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TECHNOLOGY TRANSFER OFFICE MODEL

Abstract: At present creation of specialized organizational structure, the technology transfer office (TTO) in higher education institutions (HEIs) becomes increasingly important for establishing communication between scientists, business, and the state and for implementation of the results of scientific and technical activities of higher education institutions in the real sector of the economy. Surveys of domestic and foreign scientists show that the issues of creating project offices (which in fact are TTOs) in HEIs remain insufficiently explored. Given this, the authors conducted a study of project management to create a TTO in a HEI. Efficient organizational project management requires the presence of Organizational Breakdown Structure. This article proposes an Organizational Breakdown Structure template, which clearly demonstrates the project team structure targeted at TTO creation in a HEI, the subordination and basic functions of each team member. In addition, the article proposes a model of organizational structure of the newly created TTO, which is also a template for HEI, and which defines the structure of the office staff, their subordination and main functions. To determine the location of the TTO in the structure of HEI, the article proposes a corresponding model that shows the subordination and connection of the office with other functional units of HEI. Using the models presented in the article, any HEI will be able to effectively manage the project of creating a TTO and as a result to create a project product – a TTO.

Key words: technology transfer, technology transfer office, technology transfer office model.

Introduction

Every year in higher education institutions (HEIs) of Ukraine innovative technologies are created but the most of them remain unimplemented [1]. Creation of the innovative ecosystem in our country becomes a priority given the direction of state policy [2].

Analysis of international experience showed that in the United States, one of the most successful countries with regard to efficiency of technology transfer (TT), the technology transfer offices (TTOs) created in HEIs play an important role [3].

Domestic scientists conduct a number of studies and substantiate the formation of specialized structural units in HEIs to manage TT [4; 5], but they do not use the project approach for that.

In fact, TTO is a specific organizational structure within a single information and communication system of the institution, which uses the project approach to manage projects and portfolios of TT projects.

By TT project, we mean a sequence of managing measures, which provide coordination of human, material and information resources throughout the technology lifecycle by applying project management (PM) methodology to transfer and implement the results of scientific and technological research and development of HEIs in the real sector of the economy and to create innovative products based on them.

Given the above, the problem of the project approach-based creation of TTO is topical and yet unresolved. Available international standards for PM [6; 7; 8] provide only definitions and type classification of the project offices, whereas insufficient attention is payed to organization of such offices.

Foreign and domestic scientists also do not sufficiently cover the issue of creating project offices. Domestic scientists [9; 10] develop the concept of project office and define its functions, features and types. The author [11] described the operation features of project offices, their types, benefits and main stages of creation. The author [12] proposed an algorithm of creation and a conceptual model of the project office in the company.

However, the issue of organization of project offices in HEIs has specific its own features, and therefore requires more in-depth research [13].

We used a systematic approach and method of constructing hierarchical diagrams in this study that is based on the concept of the triple helix [14], which provides for the interaction of HEI, government and business [6].

Main structure

An effective project implementation depends primarily on clear division of tasks between specific executors or units. Subordination in the project team is presented in the form of organizational breakdown structure (OBS) of the project of TTO creation, the template for HEI of which is given by the author on fig. 1.
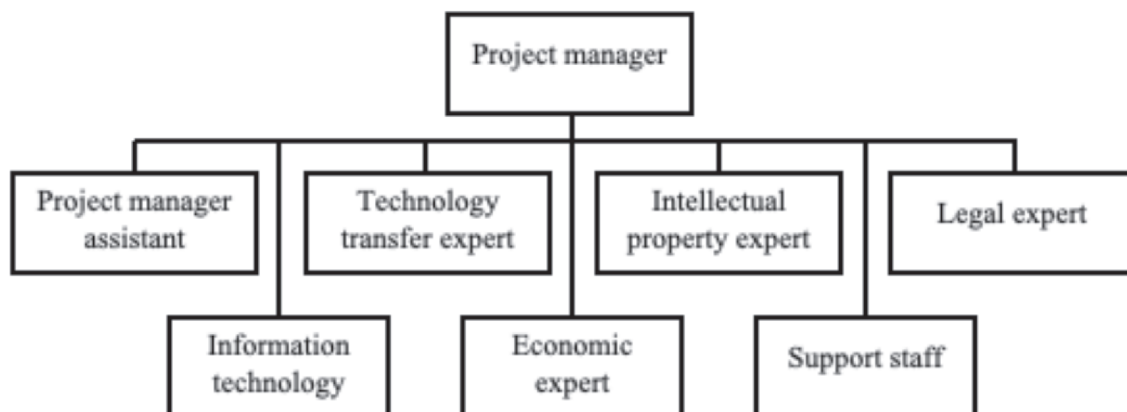

Fig. 1. The template of OBS of the project of TTO creation in HEI

The distribution of functions and tasks of the team members of the project of TTO creation in HEI is presented in table 1.

Table 1. Functions of the team members of the project of TTO creation in HEI

Team member	Main functions
Project manager	Provides general PM, approval of the charter, basic project plan, OBS project, organizational structure of TTO, IP policy, sets criteria for project team selection, selects the project team, TTO staff, makes communication between project team members, stakeholders, conducts project implementation monitoring
Project manager assistant	Develops the project's charter, basic project plan, OBS project, organizational structure of TTO, conducts trainings on PM, implements the PM methodology into work
TT expert	Advises on all issues related to TT, determines the requirements for TTO specialists, their functions, determines the criteria for selection to TTO, organizes the selection, creates a standard form of technology description to file information about it in technology and IP rights sections of HEI's site
IP expert	Develops IP policy, forms that HEI's employee should fill in when creating technology, defines criteria for deciding on the expediency of registering technology as IP right object (hereinafter – IPRO), monitors the existing and potential IPRO in HEI, makes analysis of information on technologies and IPRO of HEI, makes reports based on obtained information, develops database architecture of IPRO in HEI
Legal expert	Provides documentation of the project, preparation or preliminary coordination of contracts with contractors or suppliers, IP policy
IT expert	Creates virtual communication channels for the project team, develops architecture and selects software for TTO operation, searches for developers, implements cloud technologies, develops IPROs database, technology section of the website
Economic expert	Prepares documentation on the project budget, makes planning, cost monitoring
Support staff	Arranges rooms for the project team, TTO

A project manager of TTO creation in HEI could be an employee of HEI (head of department, professor or associate professor) who is responsible for project planning and implementation, risk response, provides communication between the project team members, sets up the project team for fruitful work, approves documents and communicates with project stakeholders. Requirements to be met by the project manager:

skills in PM methodology and experience in applying PM models and methods in practice;
close ties with senior management and heads of functional units of HEI;
communication skills and skills to create a psychological climate acceptable for the introduction of changes in HEI;
knowledge in the field of IP and TT.

A project manager assistant implements the PM methodology in the work of the project team and TTO, organizes PM trainings to heighten the level of knowledge of functional managers of HEIs, develops the charter, basic project plan, develops OBS of TTO project in HEI, organizational structure of TTO. The project manager assistant could be an employee of HEI, who professionally carries out scientific, scientific and technical or scientific and pedagogical activity and has skills on the PM methodology.

A TT expert advises on all issues related to TT, determines the requirements for TTO specialists, their functions and powers, organizes the selection. An expert in TT could be a HEI employee who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, has education and experience in the field of IP, has been trained in TT and has skills in this field.

An IP expert develops the IP policy of HEI, template documents (forms) to be filled in by HEI employee in case of technology creation, determines the criteria for deciding on the

expediency of registering the technology as IPRO, audits existing and potential IPRO in HEI, collects information obtained and files it into a single database, the structure of which is determined together with an IT expert, analyzes the number of implemented IPROs in relation to the number of registered and in relation to the number of created ones. An IP expert could be HEI's employee who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, has education and experience in the field of IP.

A legal expert provides documentation of the project subject to amendments to the chart of the HEI, develops the regulations on a structural unit, job descriptions and other documents required for TTO creation, as well as preparation or approval of contracts with suppliers and/or contractors, IP policy of HEI. A legal expert could be an employee of HEI who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, has legal education and experience in the field of jurisprudence.

An IT expert organizes the creation of virtual communication channels, selects software for the project team and TTO or develops the architecture of the future program, searches for developers, monitors contractors' performance of tasks, installs selected software, assists the team on its mastering and mastering of cloud technologies, which are subject to implementation, develops the architecture of the database of technologies and IPROs of HEIs, ensures the creation (search for developers) and operation of the technologies and IPROs section of HEI website, analyzes the channels of website promotion. An IT expert could be a HEI employee who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, has education and experience in the field of IT and programming.

An economic expert prepares documentation on the project budget, makes planning and monitoring of costs. An economic expert could be a HEI employee who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, as well as an accountant who has education and experience in the field of economics or accounting.

In the absence of any of the mentioned experts in HEI, it is possible to involve him/her from third-party organizations or to teach him/her these skills. Also, in the case of a combination of knowledge and skills in one of the employees, for example, in the field of IP and in the legal field, both roles (IP expert and legal expert) could be performed by one person.

The support staff arranges rooms for the project team, TTO, makes reparation works if necessary, brings furniture, equipment, etc. Support staff includes two technicians who may have a secondary special education and perform only technical functions.

Project team members work closely with each other to implement the project effectively. The interaction is organized by the project manager and his assistant. When selecting a project team, the manager should take into account the above-mentioned skills, experience, education, as well as the character and communication skills of a candidate. For effective work, the project team must be a single whole, pursue a common goal and respond quickly to risks.

Under the condition of effective project implementation, as a result of its completion, the project product - TTO will be created. In addition, another product of the project will be a newly created section on HEI website, dedicated to technologies, developments and IPROs of HEI.

In order to clearly understand the subordination and number of employees in TTO, as well as to distribute the functions and tasks of such employees, we offer a template of the organizational structure of TTO in HEI as shown in fig. 2.
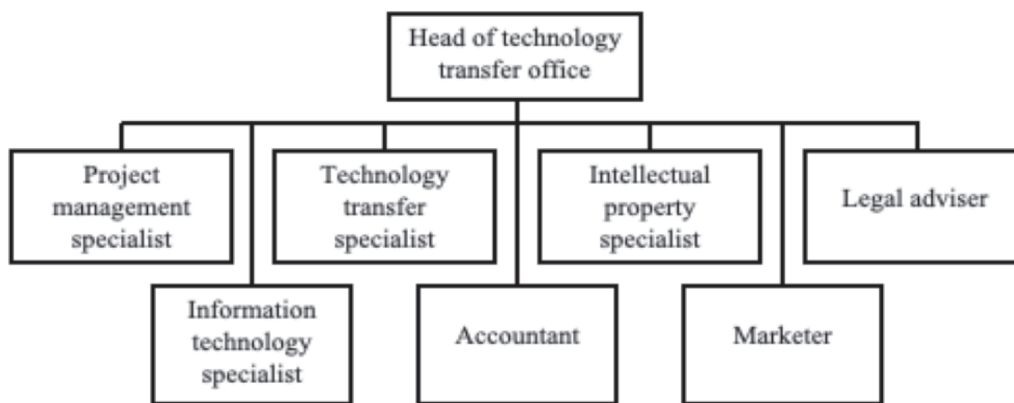
Fig. 2. A template of the organizational structure of TTO in HEI

Functions of above-mentioned TTO's employees are shown in table 2.

Table 2. TTO employees' functions

TTO's employee	Main functions
Head of TTO	General management of TTO, approval of documents, provision of communications between TTO employees, senior management of HEI, potential consumers and other stakeholders, raising questions about the future of the technology (whether it should be registered, promoted etc.) based on the description provided by the TT specialist subject to discussion for decision-making by the Academic Council, after a positive decision by the Academic Council transmits the relevant information to the IP specialist for IPRO registration and to the IT specialist to input the description of the newly created technology in the site section dedicated to technologies and IPRO of HEI
PM specialist	Implements the PM methodology in the work of TTO, provides training in models and methods of PM, studies TTO projects, forms the knowledge base of TT projects, helps with the implementation of TT projects
TT specialist	Advises on all issues related to TT, implements TT projects, searches for potential consumers of HEI's technologies and international partners, assists innovators to file the documents (description of technology, applications for competitions, grants, etc.), approves documents filled in by innovators
IP specialist	Identifies potential IPROs, develops a strategy for acquiring legal protection for IPRO, transmits information to a TT specialist, registers IPRO in accordance with the strategy agreed by the Academic Council, inputs IPRO in the database, orders assessment of IPRO
Legal adviser	Provides legal support for all stages of TT projects, prepares or approves TT agreements, represents HEI's interests in disputes over IPRO and TT
IT specialist	Supervises the work of virtual communication channels, software, databases, website, inputs information about newly created technologies and updates information in the website's section dedicated to technologies and developments of HEI, promotes the website on the Internet
Accountant	Puts IPRO on the balance according to the conducted assessment, controls money transfers under TT agreements and their distribution
Marketer	Conducts research to identify market needs in certain technologies, monitors conferences, exhibitions where HEI's technologies could be presented to potential consumers

A head of TTO in HEI is responsible for the work of TTO, carries out the general management of TTO, provides communications between TTO employees, and also carries out communications

with heads of functional units of HEI, the top management of HEI, Academic Council, potential consumers of technologies (representatives of real sector of economy) other stakeholders, is responsible for managing TT projects. The head of TTO could be an employee of HEI - vice-rector or head of the department, or professor/associate professor of the department. The head of the TTO should have the methodology of PM and experience in applying models and methods of PM in practice; should have close ties with senior management and heads of functional units of the HEI; be sociable; have knowledge in the fields of IP and TT.

The PM specialist implements the PM methodology in the work of TTO, teaches PM models and methods, studies TTO projects, forms the knowledge base of TT projects, helps with the implementation of TT projects, analyzes the work of TTO, identifies systemic shortcomings, develops methods to eliminate them. A PM specialist could be an employee of the HEI, who professionally carries out scientific, scientific and technical or scientific and pedagogical activities and is aware of PM methodology.

A TT specialist advises on all TT issues, carries out TT projects, searches for potential consumers of HEI's technologies and international partners, assists innovators in creating a description of the technology and approves the information about the technology to be placed in the relevant site section of HEI, submits the agreed description for consideration to the head. A TT specialist could be an employee of HEI who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, has education and experience in the field of IP, has been trained in TT and has skills in this field.

An IP specialist identifies potential IPROs, prepares their descriptions subject to discussion in order to decide on the registration of IPROs or the impossibility of such registration by the Academic Council, prepares and submits a set of documents required for registration of IPROs, inputs information about IPROs in the database, orders assessment of IPRO. An IP specialist could be an employee of HEI who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, has education and experience in the field of IP.

A legal adviser provides legal support for all stages of TT projects, prepares or approves TT agreements, represents the interests of HEI in disputes over IPRO and TT. A legal adviser could be an employee of HEI who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, has legal education and experience in the field of jurisprudence.

An IT specialist supervises the work of virtual communication channels, software, databases, website, updates the information in the website section dedicated to technologies and developments of HEI, selects channels for promotion and website promotion on the Internet. An IT specialist could be an employee of HEI who professionally carries out scientific, scientific and technical or scientific and pedagogical activities, has education and experience in the field of IT and programming.

An accountant puts IPRO to the balance in accordance with the assessment, monitors money transfers under agreements on TT and their distribution, transmits the relevant information to the head of TTO. An accountant could be a staff member of HEI.

A marketer conducts research to identify market needs for certain technologies, transmits the revealed information to the head of TTO, monitors conferences, exhibitions, where HEI's technologies could be presented to potential consumers, selects channels for promoting HEI's technologies, promotes HEI's technologies in social networks and so on.

In order to effectively implement TT projects, TTO employees should cooperate fruitfully with each other and with representatives of other functional units of HEI. TTO should become a reliable friend and assistant for HEI's innovators and senior management, as well as a partner for business and government.

Given the established structure in HEI, at the first stage TTO will occupy the PM level in the organizational structure of HEI – fig. 3. However, if the performance of TTO is high and TTO demonstrates its effectiveness, it is possible to increase TTO to the operational or even strategic level in the organizational structure of HEI.
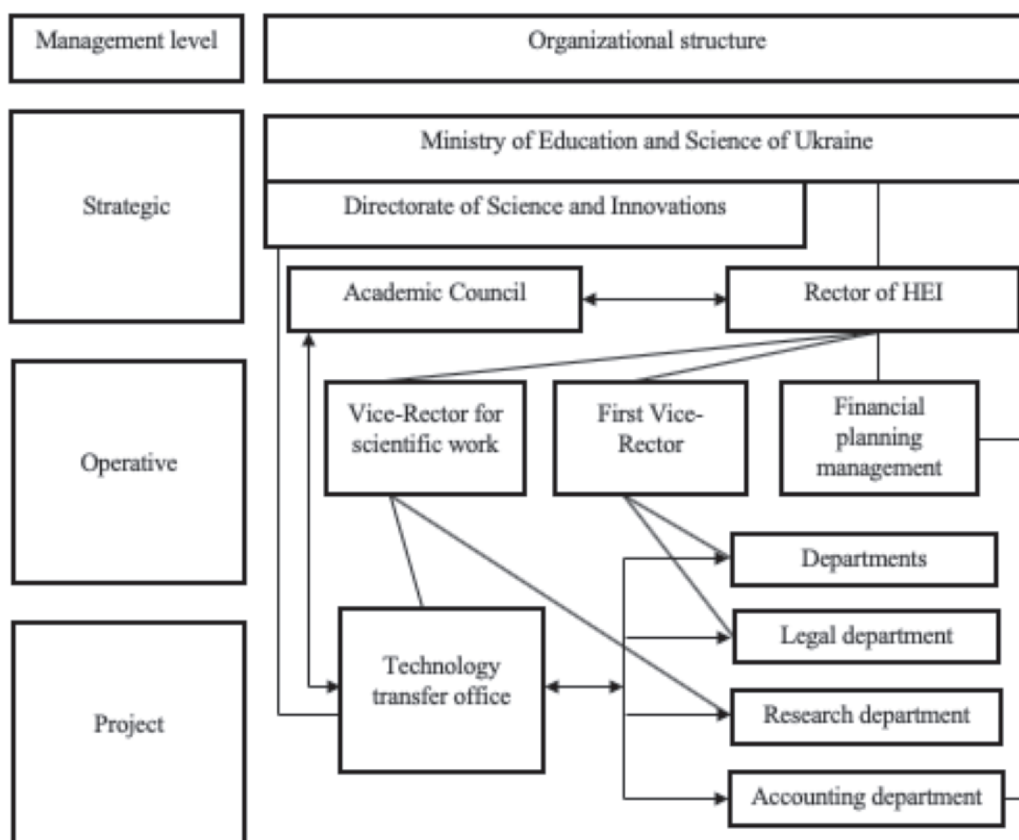

Fig. 3. A place of TTO in the organizational structure of HEI

In figure 3 lines mean subordination, arrows - information exchange and interaction. In its activities, TTO closely cooperates on the one hand with the management of the HEI and the relevant directorate of the Ministry of Education and Science, and on the other hand with innovators and potential developers of new technologies in HEI who are employees of functional units. In fact, TTO is a bond between HEI, the state and business representatives, implementing the triple helix model.

Conclusion

In the course of the study on the creation of TTO in HEI, the authors proposed a template OBS, which will allow to organize a project team in HEI that will implement the project of creating TTO. The functions of each team member and the requirements that he/she should meet are defined. Also, in this article the authors propose a template organizational structure of TTO with the definition of the main functions of employees of this TTO and the requirements that determine the applicant's compliance with TTO in the relevant position. In addition, the place of TTO in the organizational structure of HEI, its subordination and relations with other functional units of HEI were determined. Thus, based on the models proposed in the article, any HEI will be able to create TTO. The initiated research could be a basis for further research in the field of creating TTO in HEI.

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