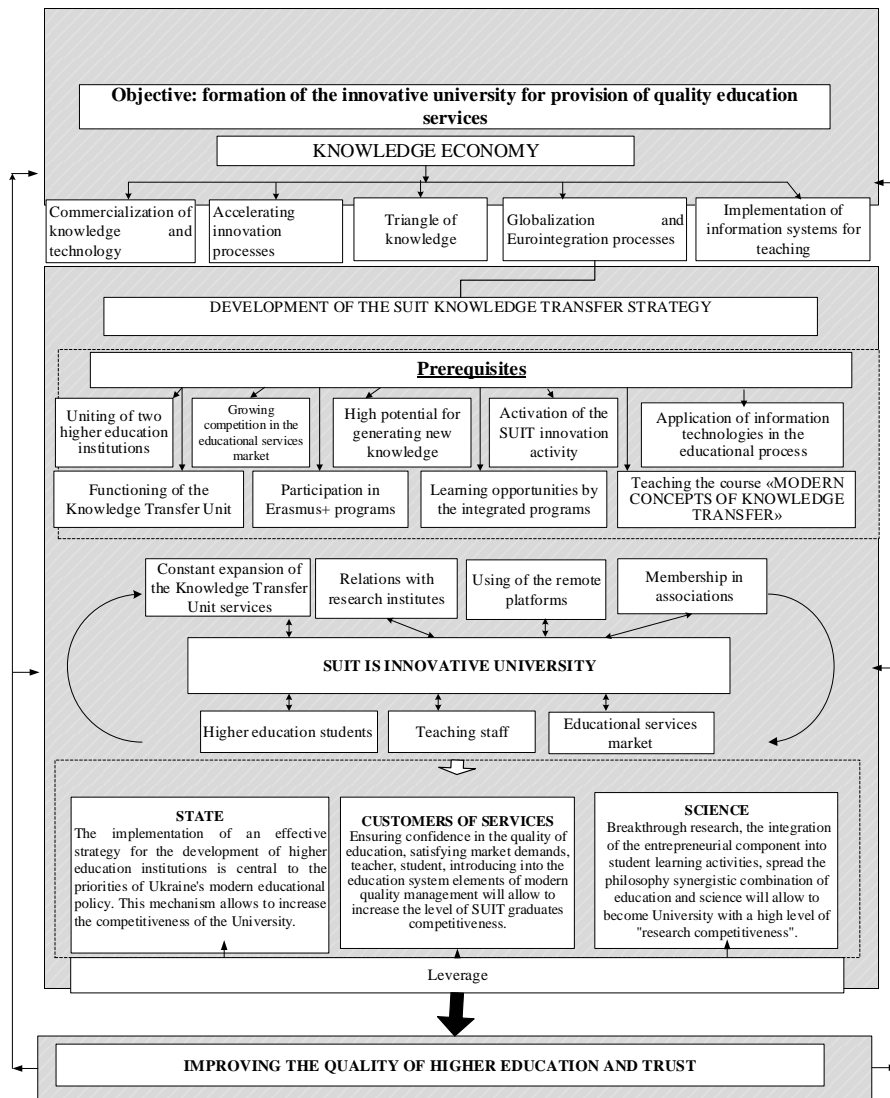


Fig. 1. Mechanism of formation innovation university on the basis implementation of the State University of Infrastructure and Technologies Knowledge Transfer Strategy

2. Elements of the strategy.

Educational services market. The acceleration of social development pace, which has a clearly expressed innovative character of global development, enhances the role

of education and science so as the quality requirements of scientific research, technological development, educational services and knowledge transfer. Today, two global problems determine new status of an innovative university in society and state: firstly, need for the implementation of mass higher education in order to general intellectual nation development; secondly, the knowledge transfer for purpose of rapid and total introduction of innovative technologies in various economic sectors [7].

The university should cooperate with employers to continuously monitor the highly demanded professions. Detection of shortcomings in time will make it possible to adjust curricula in compliance with the labor market. Employers find lack of in-job training for future graduates as the main disadvantage of the existing education system. It is suggested to create a department of cooperation with employers as a part of workplacement department. The department will deal with in-job training of applicants, an interactive survey of personnel managers on shortcomings in the applicants training for higher education, the search for potential employers and the preparation of requests, the involvement of enterprises to pay for educational services of future employees. An integral part of the information support in cooperation department with employers should also be the monitoring of labor market and market of educational services. It will ensure continuous update of important and theoretically substantiated data and usage in management of the University. Based on these data, appropriate management decisions should be made regarding the organization, optimization and improvement of the educational process at the University. Promising direction to improve the level of practical training, which will further develop the innovative university, is the creation of practical centers with leading enterprises based on the University, and use of computer simulators. Students will be able to acquire advanced practical and organizational skills in them.

Teaching staff. Qualitative teaching staff of the departments is one of the defining conditions for the higher education quality. Rating of researchers and teachers is an important criterion that details the quality of teacher's activities and personalizes the achievements of departments, faculties and the University as a whole. The training department is requested to develop a rating list of teachers, taking into account licensing requirements, foreign language skills, communication with students, academic achievements and additional responsibilities. The Knowledge Transfer Strategy involves optimizing the list of subjects, based on the need for graduates' competitiveness in the labor market, rather than teachers abilities to represent a limited number of subjects.

Higher education students. Today, the requirements for training content are influenced not only by employers, but also by students. Possibility of free choice for subjects stimulates applicants to build a certain trajectory of their studies, including both educational and scientific components. The number of applicants who are interested in learning English is growing. From 2018-2019 academic year, the Faculty of Management and Technology introduced two English language courses: "Management" and "Software Engineering". It is proposed for the 2019-2020 academic year to develop master's curricula for educational and professional programs of the following courses: "Management of foreign economic activity", "Business logistics".

Constant expansion of the Knowledge Transfer Unit services. At present, the main mission of the Knowledge Transfer Unit at the State University of Infrastructure and Technologies is to be the interface between University and "outside world", helping its "residents" bring their innovations and competences to the market [8]. To increase the efficiency of knowledge transfer and promote social and economic development of the region, it is proposed to expand cooperation with industry, develop a program for supporting student start-ups, also as qualification rising program, introduce a market demand research system for commercialization of inventions, develop interdisciplinary training modules, search for potential business partners.

Relations with research institutes. The transformation mechanism of traditional University into the innovation involves implementation of triple innovation spiral principle, which combines the innovative components of education, science, transfer of knowledge and technology into one single unit. Necessarity for combination of fundamental knowledge with professional business study and acquisition of skills in entrepreneurship and cooperation with business predetermines the development of various forms of cooperation. Strategic partnership with research institutes will allow to increase the volume of attracted educational-research-oriented grants, teach specialists with innovative thinking; conduct special training on the basics of entrepreneurial affairs [9]. Collaboration with the Institute of Expert-Analytical and Scientific Research will improve the quality of masters' training in public management and administration and business administration. In order to develop educational and professional program "Business Informatics", it is necessary to work out interdisciplinary module with educational and scientific laboratory "Physical bases, technologies of construction and security of wireless information systems". Cooperation with the Institute of Information Technologies and Ukrainian Studies will allow developing and implementing a remote platform for training and organization of scientific conferences, and will improve quality of specialists training in economic and informational specialties.

Using of the remote platforms. Distance learning can be considered as type of study in which provision of substantial part of teaching material and most of interaction with the teacher is carried out using modern information technologies: satellite communications, computer telecommunications, national and cable television, multimedia, educational systems [10]. Using of remote technologies in learning process provides the opportunity for students to choose convenient time for studying and mastering the subjects, independently carry out remote-modular control and analysis of their educational activities, and teachers - to systematically manage the student's academic work, to control and analyze their activities for each module of educational subject that stimulates the student to qualitatively master content of higher education. The functioning concept of the Innovation University involves using of cloud technologies, Big Data, BYOD (Bring Your Own Device), gameimization of education, robotics, expanded reality (supplemented), STEM-education, SMART and Google Sites. Distance learning is intended to solve specific tasks related to development of creative higher education component. Training and control courses based on dialogue information systems, cases, situational games contribute to studying process improvement, development of students' skills in

research and practice. Such courses have an extensive structure, include textbooks, assessment questions with keys, tasks for self study. To coordinate effectively both educational process and management of the whole University's activities, we propose to develop our own intranet. It will allow students to organize their interaction with teachers and masses of information on qualitatively new principles, taking into account individual approach in teaching and freeing teacher's time for additional tutorials. Such system, based on modern telecommunication capabilities and the latest means of data entry and storage, is able to organize real-time simultaneous multiple access to data, exchange and share of information. Network users have fast, convenient and standardized access to structured alphanumeric and multimedia information, so videoconferencing and workshops become possible [11].

Membership in associations. At this stage of development, the State University of Infrastructure and Technologies is a member of the Baltic International Maritime Council and the International Maritime Universities Association, which enables the introduction of innovative training models at the Faculty of Navigation. To implement the Knowledge Transfer Strategy, international cooperation needs to be expanded. The new development strategy - "Europe 2020" offers a wide range of opportunities for establishment of innovative university. Support for applicants' mobility is possible only with the participation of the University in international scientific projects: Horizon 2020, Erasmus+, Jean Monnet, etc.

For the further participation of SUIT in the Erasmus+ program, the following courses are developed:

- Digital Literacy - 3 ECTS; 16 contact h.; 14 praxis; 60 student workload;
- Blockchain, Innovation management and Disruptive technology - 4 ECTS; 24 contact h.; 20 praxis; 76 student workload;
- Digital Marketing in Action - 4 ECTS; 24 contact h.; 20 praxis; 76 student workload;
- Agile project management - 4 ECTS; 24 contact h.; 20 praxis; 76 student workload;
- Digital Business Models - 5 ECTS; 30 contact h.; 15 praxis; 105 student workload.

Strategic plans of the Innovation University also include membership in the European Association of Universities, the European Association for Adults Education, conclusion of agreements on international cooperation with higher education institutions in Poland, Slovakia, Estonia. This will give an opportunity to participate in international conferences, educational trainings, seminars, institutional analysis related to modern trends in the world educational system.

4. Conclusions and Future Work

The role of the Innovation University in modern conditions lies in its development not only as the center of advanced scientific research and higher education, but also as an important subject of innovation activity focused on the commercialization of scientific results through the market introduction of competitive products [12]. Large

number of higher education institutions in the market of educational services necessitates continuous improvement. Suggested Knowledge Transfer Strategy will allow the State University of Infrastructure and Technologies not only to improve quality of educational services provided, but also to become the focus of innovation and scientific development. The strategy will allow to solve the problems of formation and development of research and innovation activities of the University in the conditions of integration into European and world educational and scientific spaces, introduce a system of continuous monitoring of educational services, strengthen international cooperation, become a member of the NTTN National Technology Transfer Network. The exchange of experience with research institutes in the future will allow to become the initiator of science park establishment, to attract investment in research development, to raise the University's rating, to use of the latest technologies in education, to increase the number of applicants for different higher education levels. This strategy will be constantly improved according to needs of the region and will allow transition to innovative type of education with further introduction of the latest information technologies and achievement of high quality education.

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