
Client-Project-Oriented University Education in Era of Rapid Technological Development and Change of Professions

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Abstract: In the era of rapid technological development in universities, it is advisable to switch to client-project-oriented education. It allows the university to embark on a commercial path of self-sufficiency. Client-project-oriented education allows universities to effectively form partnerships with business and industry to train competent specialists for the implementation of projects. For project production management, a technological competence platform is created for the training of project implementation specialists. According to the required competencies of the project participants, the university prepares training courses for specialists in the acquisition of skills on the technological competence platform. On the technological platform of competencies, students with professional knowledge acquire the necessary professional skills and the ability to work in the project team. They become competent specialists who are ready to participate in the implementation of the project. The university becomes an institution of educational development. Universities form an educational core with a transition to an individual trajectory of education and research. Students receive knowledge and skills to participate in a specific project. The principle of learning mobility is implemented by filling and changing the educational process in accordance with the requests of the students themselves. The principle of learning mobility makes it possible to respond flexibly to the needs of individual companies and subjects of the federation. This principle is manifested through the constant transformation of the functional and organizational structure, allowing universities to adapt to the training of personnel on rapidly changing technologies of the innovative industry and industry. In the era of rapid career change, client-project-oriented education is especially relevant.

Keywords: Client-Project-Oriented Education, Interdisciplinary Research, Individual Learning, Management Mobility

1. Introduction

Transformational mobility of universities serves as a tool to increase the efficiency of university management, increase the quality of education and ensure its maximum individualization for the needs of a specific study and employer. The principle of mobility itself manifests itself in the variety of means, methods, organizational forms of the system of all levels of education, their flexibility and readiness for rapid transformation in accordance with the changing needs of the individual, the labor market, and society. It allows the use of various productive methodological systems and technologies, and consists in the creation of information networks, knowledge bases and data banks for distance education, as a result of which the student

can adjust or supplement his educational program in the desired direction. To effectively ensure mobility, various information and communication technologies are used, which provide flexible and fast interaction between all participants.

Rapid technological development will lead to the replacement of the labor exchange with an exchange of competencies and the creation of an exchange of targeted education. The competence exchange will be formed by representatives of the technological sector of various enterprises of industry and services. The exchange of targeted education will be formed by universities together with the technological sector of industry and services. In the era of rapid technological development, universities should provide an individual trajectory of targeted competencies in terms of time, knowledge and skills of a researcher and

performer based on the technology sector.

At the level of vocational education, the teacher monitors the completion of internships and practices, educational programs, thereby creating a system for effectively monitoring the mobility of students. The principle of mobility in the system of vocational education is aimed at the formation of social, professional, communicative and other competencies. These competencies contribute to the development of cognitive and socio-professional mobility of vocational education students, who, in turn, are one of the priority qualities of a modern specialist. It involves constantly updating the content of training and improving knowledge, skills and skills as necessary, due to changes in the labor market.

The principle of mobility implies continuous, advanced development, the ability for an accelerated and expanded training system [1-4]. Pupils learn to make rational decisions, in case of correction of professional activity in labor market, for obtaining missing knowledge, abilities, skills and ways of development of necessary competences and professions and to study several specialties in parallel with the right of obtaining diplomas in each of them.

The application of the mobile principle in the system of client-project-oriented higher education makes it possible to train qualified socially and professionally oriented and mobile specialists at the level of vocational training, which is one of the most important priority areas at the current stage of digital industrialization of society.

The mobility of university client-project-oriented education is based on multi-cross-disciplinary fundamental and applied training and research with verified diversified system mastery of competitive professional competencies.

2. Multi-disciplinary Training and Inter-trans Disciplinary Research

Multi-disciplinary training is a combination of different disciplines that do not have explicit links between themselves in content. Interdisciplinary research is based on the knowledge and skills of two or more different disciplines, which can range from the simple exchange of ideas to the mutual integration of concepts and methodologies to understand, justify and possibly manage the phenomena of super-complex systems. Inter-disciplinary means collaboration in two or more scientific disciplines. The basic, initial form for an interdisciplinary form is multi-disciplinary, which involves sufficiently free interaction of scientists from different disciplines, which does not aim to formulate a common approach or obtain collective results. Interdisciplinary research aims to overcome the methodological and theoretical (including categorical) identities inherent in the scientific disciplines involved in interaction in order to create a new, common conceptual framework and obtain innovative results through it. It is with interdisciplinary research that the successes of modern natural sciences are associated. An interdisciplinary approach

is best suited to explore complex, multilevel, heterogeneous, continuously changing institutional systems.

Trans disciplinary research aims to create a common system of axioms for a certain set of disciplines and integrate disciplinary paradigms for joint research and unity of knowledge. Trans disciplinary is understood as the study of the subject (more precisely, elements of the subject area) of one scientific discipline using the methods and terminology of another discipline; in other words, it is the study by representatives of one discipline of another subject.

Multi-disciplinary training and cross-disciplinary research provided by mobility knowledge management.

2.1. Mobility of Knowledge Management

Knowledge management in education is carried out to train marketable personnel on the basis of multiple disciplinary and interdisciplinary knowledge. Knowledge management is also used in the formation of research communities on publications and competencies and professionalism in applied scientific and innovative research and in solving current problems in the communication mode.

Knowledge management in innovation and technological development is carried out on the basis of monitoring and analysis of the state of the international high-tech market and technological capabilities of domestic industry.

Knowledge management is a systematic process through which competitive elements of intellectual capital are created, maintained, distributed and applied, leading to success, transforming all kinds of intellectual assets into best practices with higher performance, efficiency and better quality. Knowledge management is based on the knowledge map. The knowledge map is the process of identifying the knowledge and skills needed to develop a solution. Knowledge is in the heads of specialists, then the best way to use this knowledge will involve these specialists in research. Knowledge in people's minds reveals itself at the moment of interaction between them. In the process of communication, employees exchange knowledge. It is necessary to direct this interaction towards achieving the goal, generating new ideas and updating existing knowledge about the entities of objects, phenomena and processes of reality. The essence of the object, phenomenon and process of reality researcher first deeply feels and then describes the elements of knowledge. When feelings are learned by practical skills, the researcher more fully feels and accurately describes and presents processes, phenomena and objects.

The mobility of knowledge management ensures the efficient use of knowledge. Mobility of knowledge management is the process of communication (targeted communication) in research communities, directing it to extract new and update existing knowledge and helping, make the right decisions and take the necessary actions, obtain the necessary knowledge, and achieve results on time. The mobility of knowledge management in inter- and trans-disciplinary research is carried out on the basis of synergy between science, business and education.

2.2. Synergy of Science, Business and Client-Project-Oriented Education

Combining educational and scientific activities, their synergy is a factor and a real means of increasing the efficiency and competitiveness of innovative high-tech activities. Synergy between education and science is a prerequisite for the development of an innovative economy.

The synergy of integration of science and education gives an accelerated educational effect in the training of highly qualified researchers. The accelerated process of training highly qualified researchers is implemented through the integration of higher education with advanced research fundamental science. Education and science, especially in their synergistic synthesis, are increasingly becoming the engine of technological progress, without which socio-economic progress is unthinkable. High-quality training of researchers, based on an alliance with scientific activities, is a priority policy in all developed countries of the world, as well as a necessary component of the institutional structure of an innovative economy and business.

The reproduction of highly qualified researchers who meet the requirements of an innovative economy and business has a high priority. Large corporations should invest sufficiently in research and development in the field of high technology, training specialists of appropriate quantity and quality, and form a system of public-private partnership in higher education. The creation of large educational complexes based on the joint activities of the university and the production sector is one of the most important areas of intersectoral cooperation for the development of high-tech industry.

Development of a person's creative abilities, expansion of opportunities of individual research innovation activity, mobilization of a researcher's potential for realization of own ideas and developments ensures mobility of creative innovative higher professional education [2]. The peculiarity of such education is that it is aimed at developing the constant need for creation, finding a new one, in accumulating intellectual potential and using it in practice.

A new quality of work appears - creative activity as a function of the self-realization of a holistic person, a creator. Deep fundamental training and mobility, characteristic of creative innovative higher professional education, gives a synergistic effect, promotes continuous training, allows you to predict and evaluate development trends. Such education increases the perception of problems and options for solving them, stimulates a creative approach to solving them. But the main thing is to realize the idea of the need and possibility of training creative research activities. Now need researchers with a search mentality, creative intuition, a clear vision of what this or that new technology should lead to.

The synergy of science, business and client-project-oriented education makes universities institutions for educational development. Today, university education, business and science, their synergy is the main resource of

innovation and high-tech economics [4].

3. Innovation Activities of High-tech Economy

The innovation process is connected with changes in the field of knowledge presented in various areas of human life. At the same time, in the context of this process, a new knowledge is born, spread and turned into technology and profit. There is a close connection between mental activity, on the one hand, and material production, on the other. The pace and scale of translation of knowledge into technology provides an opportunity for improvement. In a high-tech economy, a firm's viable competitive advantage stems from its ability to use new knowledge.

Industries attract the profitable use of innovative professional knowledge for new technologies, services, organizational, technical and socio-economic solutions of a production, financial, commercial, administrative or other nature. The period of time from attracting innovative professional knowledge, creating innovation to its use is called the innovation lifecycle. Taking into account the sequence of work, the life cycle of innovation is considered as an innovative process. In the world economic literature, the innovation process is considered to be embodied in new products and technologies. In accordance with international standards, innovation is defined as the end result of innovation, embodied in a new or improved product introduced in the market, a new or improved technological process used in practice, or a new approach to social services.

Innovation makers are guided by criteria such as product lifecycle and cost-effectiveness. Their strategy aims to surpass competitors by creating an innovation that will be recognized as unique in a certain area. Scientific and technological developments and innovations act as an intermediate result of the scientific and production cycle and, as they are practically applied, turn into scientific and technological innovations - the end result. Scientific and technical developments and inventions are the application of new knowledge for the purpose of its practical application, and scientific and technical innovations are the materialization of new ideas and knowledge, discoveries, inventions and scientific and technical developments in the production process with the aim of their commercial implementation in order to satisfy certain needs of consumers. The indispensable properties of innovation are scientific and technological novelty and industrial applicability. If scientific and technological innovations meet market demand, then they bring profit to the industry. The identification of the actual status of profitability provides the basis for further innovative changes. A full analysis will not only identify possible areas of innovation, but also justify which of them is most cost-effective.

Modern companies are innovating as a means of increasing profits and gaining a wider market segment. Governments see them as a panacea for accelerating economic growth

through increased competitiveness in the world. Innovation creates value and wealth by relying on some form of change (in any field - technology, materials, prices, services, demographics or even geopolitics), forming a new demand or resorting to new ways of replacing fixed capital and using "mature markets." Innovation promotes the movement of resources to higher productivity and profits.

Research has become the main authority around which most other factors of the modern business transformation of the knowledge economy revolve. The knowledge economy today stands on the verge of forming a new market segment - the knowledge market. The knowledge market will be based on research and knowledge capitalization. Capitalization of innovative professional knowledge, which brings profit to industries, is one of the main categories of the theory of human capital. This concept reflects a market assessment of the stock of human capital held by an individual. Thus, when capitalizing professional knowledge, it is necessary to first consider the main costs of human capital for their production.

The awareness of knowledge as a commodity and the most important resource for the development of civilization, the rapid development of the Internet, mobile communications and digital technologies that provide opportunities for the effective use of intellectual resources - all this determines fundamentally new approaches to the possibilities of practical use of the zone and the dynamics of changes taking place in society. Education at the university should be aimed primarily at teaching the student to solve practical problems, and not just at transferring knowledge. Russian universities are undergoing changes today that will lead to the emergence of a new type of university. Previously, universities were focused only on the promotion of knowledge, today the commercialization of developments becomes important. In third-generation universities, the development and commercialization of know-how and the capitalization of knowledge comes first. This raises issues such as intellectual property protection. New knowledge, new skills is attracted. University 3.0 is primarily an open university that actively cooperates with industrial companies and foreign colleagues. Interaction with industry has a positive impact on the education process: students understand what disciplines they need for successful work, and in accordance with this, build their studies. Students should themselves be responsible for their education - to be able to choose those courses that they consider necessary. When students have access to different companies, they get an idea of what disciplines they need. They themselves are responsible for education. When responsibility is transferred to students, then this motivates them to develop. The role of universities of the future to develop students and include in the implementation of the company's project, to teach the student to capitalize knowledge for commercialization within an innovative ecosystem [5].

4. Innovative Ecosystem Digital Platform

The technology platform is an innovative ecosystem and

acts as a provider of knowledge and technologies of the future, concentrating around itself a lot of companies, research centers, a variety of technical and logistics services, and, most importantly, consumers. The technology platform is used as a way of organizing the interaction of various participants (business structures, universities, state bodies, independent experts) to solve ultra-complex problems. Technological platforms are created in industries related to new knowledge (biomedicine, intelligent energy, nuclear industry, urban infrastructure, robotics, etc.). Universities in platforms often play the role of providers of scientific resources for research. In conditions of rapid changes and uncertainty, a new generation of managers, engineers, economists will have to solve not only qualitatively other tasks, but also act ahead of schedule, which requires special personnel competencies. The problem cannot be solved without a qualitative change in the content of educational products, training methods, and the prompt introduction of the results of scientific achievements into the educational process. There is a need for the formation of specialized university technology platforms focused on the commercialization of research activities. The technology platform does not do without the participation of universities, whose role increases sharply in solving poorly structured problems with a lack of necessary knowledge. Without cooperation with business, it is impossible to maintain high results in research activities, develop competencies, conduct a deep analysis of social and economic trends, improve educational content and focus on commercialization of research results.

The system of commercialization of research results, like the innovation system, is one of the types of open systems in which financial resources, material means in the form of products, patents, articles, as well as human resources function. It includes scientific organizations, universities, technology parks, business incubators, venture capital companies, enterprises and corporations. As well as structures providing regulatory, information and financial support.

To commercialize the results of scientific research, a digital platform of intelligent products is used. The digital platform of intelligent products is a constantly operating market platform on which, according to certain rules, transactions are made for the purchase and sale of intelligent products in the form of projects, developments of various degrees of readiness, laboratory and industrial samples and installations, patents, experimental productions, research results used in civilian industries. The digital platform of intelligent products also acts as an organizational regulator of innovative processes. Platforms are created for contacts between developers and investors, an information hub of interests of the business community, the state and the intellectual community. The results of research and development are displayed on the digital platform of intelligent products in the form of developments of various degrees of readiness, laboratory and industrial samples and installations, patents, experimental production, on the one

hand. And creating technical and financial conditions for research and development - on the other hand (from the customer).

It is easier for representatives of business organizations to focus on addressing a development order in the presence of a market-based digital platform of intelligent products, in which a significant number of organizations of the country involved in research and development [6, 7]. If a business or industry manages to formulate a task or order to create a technology, you can create a virtual team based on existing competencies that could implement this technology at the request of the industry. Conversely, when teams come together and offer innovative applied knowledge or technology to the industry.

For a technology platform to perform the functions of communication and commercialization of results, it must be oriented towards a market competitive environment. A carefully designed marketing strategy for the technology platform is needed, including not only market research, the creation of breakthrough technologies, but also a thoughtful advertising campaign aimed at increasing the demand for innovation and increasing the prestige of scientific and engineering activities. In the context of globalization, the breakthrough technologies created by the technology platform must compete successfully with the technologies and products of the world's leading manufacturers. For successful commercialization, the result of research activities should be a complete product, demanded by both the Russian and world markets. For successful commercialization of the technology platform, as a communication platform, must be formed on the principles of marketing interaction.

5. Partnership Formation with Business and Industry

Universities should become a trend of change in the region and support personnel for technological and industrial development with intensive interaction and participation with agents of the regional environment, according to the regional development roadmap.

With the rapid development of technology, there is a need for life-long education, the capabilities of which are determined by the latest means of telecommunications (e-learning) and a variety of choices, not limited to a certain extent, even by state borders. The need to master and organize huge flows of information requires the ability to learn. The ability to learn, becomes a guarantee of social inclusion in the life of the region, and be in demand. Otherwise, a person risks being in a state of systematic lag.

The appeal to digital education strategies is largely dictated by the need to intensify economic development. The need to respond adequately to the growing volume of information, the development of high technologies and the new format of human-environmental relations determines the direction of education towards the digital model. The

modern educational system faces the tasks of overcoming the fragmentation of narrowly disciplinary perception of reality, a lopsided pragmatic focus on the result and an orientation towards unity. A holistic theoretical and pragmatic education system is required. The transdisciplinary paradigm, acting as the basis for the synthesis of the knowledge of man, nature, society and production, complements scientific rationality. It allows you to create digital twins of the production process of production and the technological process of equipment operation. Create digital twins by training neural network systems based on accumulated big data related to manufacturing for intelligent control of technological processes and equipment. Control the digital double either in consultation mode, or automatically or by adjusting the parameters. Intelligent control of digital twin production optimizes its operation, increases productivity and competitiveness of products at quality and price [8].

The development of human capital as the main resource and key factor in the development of the modern economy tends to increase life expectancy and healthy life activities. Transferring the population to a healthy life will solve this problem [9]. To do this, the university needs to provide:

- Acquisition of knowledge and skills on healthy lifestyles;
- The formation of a public culture of healthy life.

In pandemic conditions, international telemedicine network with rapid coronavirus registration by resonance technology can help monitor coronavirus infections [10].

Rapid technological development leads to the creation of digital competency exchanges and an exchange of targeted education. The digital platform of the competence exchange is based on a system of rapid search, preparation and selection of candidates for vacant positions for the development of the region's economy and industry. The system combines the requests and proposals of a wide range of employers, applicants, as well as the resources of educational organizations [11-15].

The digital platform of the exchange makes it possible for applicants to develop their professional and soft-competencies to the requirements of employers under specially designed educational programs. Targeted admission to the university and training is carried out at the expense of and by direction from the state department or from the enterprise. The use of the target area for training requires mutual fulfillment of obligations between the parties to the concluded contract. Such obligations arise from the functioning of certain rules of law.

6. Development of Client Project - Oriented Education

Each educational institution operates in a competitive environment in the market, each educational institution is faced with problems of determining by whom its market is specifically represented, what its volume and development trends are, is homogeneous or diverse, how and under what factors the attitude of consumers of educational services to

the institution providing them changes.

In addition to determining the needs and needs of consumers, the educational institution needs to keep a record of the formed and carried out and an assessment of activities will help in this. The valuation can be done using the measures of profit, cost recovery and profitability. Within the framework of education, it is also customary to talk about social assessment, considering it as a result of the activity of a market subject that is not related to profit and is aimed at the benefit of society as a whole or a separate group of the population (if a specific product is produced, for example, an idea, concept or program).

As economic indicators can be defined: revenue from the sale of educational services, institution costs, profit from sales, cost recovery, overall profitability of activities and others.

As social: programs, educational courses, the quality of educational infrastructure, the quality of services, including educational results, the quality of the product itself - the graduate due to the development of the direction, the professionalism and qualification of personnel, the use of modern educational technologies in the educational process and others.

The effectiveness of the institution as a whole can be assessed through an external (how consumers, competitors and other partners evaluate the institution and its activities) and an internal assessment form (listed above, etc.). Also, dividing the expenses of an institution into permanent and variable allows you to quickly control both types of expenses and determine the most profitable types of educational services.

Within the framework of customer-oriented activities, it is advisable to talk about marketing models, which give us an understanding of how to organize activities for the sale of services, which should be more taken into account in communication with consumers and how best to organize these events.

Marketing and customer-oriented activities of the lone are needed by participants in the educational services market. Education institutions, in order to know what the consumer needs, to predict demand, to conduct competent valuation and provision of services, as well as their promotion, that is, to conduct client-oriented activities. The customer of educational services needs to know as much as possible about the offer, understand the competitive advantages of the services, social results from their receipt, and receive maximum satisfaction of their needs.

Educational institutions will be required to conduct a serious marketing, communication strategy, research on the educational services market, which should lead to improved management of the educational process, to the use of methods of finding and recruiting consumers and customers, a qualitative change in educational technologies, a change and improvement in interaction.

The formation of demand for educational services, the promotion of information about them will require the development of an integrated system of market interaction with business and society, connected with the movement of services, the exchange of information, technologies,

knowledge, experience.

University teachers offer knowledge to participate in a targeted project. During training, project competencies are mastered. At the next stage, professional skills are acquired on the customer's technology platform, and project management of skills for teamwork is mastered (Figure 1).

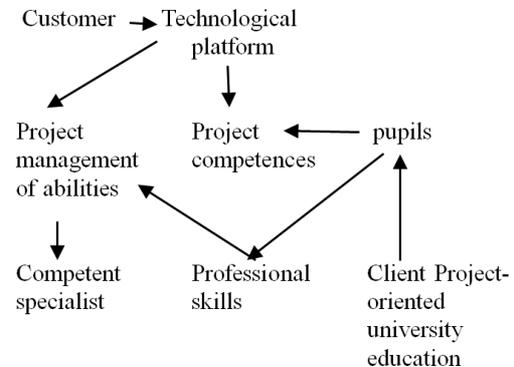


Figure 1. Client Project-Oriented University Education.

On the customer's technology platform, trainees acquire professional skills and develop the ability to work in a team. That is, they become competent professional specialists.

7. Conclusion

Universities can be mobile and transform to take an active part in the development and creation of platform solutions for sectors of the economy and social sphere of the regions. Such as the development of human capital, technological entrepreneurship, infrastructure for the development of entrepreneurship, digital technologies in urban planning, the digital economy of the university, transport systems, environmental improvement, telecommunications of the city of the future, the digital platform for interaction of the university with the external environment of a smart city, a smart student campus and others.

Communication between universities, authorities and industry is becoming more intelligent, digital and flexible. Initiatives such as Germany's fourth industrial, U.S. industrial Internet, and China's industrial production show how the digital industry is transforming university education and training. At the current stage, it is important to create an open international technology platform for client-project-oriented education to form a wide coalition of universities in various countries in the training of personnel and the development of trans disciplinary research. The international technology platform of client-oriented education will become a global navigator for the formation of sought-after professional competencies for the development of the information, educational, scientific and scientific-production infrastructure of universities, experience and proposals for the commercialization of developed technologies and results of intellectual activity, as well as products produced using technologies and results of intellectual activity in the world.

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