

JEL Classification:
H53; I23; I25

UDC 376.013.42-
056.2/-056.3(075.8)

DOI: 10.30857/2415-
3206.2021.1.6

DETERMINING WHETHER THE PROTOTYPE HACKATHON ECOSYSTEM FOR TECHNOLOGY TRANSFER IN A HIGHER EDUCATION INSTITUTION MEETS THE NEEDS OF STAKEHOLDERS

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BACKGROUND AND OBJECTIVES. The development of the innovation ecosystem is one of the main vectors of development of the Ukrainian economy. One of the main elements of such policy are higher education institutions. Organizational method is an effective transition to the project approach of technology transfer management. The use of the organizational method implies the creation of a new organizational structure in the higher education institution. Such structure can be the creation of organizational unit – Hackathon-ecosystem of technology transfer, the main task of which will be the management of technology transfer projects.

METHODS. The study used methods of expert evaluation and questionnaire survey of stakeholders using closed and open-ended questions; feedback grids – to diagnose the effectiveness of the created prototype of the Hackathon ecosystem; Pareto diagrams – to analyze the information by determining the total score of the survey results; A / B testing – to choose between the existing version of the site and the created prototype; usability testing – to determine the degree of convenience and intuitive interface prototype.

FINDINGS. The method of creating a hackathon-ecosystem of technology transfer

in higher education institution with elements of design thinking is proposed. The work of new structural unit allows to determine the needs, interest, preferences and priorities of university stakeholders. Such stakeholders are university's employees, business representatives and the state. Tools of design-thought (observation, survey, generation and selection of ideas, prototyping) of stakeholders allow to build an optimal prototype of Hackathon-ecosystem of technology transfer in higher education institution.

CONCLUSION. Determination of compliance of the prototype of Hackathon-ecosystem of technology transfer in higher education institution with the needs of stakeholders allows to get feedback on directions of improvement of innovative work of university in general and new organizational structure, in particular. Questioning of technology transfer stakeholders in Kyiv National University of Technologies and Design allowed to create an optimal user-friendly and intuitive interface of Hackathon ecosystem prototype, corresponding to stakeholder needs.

KEYWORDS: Hackathon ecosystem; technology transfer; institution of higher education.

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
10	2	2

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ВИЗНАЧЕННЯ ВІДПОВІДНОСТІ ПРОТОТИПУ ХАКАТОН-ЕКОСИСТЕМИ ТРАНСФЕРУ ТЕХНОЛОГІЙ У ЗАКЛАДІ ВИЩОЇ ОСВІТИ ПОТРЕБАМ СТЕЙКХОЛДЕРІВ

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ПОСТАНОВКА ПРОБЛЕМИ ТА ЗАВДАННЯ.

Розвиток інноваційної екосистеми є одним з основних векторів розвитку української економіки. Одним з основних елементів такої політики виступають заклади вищої освіти. Ефективним переходом до проектного підходу управління трансфером технологій є організаційний підхід. Використання організаційного підходу передбачає створення нової організаційної структури у закладі вищої освіти. Такою структурою може бути створення організаційного підрозділу – Хакатон-екосистеми трансферу технологій, основним завданням якого буде управління проектами трансферу технологій.

МЕТОДИ. У дослідженні були використані методи експертної оцінки та анкетування стейкхолдерів з використанням закритих і відкритих питань; сітки зворотного зв'язку – для діагностики результативності створеного прототипу Хакатон-екосистеми; діаграми Парето – для аналізу інформації шляхом визначення сумарної оцінки результатів анкетування; А / В тестування – для вибору між існуючою версією сайту і створеним прототипом; юзабіліті тестування – для встановлення ступеня зручності і інтуїтивної зрозумілості інтерфейсу прототипу.

РЕЗУЛЬТАТИ. Запропоновано метод створення Хакатон-екосистеми трансфе-

ру технологій у закладі вищої освіти з елементами дизайн-мислення. Робота нового структурного підрозділу дозволяє визначити потреби, зацікавленість, переваги та пріоритети стейкхолдерів університету. Такими стейкхолдерами є співробітники вузу, представники бізнесу, держави. Інструменти дизайн-мислення (спостереження, опитування, генерація і відбір ідей, створення прототипу) стейкхолдерів дозволяє побудувати оптимальний прототип Хакатон-екосистеми трансферу технологій у закладі вищої освіти.

ВИСНОВКИ. Визначення відповідності прототипу Хакатон-екосистеми трансферу технологій у закладі вищої освіти потребам стейкхолдерів дозволяє отримати зворотній зв'язок щодо напрямків вдосконалення інноваційної роботи вузу в цілому і нової організаційної структури, зокрема. Проведене анкетування стейкхолдерів трансферу технологій в Київському національному університеті технологій та дизайну дозволило створити оптимально зручний і інтуїтивно зрозумілий інтерфейс прототипу Хакатон-екосистеми, який відповідає потребам стейкхолдерів.

КЛЮЧОВІ СЛОВА: Хакатон-екосистема; трансфер технологій; заклад вищої освіти.

INTRODUCTION.

Ukraine has a strong scientific potential, every year in higher education institutions (HEIs) innovative technologies, developments are created, technology transfer offices are registered (Andrushkiv et al., 2015). However, most of them remain unrealized in the real sector of the economy (Afanasiev et al., 2013). The modern vector of state policy is aimed at the development of the innovation ecosystem, the main element of which are universities (Sergeeva et al., 2014). The use of the Hackathon Ecosystem of Technology Transfer (HETT) can serve as a prototype for the use of the results of innovation activities in higher education institutions by the needs of stakeholders.

The application of the project approach will make it possible to create effective organizational units on the basis of HEIs – Hackathon-ecosystems of technology transfer, whose main task will be the management of projects and portfolios of technology transfer projects (Kolomiets et al., 2017). The availability of HETT will allow to establish cooperation with business representatives, which, in turn, will increase the level of implementation of scientific and technological developments and attract extrabudgetary funding to the university (Dmitriev, 2017). The creation of such HETT is essentially a project, so there is an objective need to apply project management methodology (Bay et al., 2012). The problem of interaction between HEI, government and business has been the subject of research of many scientists, among which (Bai et al., 2012; Verkhoglyadova, 2004; Grin et al., 2013; Grinkevich, 2017; Grishchenko et al., 2015), some provisions of which were the basis for this study. Some of the mentioned scientists proposed the creation of organizational units – Hackathon ecosystem of technology transfer in HEIs to manage technology transfer processes. However, these studies were conducted without taking into account the project approaches. At the same time, HETT is essentially a mechanism of operational project management, and therefore the application of the project approach in the creation and functioning of HETT is necessary. The issues of creating and organizing such project offices in HEIs have their own peculiarities. Management of projects and project portfolios in HEIs and scientific institutions through the creation of a separate structural unit in HEIs or scientific institution in order to manage innovation activities is the most effective option to solve the problem. However, the issue of creating a new organizational structure for the purpose of managing technology transfer projects and portfolios is still poorly resolved. Therefore, today there is a need to establish ties between representatives of HEI and business, which will increase the level of implementation of the results of scientific and technological research in the real economy and attract extrabudgetary funding to the HEI. The solution to this problem is proposed by creating on the basis of HEI an organizational structure, which will be responsible for managing projects and portfolios of

technology transfer projects – the Hackathon ecosystem of technology transfer. However, for successful creation and further functioning of such organizational structure there is an objective need to apply project approach. The aim of the article is to determine whether the prototype Hackathon-ecosystem of technology transfer in higher education institutions meets the needs of stakeholders. The study is based on the data of Kyiv National University of Technologies and Design (KNUTD) in 2020.

MATERIALS AND METHODS₁₀

Determining whether the prototype Hackathon ecosystem of technology transfer in higher education institutions meets the needs of stakeholders is carried out by processing the responses by expert method using the following eq. (1):

$$\mu C_1 = \frac{\sum A(R_1) \dots A(R_n)}{n}, \quad (1)$$

where $A(R_{1\dots n})$ – respondents' answers;

$C_1 \dots C_{10}$ – evaluation criteria;

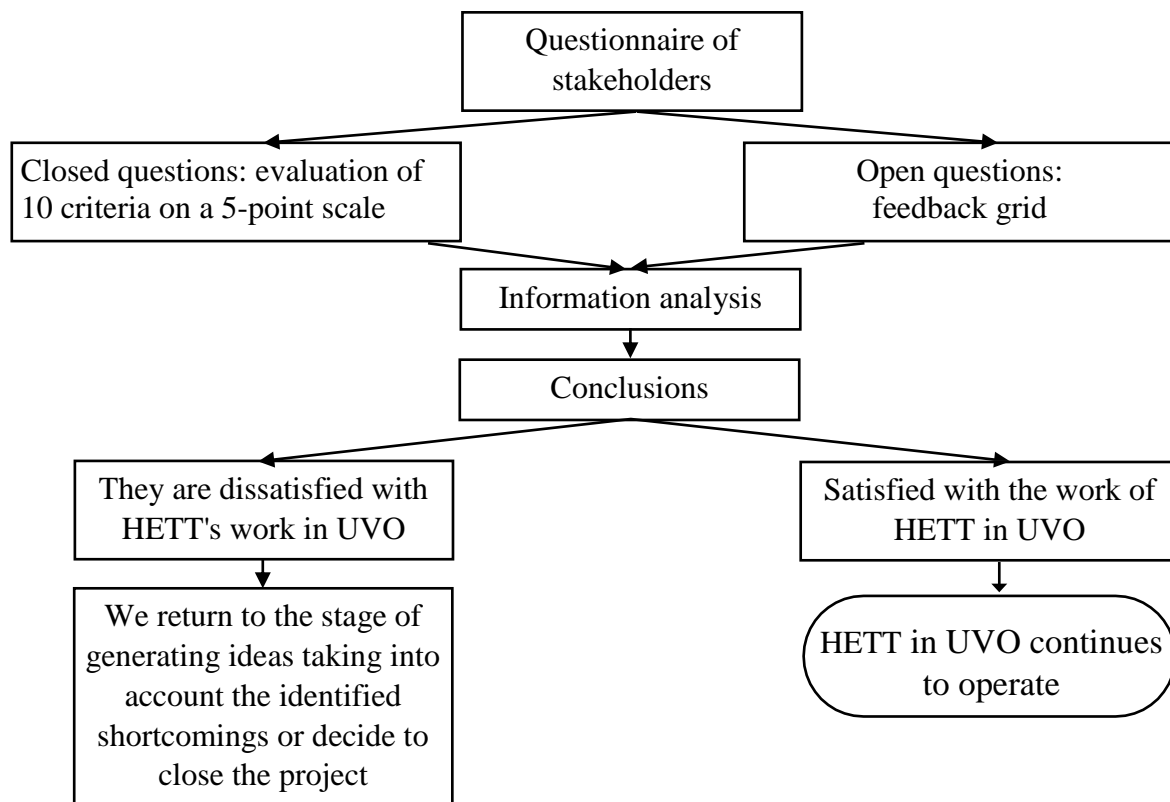
$\mu C_1 \dots C_{10}$ – total numerical evaluation of all respondents.

RESULTS AND DISCUSSION.

The method of determining the compliance of the HETT prototype in the HEI with the needs of the stakeholders will allow to make a decision on the further fate of the new organizational structure – on the beginning of the full functioning of the HETT in the HEI or on the closure of the project. Also, this method will make it possible to determine the directions for improvement of the new organizational structure. However, it should take some time (about 3–12 months) to have an objective opportunity to assess the results of this prototype HETT. The main task is to get feedback on the functioning of HET in the HEI. The method of determining the compliance of the HETT prototype at the HEI with the needs of the stakeholders, presented in Fig. 1, including the questionnaire of the stakeholders using closed questions, the answers to which represent the performance scores on a 5-point scale of 10 criteria, with the total score will assess the level of satisfaction with the HETT work.

In order to determine whether the prototype HETT at KNUTD meets the needs of stakeholders, a questionnaire survey was conducted among respondents who had already participated in surveys at the stage of initializing the project of creating HETT at KNUTD, as well as among other interested parties. The questionnaire was generated with the simultaneous use of closed and open-ended questions. The formulation of closed questions should meet clearly defined criteria for assessing the relevance of the HETT prototype at the HEI to the needs of stakeholders. In order to formulate the closed questions, the criteria

for determining whether the HETT prototype at the HEI meets the needs of stakeholders were established and are shown in Table 1.



Source: proposed by author.

Fig. 1. Approach to determining whether the prototype HETT at the university meets the needs of stakeholders

Table 1
Criteria for determining whether a HETT prototype meets stakeholder needs at the university

Designation of the criterion	The name of the criterion	Description of the criterion
C1	Timeliness	Execution of the project in the established term or with the minimum deviation from the established term
C2	Efficiency	The efficiency of the HETT team; efficiency and efficiency of management decisions; efficiency of technology advancement
C3	Flexibility	Establishing links between different functional units of the UVO for the joint creation of innovative technologies; adjustment to market requirements
C4	Optimality	Creation and maintenance of databases of technologies, developments and OPIV UVO; setting up and maximum simplification of the document management system in UVO regarding technology transfer; creation of the section of the site devoted to UVO technologies for an opportunity of access to the given information of the maximum circle of potential consumers

End Table 1

Designation of the criterion	The name of the criterion	Description of the criterion
C5	Reliability	Providing advice and assistance to technology innovators
C6	Stimulation	Creating a psychological climate in UVO to stimulate innovation; preparation and implementation of an IP Policy, which will determine the distribution of funds received as a result of the transfer of IPR rights or licensing, and will encourage the creation of innovative technologies in the UIA
C7	Economy	Maximum cost reduction: instead of involving third-party specialists (for software development, marketing research, etc.) – the use of own staff and resources
C8	Progressiveness	Participation in national and international projects, continuous development and training
C9	Communication	Establishing relations with representatives of business, the state; setting up communication channels
C10	Effectiveness	Involvement of the Ministry of Education and Science in co-financing the project; attracting additional funding for the purchase of modern equipment for universities; attracting extra-budgetary funding

Source: proposed by author.

The criteria given in the table, taking into account the specific functioning of the HEI and provide an opportunity to carry out an objective assessment of the activities of the new organizational structure. When evaluating the criteria indicated in Table 1, we propose to use a 5-point scale, according to which:

"1" – HETT prototype absolutely does not meet the needs of stakeholders by this criterion;

"2" – the HET prototype does not meet the needs of stakeholders by this criterion;

"3" – the HET prototype meets stakeholder needs in general by this criterion, but it is desirable to improve it;

"4" – the HET prototype meets stakeholder needs by this criterion, but not to the fullest extent;

"5" – the HET prototype fully meets the needs of stakeholders by this criterion.

Thus, on the basis of the criteria defined in Table 1, closed questions are formulated, which the respondent should answer, scoring from 1 to 5 points for each criterion. The total number of points from one respondent can be from 10 (absolute dissatisfaction with HETT at the university) to 50 (full satisfaction).

Taking into account certain criteria for the relevance of the HETT prototype to the needs of stakeholders, as well as the 5-point evaluation scale,

we propose to formulate closed questions with suggested answer options as follows:

Question #1: "Was the HETT project implemented on time?" Answer options: "The project was implemented on time" – 5 points; "The project was implemented with minimal delay" – 4 points; "The project was implemented with a delay" – 3 points; "The project was implemented with a significant delay" – 2 points; "The project was not implemented" – 1 point.

Question #2: "How effective was the work of the HETT?" Answer options: "The work of the HETT team was well-coordinated, managerial decisions in matters of technology transfer were prompt and effective, technologies are effectively marketed and there are already successful examples of their implementation" – 5 points; "The work of the HETT team was well-coordinated, managerial decisions in matters of technology transfer were prompt and effective, but technologies have just begun to be marketed" – 4 points; "The work of the HETT team was coordinated, but managerial decisions in matters of technology transfer were not prompt and ineffective" – 1 point.

Question #3: "To what extent has HETT succeeded in setting up links between functional divisions of HEIs to work together to create innovative technologies and adjust the work to market requirements?" Answer options: "Functional divisions of HEIs work together to create innovative technologies taking into account market requirements" – 5 points; "Functional divisions of HEIs begin to work together to create innovative technologies taking into account market requirements" – 4 points; "Functional divisions of HEIs begin to work together to create technologies" – 3 points; "Functional divisions of HEIs have not begun joint work to create innovative technologies taking into account market requirements, but there is an understanding of the need to create innovative technologies" – 4 points.

Question #4: "How convenient is the workflow and data storage of technologies created at the university?" Answer options: "The system of workflow on the created technologies is simplified and clear (there are all necessary forms of documents, schemes of the documents' passing), the work of databases is adjusted, HETT employees assist in filling of all documents and databases if necessary" – 5 points; "The system of workflow is simplified and clear (there are all necessary forms of documents, schemes of the documents' passing), the adjustment of the work of database is in progress, HETT employees assist in the work of the database if necessary".

Question #5: "How do you evaluate the provision of consultations by the employees of KHETT on the issues related to technology transfer?" Answer options: "HETT employees provide comprehensive consultations on all issues related to technology transfer at convenient time for HEI employees" – 5 points; "HETT employees provide comprehensive consultations on all issues related to

technology transfer, but only at the time set by such employees" – 4 points; "HETT employees consult on all issues related to technology transfer, but it is very difficult to get to such consultation" – 3 points; "HETT employees consult only on some.

Question #6: "How do you assess the incentives for activities in the field of creating innovative technologies?" Answer options: "Intellectual property policy, clearly defines the distribution of funds, provided distribution encourages innovators to create technologies, the psychological climate also contributes to the creation of innovative technologies" – 5 points; "Intellectual property policy, clearly defines the distribution of funds, provided distribution encourages innovators to create technologies, the psychological climate contributes to the creation of innovative technologies" – 4 points; "Intellectual property policy, clearly defines the distribution of funds, provided distribution encourages innovators to create technologies, the psychological climate also contributes to the creation of innovative technologies" – 4 points.

Question #7: "Was the project implemented within the planned budget?" Answer options: "The project was implemented within the planned budget, thanks to co-financing even managed to save some money" – 5 points; "The project was implemented within the planned budget" – 4 points; "The project was implemented slightly higher than planned budget" – 3 points; "The project was implemented significantly higher than planned budget, but it was possible to implement the project" – 2 points; "The project was implemented significantly higher than planned budget, due to which the project could not be implemented" – 1 point.

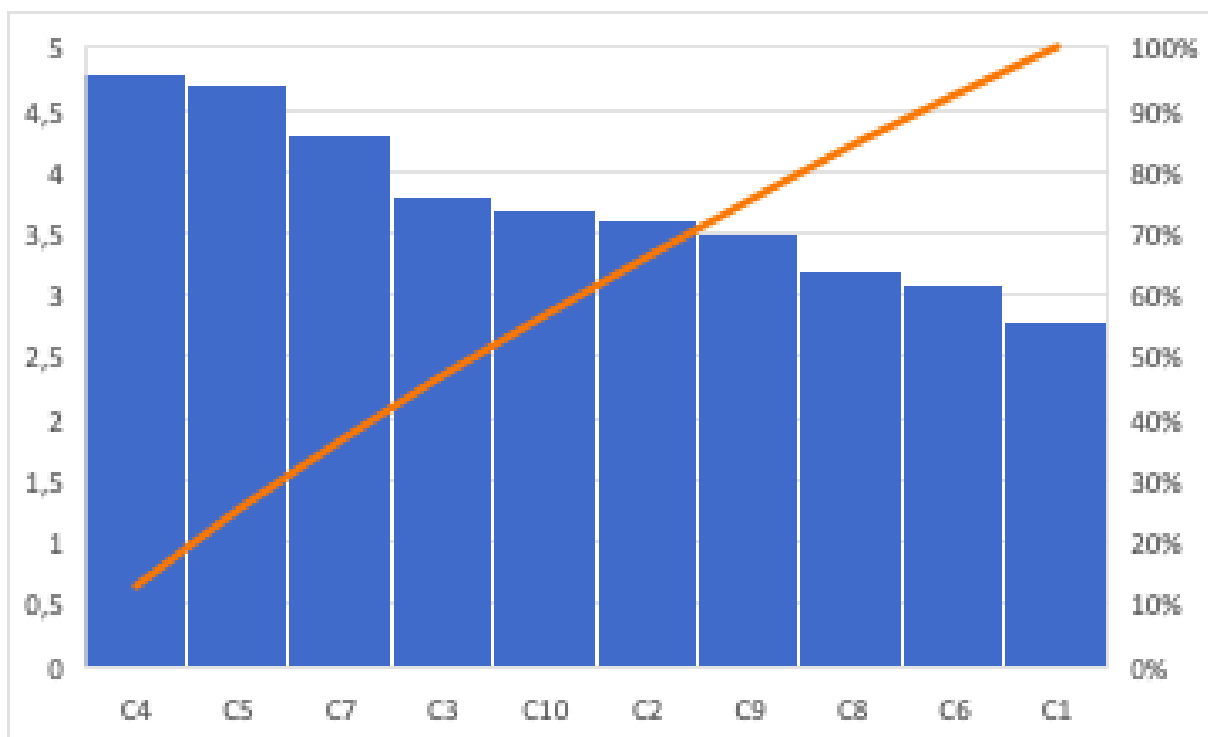
Question #8: "Do representatives of HEIs participate in national and international projects in the field of technology transfer thanks to the work of HETT?" Answer options: "Representatives of HEIs have already actively participated in national and international projects and continue to apply for participation thanks to the information received from the HETT staff" – 5 points; "Representatives of HEIs apply for participation in national and international projects thanks to the information received from HETT staff" – 4 points; "HETT staff distributes information about international or national projects, but HEI representatives perceive this information quite passively" – 3 points; "The staff of the HETT is not involved in national projects" – 2 points.

Question #9: "How tuned are the communication channels between the representatives of HEIs and businesses?" Answer options: "Communication channels, including the Internet, are configured and meet the requirements of the market, namely: the section of the website with a user-friendly interface, dedicated to the technologies of HEI, the active promotion of technology, there is a database of representatives of business, which may be potential consumers of technology, there is communication with them" – 5 points; "The

communication channels, including the Internet, are configured: the section of the website dedicated to the technologies of HEI, only formed a database of representatives of business" – 5 points; "Communication channels are set up, including in the Internet: the section of the website on the technologies of HEI is formed – 2 points; "Communication channels are not configured" – 1 point.

Question #10: "Has extrabudgetary funding been attracted to the university due to the work of the HETT?" Answer options: "Extrabudgetary funding was attracted in a significant amount" – 5 points; "Extrabudgetary funding was attracted not in a significant amount" – 4 points; "Extrabudgetary funding is being attracted" – 3 points; "It is planned to attract extrabudgetary funding" – 2 points; "No plans to attract extrabudgetary funding" – 1 point.

Based on the resulting total scores on equation (1), we propose to build a Pareto diagram, which will determine which of the criteria do not meet, do not quite meet, or do not meet the needs of stakeholders at all. It will allow to define a direction of improvement of HETT work in higher education institution (Fig. 2).



Source: built by the author.

Fig. 2. Pareto diagram for identifying areas of improvement in HETT at the university

Open-ended questions were formulated by supplementing the questionnaire with a feedback grid, shown in Table 2.

Table 2

Feedback grid

What I liked about HETT's work at the university?	What did you dislike about HETT's work at the university?
What questions do you have about the work of HETT?	What are your ideas for improving the work of HETT?

Source: proposed by author.

It is very important that the respondents who provided a low evaluation of HETT activities in the HEI, express their opinions and ideas in the proposed grid. The combination of closed and open questions in the questionnaire process will allow us to make objective conclusions about the need to make changes in the activities of the created HETT. If, as a result of the questionnaire, it is found that the prototype HETT in the university does not meet the needs of stakeholders, it is necessary to return to the stage of generating ideas and, taking into account the information obtained, to select ideas with subsequent iteration. If, as a result of the questionnaire, it is determined that the HETT prototype meets the needs of stakeholders, the HETT will continue to function. However, the ideas identified in the questionnaire to improve its functioning should not be discarded, but can be gradually implemented if appropriate resources are available. To determine the relevance of the prototype section of the site dedicated to technology and development of the HETT, we propose to use A / B testing and usability testing. During A / B testing we propose to show respondents for comparison screenshots of the current version of the HEI section of the site dedicated to technology, development, as well as screenshots of the section of the site that is proposed to be implemented. Based on the respondents' responses, it will be possible to unequivocally determine which version of the site is more acceptable. Usability testing of the prototype section of the site devoted to technologies, developments of the university we propose to conduct by engaging the respondents to search for specific information in this section in order to evaluate how user-friendly and intuitive interface, the possibility of identifying deficiencies with a view to their subsequent elimination. The information obtained as a result of testing on the prototype section of the site will help to decide on the need for its revision or the beginning of full-fledged functioning.

CONCLUSION.

During the observation and survey it was found that there are no modern communication channels between representatives of the University and business, primarily in the Internet. Therefore, during the generation of ideas it was proposed to create an additional product of the project – a section of the website, which will be dedicated to technology, development of the HEI. The method for determining the compliance of the HETT prototype in the HEI with

the needs of the stakeholders was proposed, the main task of which is to get feedback on the functioning of HETT in the HEI. The method includes questioning of stakeholders with the use of closed (evaluation of certain 10 criteria) and open questions (feedback grid), information analysis by determining the total evaluation of each criterion and constructing a Pareto diagram on the basis of obtained data, drawing conclusions, according to which the decision on the further fate of the created prototype is made. Ten criteria for determining the relevance of the HET prototype to the needs of stakeholders, including timeliness, efficiency, flexibility, optimality, reliability, incentives, cost-effectiveness, progressiveness, communicativeness, effectiveness, and a 5-point scale for evaluating these criteria were formulated. On the basis of certain total evaluations of each criterion by constructing a Pareto diagram it was established which areas of HET's work need improvement in the first place. It was proposed to determine the effectiveness of the prototype section of the site devoted to technology, development of HETT by applying the method of A / B testing to choose between the existing version of the site and the created prototype, as well as usability testing method, which will determine how user-friendly and intuitive interface prototype.

ACKNOWLEDGEMENT.

The author is grateful to the heads of higher educational institutions for their assistance in conducting this research

ABBREVIATIONS:

<i>Eq.</i>	Equation
<i>fig.</i>	Figure
<i>HEI</i>	Higher education institution
<i>HETT</i>	Hackathon Ecosystem of Technology Transfer
<i>KNUTD</i>	Kyiv National University of Technologies and Design

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HOW TO CITE THIS ARTICLE

Krakhmalova, N. (2021). Determining whether the prototype hackathon ecosystem for technology transfer in a higher education institution meets the needs of stakeholders. *Management*, 1(33): 61–73. <https://doi.org/10.30857/2415-3206.2021.1.6>.