INNOVATIVE ECOSYSTEM OF ISRAEL'S UNIVERSITIES AS A VECTOR OF SUSTAINABLE DEVELOPMENT

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Abstract. *In this article, the authors consider the elements of the university innovation ecosystem, which is a new educational concept. Based on the analysis of literary sources, it is concluded that the university ecosystem is a flexible mechanism for the interaction of all its participants, which allows them to timely and adequately respond to external and internal changes. The authors proposed a model of the innovation ecosystem of Israeli universities with a description of its main elements.*

Keywords: *ecosystem, innovation, university*.

Currently, there is a rethinking of the learning process, new concepts and paradigms of education are being developed. In the field of education, significant changes are taking place that are necessary for its further sustainable development. The changes are caused by the development of innovative technologies, globalization, humanization, greening, as well as the process of digitalization [3]. In this regard, society for its development needs self-governing, enterprising people capable of continuous self-development.

One of the main factors for the success of a modern university in the global and national markets is its innovation ecosystem. The innovation ecosystem of the university as a concept is becoming more and more popular. But it is necessary first to say about the concept of an ecosystem.

Moore D. [13] coined the term business ecosystem in 1993 and viewed them as dynamic complex structures in which stakeholders jointly develop on the basis of both competition and cooperation [14]. Valkokari [18] distinguishes between three types of ecosystems: the business ecosystem focuses on creating customer value; the knowledge ecosystem focuses on generating new knowledge and technologies; an innovation ecosystem integrates research (knowledge) and exploitation (business) ecosystems. Conceptual innovation ecosystem is distinguished from business ecosystem by co-creation of value [10].

Jackson D.J. [12] considers the innovation ecosystem as a dynamic economic model of complex relationships that are formed between participants or organizations, whose functional

goal is the development of technology and innovation. He emphasizes the high importance of research and the generation of innovation, which is one of the challenges of modern universities.

What is new in the innovation ecosystem is its ecological aspect, characterized by interdependence between different collaborators and co-development / co-creation that binds them together over time, along with the aspect of sustainable development. Sustainable development of the university, according to Cai Y. [4], is associated with the transformation of society (or innovation in society) and the transformation of the university (or innovation in the university).

According to the authors, the innovation ecosystem of the university represents the unification of various participants in a common network of cooperation to create new services / products / technologies and contributes to the generation of ideas, their development and interchange.

The university ecosystem is capable of developing at different levels: at the micro level in order to create conditions for the organic and fruitful interaction of the elements of the innovation ecosystem; at the macro level - to promote and market (international / national / regional) own / joint developments. At the macro level, the university not only serves as the main engine of economic development through the transfer of knowledge [7], but should be more socially responsible [16].

According to the authors, there is no “benchmark innovation ecosystem” that any university ecosystem should match. But it is possible to identify common elements of the ecosystem model, on the basis of which they could be compared and their progress evaluated. If we talk about solving the problem of managing the development of an innovation ecosystem, then the description of the ecosystem should be aimed at understanding the structure of the ecosystem and improving feedback. In addition, the question of the purpose of ecosystem development is relevant, so that in general it is possible to talk about development / degradation and their degree.

Education is the major source for knowledge sharing and creating high quality human resources. Israel’s ability to harness education for creating innovative knowledge and motivation to develop high-tech in the future is a core capability, which provides growth potential and a long-term competitive advantage. There is strong collaboration between universities and industry, resulting in highly developed knowledge transfer between companies and universities.

The authors tried to compose an innovation ecosystem using the example of Israeli universities. Israel is one of the most innovative countries in the world with a developed ecosystem, as evidenced by various world rankings.

In Israel, nine Universities carry out research work. Universities have a high scientific human potential and modern material and technical base for conducting relevant and demanded scientific work. The general direction of the university's research work is based on scientific achievements and advanced technologies in various fields.

The model of the university's innovation system was developed based on the study of reports and scientific articles and is presented in Figure 1. Continuous arrows indicate the relationship between the elements of the ecosystem.

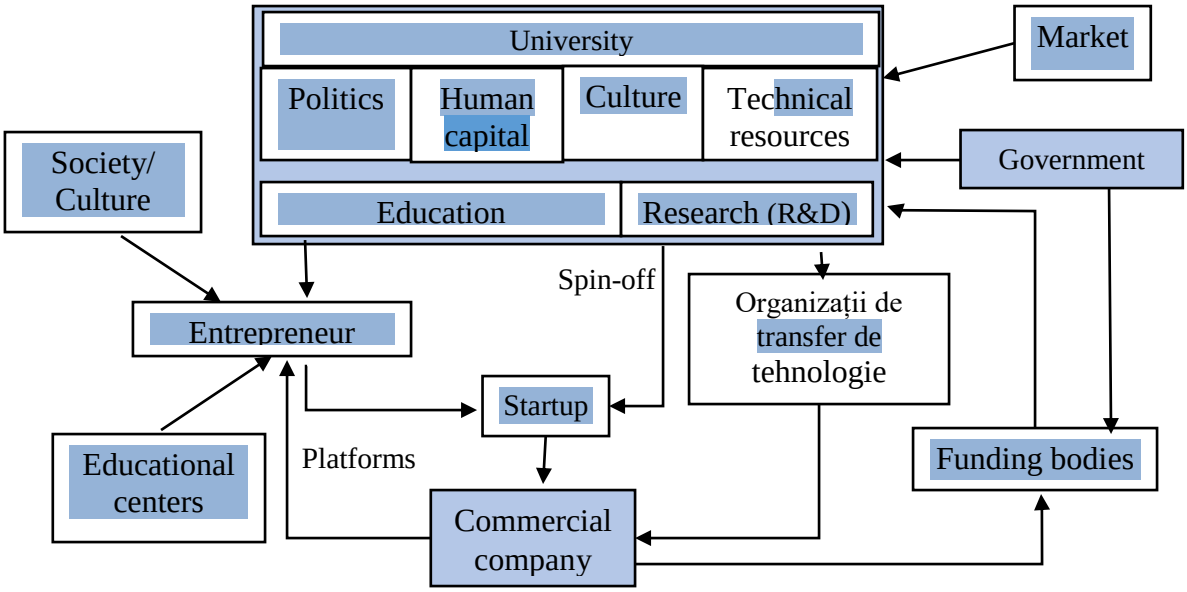


Figure 1. University innovation ecosystem

Source: developed by the author

The authors have identified four elements of the University Innovation Ecosystems (UIE) within the university (innovative politic, human capital, organizational / corporate culture, technical resources), which allow combining scientific research with educational and entrepreneurial components into a common network of cooperation. Other elements of the ecosystem interact with the university, as shown in Figure 1. Consider each element of the UIE.

The innovation policy of the university is a coordinated set of measures aimed at ensuring a stable competitive position of the university in the development and implementation of science-intensive products (technologies, services) in existing and new markets and increasing its investment attractiveness.

The policy of teaching at universities is supported by a number of government agencies (Ministry of Education, Department of Innovation and others), social partners and other non-government organizations interested in the development of entrepreneurship.

In modern society, the learning process takes a vector towards continuous education and personal self-development, based on the universal values of traditional education. The priority functions of the system are to acquire new knowledge, to acquire professional skills, to seek solutions to various problems, as well as to study, review and discover new ones [17]. It is this approach that ensures the formation of a personality capable of adapting to the rapidly changing conditions of civilization.

Human capital is people involved in the innovation process. Academic staff and students can be innovators. University leaders help support any creative endeavors of their staff / students. The ecosystem of the university promotes the generation of ideas, their development and interchange, thus forming a worldview of passion for the development of new ideas.

Israel ranks first in the concentration of employees in the field of R&D (140 per 10,000 (second place is the United States - 85 per 10,000)) and in the production of scientific papers [1].

University innovation ecosystems provides entrepreneurship education through the creation of new educational programs. The development of entrepreneurship training programs in

Israel contributes to the organization of educational information startups that are promising in terms of venture capital investment.

Tel Aviv University, Technion-Israel Institute of Technology, Hebrew University of Jerusalem are among the top 50 in the world for undergraduate and MBA programs. Tel Aviv University was the only non-American university in the top 10 for undergraduate programs and the only Israeli university in the top 25 MBA programs ranked 13th. The Technion ranked 14th with 468 alumni who founded 395 startups that raised $ 7.2 billion. Hebrew University ranked 35th with 304 alumni who founded 268 startups that raised $ 4.31 billion. [1] The mission of Israeli university professors is to accompany student startups and to participate with students in a startup society.

As part of the national multi-year plan, The Council for Higher Education - the Planning and Budgeting Committee takes action to educate students and promote innovation and entrepreneurship in the Israeli higher education sector.

Massive Open Online Courses (MOOCs) are a progressive and rapidly evolving innovative form in the online education market. MOOCs are characterized by gratuitousness, mass character, the use of lecture material specially developed and prepared by the best teachers, containing elements of traditional education, and the presence of feedback. Universities have started to use online education more intensively during the Covid-19 pandemic. Blended learning involves the integration of traditional learning and online.

Technical resources can be in the form information systems, hardware, software, databases, laboratories, an organizational/national infrastructure, and a management focus. Such structural intellectual assets sustain and increase the output of human capital.

An innovative culture at the university includes innovative values; attitude to innovation; innovative knowledge; skills and abilities of innovation and others.

Platforms is a necessary element for the fruitful interaction of ecosystem elements. The concept of (digital) educational platforms is changing the delivery of higher education services within an open education ecosystem [2]. The educational platform allows you to regulate multiple horizontal communications, in the form of research centers, innovation laboratories. It is the platforms that have been the result of some of the most successful startups in recent years.

MindCET Education and Technology Research Center is an organization that brings together educators and entrepreneurs to develop innovative technologies in education. MindCET annually selects the best EdTech startups that leverage technological resources to improve learning styles for all types of learners. There are about 30,000 EdTech companies in the world and from 300 to 500 such companies in Israel [19]. EdTech Israel has been operating since 2014 leading the Israeli educational innovation ecosystem. EdTech's stakeholders are investors, startups, educators, politicians, education companies from all over the world. They host conferences, meetings, round tables and innovation festivals. The growing education ecosystem includes over 100 EdTech businesses and entrepreneurs.

Educational centers are one of the elements of the university ecosystem. In 2019, Israel's Council for Higher Education launched the New Campus program, which encourages the creation and modernization of centers for entrepreneurship and innovation in higher education institutions [5]. Students work together with lecturers, researchers and professional mentors to advance social projects. In the centers, business representatives can share their experience with students, hold lectures on the possibilities of raising funds for business projects. As a result of conversations, trainings and other events, new ideas are born, which can then be implemented in the form of startups. On the basis of entrepreneurship centers, it is possible to create various communities of like-minded people who create ideas, who have the opportunity to discuss them and innovative

trends in various industries. The Enterprise Hubs will transform campuses into a university innovation ecosystem.

Government plays an important role in the ecosystem of universities. The state finances the development of the ecosystem of universities, provides various grants and offers programs for innovation. Funding for basic research in Israel is mainly provided by the state. About 40% of these public funds are used for the development of science through national, bi-national and government research funds [11]. Universities receive these funds through the Planning and Budgeting Committee of the Council for Higher Education. The Office for Innovation through the Research and Development Fund provides a wide range of domestic and international programs, agreements and projects [9].

The Technology Transfer Company (TTC) is dedicated to the transfer of knowledge and technology developed at universities. Technology transfer takes a variety of forms: patenting, licensing, subsidiaries, research collaboration, and joint ventures. Most of the technology transfer companies are united under the umbrella structure Israel Technology Transfer Network (ITTN), which is the umbrella organization for Israeli technology transfer companies. These companies are associated with universities and research institutes in the country. It currently has 15 partner organizations.

Universities provide knowledge about technologies that enable academic staff, students to create startups. Universities also collaborate (or compete) with entrepreneurs in technology transfer and create a conducive environment for deep and lasting connections [8]. The combination of long-term commitment of entrepreneurs with a variety of inclusive start-up activities leads to the creation of an ecosystem with strong connections [6].

Since the process of introducing innovations is impossible without the participation of developed production with its latest technologies, high-tech methods, processes and means of production, the functioning of the university innovation ecosystem is possible only with the interaction of all its structural elements.

Conclusions. Universities are the core of Israel's innovation ecosystem and contribute to the commercialization of scientific research. Universities also train qualified specialists, generate and disseminate knowledge, work closely with various enterprises, and attract investments in new projects and programs. An innovative university ecosystem fosters the engagement of all stakeholders through partnerships, creating an entrepreneurial culture in universities through entrepreneurship education and the creation of entrepreneurship hubs will drive the diffusion of innovation.

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