

The role of universities in the development of technological entrepreneurship and innovation

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Abstract. The present paper endeavours to explore the leading role of universities in fostering the development of technological entrepreneurship and innovation with particular emphasis on the factors that are likely to have a marked effect on their advancement. The paper addresses more specifically the model for promotion of technological entrepreneurship and innovation in Sakarya region, R. Turkey. Subsequent to the conducted research study, a set of recommendations is proposed for enhancing the vital role of universities in the development of technological entrepreneurship and innovation.

1 Technological entrepreneurship and innovation

A serious research interest has been expressed, over the past few years, into the role that universities play in the development of technological entrepreneurship and innovation [1,2]. The topic is undeniably relevant given that higher education, not only in Bulgaria but also on a global scale, is in the process of transformation. The priorities established in the new EU program for the period 2021- 2027 are centered around promoting scientific research and development (R&D) and enhancing university-business collaboration [3]. Additionally, the global economy, shifts in user behaviour and the emergence of new learning technologies in response to COVID-19 have prompted universities to reconsider their approach to serving stakeholders and contributing to economic growth [4]. To fully understand the role of universities in such a context, however, it is crucial to define the concepts of technological entrepreneurship and innovation.

Technological entrepreneurship is often associated with [1,2,4,5]:

- businesses with a sustainable competitive advantage based on an innovative high-tech idea;
- the ability of businesses to respond to a set of technological opportunities related to faster access to information, data analysis, increased productivity and efficiency, lower costs, new products, reduced product development time, job creation, implementation of new working practices, and bridging distances.

According to the Organization for Economic Cooperation and Development (OECD) and the EC, innovation refers to:

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- the introduction of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organisation, or external relations.

Technological entrepreneurship is related to the enterprise's increased innovativeness and competitiveness in a dynamic economic environment. This is the process of converting a single idea into a successful innovation and covers the transformation of scientific knowledge into goods and services aimed directly at the consumer market. What specifically sets technological entrepreneurship apart is its ability to ensure greater practical and commercial utility of scientific research, achieved through effective collaboration between research centers, capital market institutions, business support institutions, and enterprises. A major challenge facing these entities is, therefore, the development of appropriate forms of cooperation with the business environment, which allows for the efforts of commercial and scientific resources to be directed towards the creation of innovations [1-3].

2 Why are universities so important for the development of technological entrepreneurship and innovation?

Higher education institutions are generally considered to be the crucial driving force behind the development of technological entrepreneurship and innovation, as they have the necessary scientific potential, infrastructure, and ability to train future and current business representatives. The very creation of new technologies, products and cultivation of entrepreneurship are processes that are inextricably linked to the academic university activities. Unlocking the potential of today's youth cannot be achieved nowadays without the proper implementation of cutting-edge technologies. Conversely, there can never be breakthrough technologies and developments without the appropriate scientific potential. Universities are those that can provide a creative environment for finding comprehensive solutions to the problems of modern society, posed by technological trends (for example in the field of artificial intelligence, new manufacturing technologies, robotic technologies, etc.) [2,4].

The development of technological entrepreneurship and innovation is enabled by the following key factors: Universities, businesses, organisational support from local, regional and national institutions (the Chamber of Commerce, Regional Development Agencies, Executive Agency for the Promotion of Small and Medium Enterprises, Industry organisations, etc.) and research institutions. Institutional support implies the support of state institutions, industry organisations [4,5], SME promotion agencies, regional development agencies, as well as the relationship of the surveyed enterprises with science and education. The representatives of business or enterprises are all companies that are relevant to the development of technological entrepreneurship and innovation. Sectors such as information and communication technology (ICT), chemical industry, pharmaceutical industry, knowledge-intensive high-tech services, etc. should naturally be taken into full account. Research institutions can be constructed within the structure of both universities and enterprises. In the absence of such, the use of external research institutes is sometimes imperative.

3 The best example for the promotion of technological entrepreneurship and innovation

The example under consideration is derived from a model, initiated in 2007, to enhance the regional competitiveness of Sakarya region, R. Turkey [6]. The model involves the active participation of local governing bodies, higher education institutions, the Chamber of

Commerce and Industry, the industry organisations, organized industrial zones with the respective enterprises and clusters. Notably, among the local governing bodies, it is the SME Promotion Agency that plays the most critical role. Its primary objective is to foster the creation and development of SMEs. **The SME Promotion Agency** offers enterprises constructive advice on several areas [7,8]:

- business start-up opportunities;
- funding the activity through national and European programs;
- developing an effective business plan;
- obtaining low-interest loans;
- inclusion of enterprises in clusters and/or organized industrial zones;
- introduction of internationally recognized standards;
- acquisition of other types of intellectual property (patents, licenses, certificates, etc.)
- provision of entrepreneurship training opportunities, especially for young entrepreneurs;
- all forms of legal and organizational assistance.

The SME Promotion Agency business activities are supported by the Sakarya Chamber of Commerce and Industry (SATSO) and Sakarya University. The Chamber of Commerce and Industry (SATSO) is the one that acts as intermediary between the university, businesses and the SME Promotion Agency, facilitating their relationship through a variety of events such as seminars, round tables, conferences, and training courses for each of the parties involved [9].

Sakarya University is also a valuable partner in this endeavour, providing a platform for existing business organisations and institutions to hold a range of events, namely:

- entrepreneurship skills and qualification upgrade training courses;
- seminars;
- conferences;
- entrepreneurship training.

The technology park at the Sakarya University was established in 2010 with the following main objectives:

- promoting technology-based research and development in regional industry ;
- supporting research and development activities, and fostering entrepreneurship;
- informing society about R&D and innovation;
- creating corporate collaborations between the university and industry.

Currently, the technology park has 90 active enterprises and employs 60 academic full-time staff members. From 2011 to the end of 2021, the park had successfully implemented 152 projects in joint collaboration with these enterprises. Most of the projects were firmly focused on the development of technologies based on artificial intelligence and the acquisition of their exclusive intellectual property rights [10].

The Technology Transfer Office is an integral part of the Sakarya University Technology Park. The process of technology transfer navigates carefully through several stages:

- identification/diagnosis and evaluation of the invention/innovation product;
- protection of the intellectual property of the invention/product;
- devising a strategy for commercialization of the invention/innovative product;
- commercialization on the invention / the innovative product: spin-off company, licensing, transfer of technology;
- distribution of the revenues generated from the technology transfer among all the parties involved – the university, the inventor (innovator) and the intermediary institutions (enterprises).

The representatives of the university academic community play a crucial role in every aspect of the technology transfer. They provide valuable assistance in safeguarding

intellectual property, contribute to the development of the commercialization strategy and actively participate in its implementation [6,9].

The Center for Entrepreneurship and Innovation is also part of the Sakarya University Technology Park. Its primary objective is that of providing students with a platform to enhance their knowledge and skills through the guidance of business and academic mentors. The center offers a wide range of programs, including one that is specifically designed for students who have completed their EQD “Bachelor”, EQD “Master” and are currently pursuing their educational and scientific degree “Doctor”. The duration of the program is from six to twelve months, during which students receive comprehensive training and support to develop their entrepreneurial skills. Upon completion of the program, students are expected to take an exam, and the top twelve young entrepreneurs are selected to receive a grant of USD 25,000 to bring their ideas to full fruition.

The Center for Socio-Economic Research is dedicated to conducting extensive research, studies and analyses across various fields such as: economics; social sciences; history; administration; culture; agriculture; industry, etc.

The team of experts working at the Center for Socio-Economic Research is often commissioned by the local government/businesses to perform diverse studies (regional, social and economic analyses, marketing and statistical studies, etc.)

The primary focus of the Center for Scientific Research Projects is on the development of research projects that are funded by regional, national, and European programs. The development of the research projects is accomplished through the collaborative effort of the representatives of the academic community, the SME promotion agency, the Sakarya Chamber of Commerce and Industry, business organisations, undergraduates, and doctoral students [8-9].

The presence of incentive programs serves as a driving force for the participation of enterprises, Sakarya University, research centers and industry chambers in the regional competitiveness model. These programs are designed to provide the so-called “employment incentive package”. The incentive package includes the arrangement of health and social insurances for employers who hire young people in the 18-29 age group for a period of 5 years. During the first year of employment, the local budget covers the full amount of health and social insurance. Each subsequent year, however, the relief is reduced by 20% until the end of the five-year period.

In 2012, a collaboration agreement was signed between the Chamber of Commerce and Industry and Sakarya University. The agreement covers two training programs:

- model (3+1) – refers to college students. What is specific about this model is that three semesters of the training are completed at the university, while the fourth semester is dedicated to practical training at a given enterprise (institution) that has concluded a contract with the educational institution.
- model (7+1) – involves seven semesters of theoretical training at the university, followed by one semester of practical training at an enterprise (institution).

Of great interest is the mechanism of the funded projects aimed at encouraging youth entrepreneurship in the 18 - 29 -year-old age group. The model is based on financial resources allocated from the state budget, which are distributed with the help of the SME Promotion Agency and the Regional Development Agency of Sakarya. Following a nationwide survey of the main goods that are imported from third countries, established is the total number of the most imported goods for which the country has the necessary resources and production capacity at the local level. A total of 70 types of goods has been identified on the territory of Sakarya with the potential for production in the district. Business plans, to that effect, are being developed by the SME Promotion Agency and the Chamber of Commerce and Industry, for start-ups covering these particular goods. Young entrepreneurs are the object of assistance, and they are granted free funding in the amount of USD 50 000, in

addition to the provided consulting services for the development of a business start-up plan. Moreover, as start-ups, young entrepreneurs are further provided with the respective production bases, machines, and facilities for carrying out the production process. Applied, as an incentive measure, is the exemption from taxes and fees for a period of five years and bestowed is the possibility to purchase the machines and equipment after the expiration of a predetermined period at a value 50% lower than the actual value.

Results achieved for the period 2016-2021 are:

- 37% growth in product innovation
- 27% increase in technological innovation
- 19% upsurge in organizational innovation
- A total of 37 patents and 15 utility models were acquired
- 43 trademarks
- Technology start-ups – 137
- Implemented research projects - 152

4 Conclusion

The model hereto discussed has the potential to be applied in Bulgaria, and it should be a priority for both the government and universities to work jointly towards such a long-term goal. By doing so, universities can generate additional income for extensive scientific research and development activities, etc. To achieve this, several actions need to be taken aimed at:

- Strengthening the funding of R&D.
- Supporting small and medium-sized enterprise (SME) research and testing of new business models through the Operational Program “Innovation and Competitiveness”.
- Providing special assistance to SMEs in high and medium-tech manufacturing and knowledge-intensive services and proper stand to export-oriented high- and medium-tech SMEs in manufacturing and knowledge-intensive services.
- Facilitating the institutionalization of hidden forms of science-business interactions related to the entrepreneurial activity of scientists and researchers.
- Upholding the new role of universities and linking their research activities with business needs: reviewing the status of the researcher; introducing intellectual property rules; creating annual awards; focusing on university entrepreneurs; improving access to student entrepreneur funding; sustaining business incubators; promoting result-oriented technology transfer centres
- Initiation of “innovation vouchers” that allow SMEs to purchase innovation consulting services and know-how.

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