



## A Qualitative Research on Determining the Dimensions of Academic Entrepreneurship Ecosystem in Turkey\*

*Akademik Girişimcilik Ekosistemindeki Boyutların Belirlenmesine Yönelik Nitel Bir Araştırma: Türkiye Örneği*

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**Abstract:** This study is built on the subject of academic entrepreneurship which activates the university-industry cooperation and commercializing the university researches. Main problem is the reality of developing academic entrepreneurship to the targets has not yet achieved in Turkey. Therefore, the main objective of this study is determining the factors that affect academic entrepreneurship in its ecosystem. In this research, in-depth interviews with the semi-structured questions were conducted with 19 active academic entrepreneurs from 7 different geographical regions of Turkey. Data gathered were tested by making necessary coding with the NVivo 11. As a result, the conceptual model consists of 8 themes which are individuals, universities, human capital, environment, technopark, industry, access to finance and the government respectively. The results of the research show that individual characteristics have a great influence on the academicians' entrepreneurial activities. While various proposals have been made in order to create awareness in the perspective of the industry in Turkey, the entrepreneurial culture that should be spread in the academic arena is also underlined. While the deficiencies of existing technoparks in terms of physiological facilities and expert personnel are listed, their benefits in terms of consultancy and support are also emphasized. Results show that the supporting capacity of multidisciplinary studies at universities should increase and there is inadequacy of innovative human resources in technoparks. In addition to the favourable views of almost all academic entrepreneurs in accessing finance, the state is expected to make some improvements in supervision and bureaucratic functioning. The results of the study, along with providing comprehensive data, also provide suggestions for improvements that can be made in this area.

\* This study is formed from a PhD Thesis titled "A Qualitative Research on Technoparks and Academic Dimension of Entrepreneurship" and presented in 2018.

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**Structured Abstract:** This study is built on the subject of academic entrepreneurship which was legally settled in 2001 in Turkey in order to activate the university-industry cooperation and to commercialize the university researches. In this regard, the main objective of this study is determining the factors that influence academic entrepreneurship in its ecosystem.

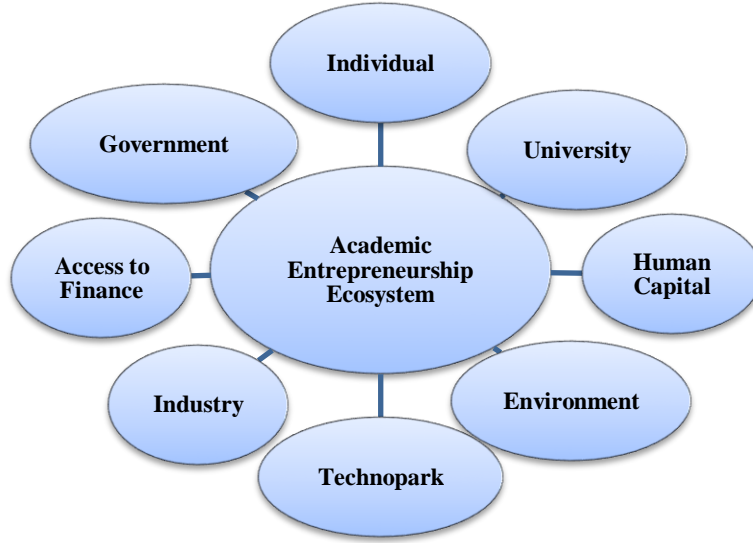
University and industry cooperation can be managed through technoparks and spin off firms. These together form the subject of academic entrepreneurship. Academic entrepreneurship became very important all over the world as the outcomes can create great value for each economy. Accordingly Turkish government has set up targets to boost commercializing of ideas produced in universities via Technology Development Zones (TDZs). Therefore they give many supports and incentives for academicians who have innovative ideas. At this point, this study becomes important because it will show pros and cons of the academic entrepreneurship process and it will provide a comprehensive research on academic entrepreneurship in Turkey as there are very limited studies in relative national literature. Accordingly the results can suggest improvement while revealing areas that go well.

The importance given to R&D needs to be increased in order to catch the global development trend in the field of technology. In line with the 2023 framework of policies, Turkey has set competitive targets especially for R&D (TÜBİTAK, 2015). Accordingly, main R&D indicators are to be mentioned to draw the current situation in Turkey. For example, one of the most important indicators is R&D expenditure of GDP and the score is % 0.96 by 2017. This has doubled the score for the last 15 years however still behind the targets (%3 of GDP) and worlds' developed countries. Secondly, the number R&D personnel are almost 137 thousand by 2017 (TÜİK, 2017). PCT Patent application is 1065 by 2016 and this is far too low compared to China, Japan or Germany (WIPO, 2015: 88-91). Number of scientific researches is also accepted to be improved and from the exporting high technology aspect, Turkey is still on the importing side of the high technology (TÜBİTAK, 2016b, Eurostat, 2016).

Most of the academic researchers have tried to understand the organizational and social effects of this new phenomenon as well as working on conditional factors affecting the level and characteristics of academic entrepreneurship (Siegel et al., 2007). A wide literature on technology transfer has emphasized institutional arrangements to understand the way technology is transferred from university to industry (Shane, 2004; Gagliardi, 2012; Muscio et al, 2016). In the context of new institutionalism, the importance and relevance of institutions and history has been emphasized in explaining the diversity of forms and characteristics of academic entrepreneurship in various countries (Owen-Smith and Powell, 2001). Sociological-based academic entrepreneurship studies focus on the social consequences of commercialization of scientific knowledge (Siegel and Wright, 2015).

In this study, interpretivist method was followed. The main reason primarily is the suitability of the method to the research purpose, facilitating the questions of how and why and providing a better understanding of the social process (Altunışık et al., 2012: 64-66). Phenomenological design was used in the study. Because this method focuses on concepts or phenomena that relevant people are aware however do not have in-depth and detailed idea. Such phenomena, concepts, orientations and changes may occur in many different ways which may give us an idea about this concept or phenomenon that we are familiar with, but this does not mean that we are fully comprehend it (Yıldırım and Şimşek, 2013: 78-83).

The "interview" method was used as the main data collection tool in this research. The questionnaire was finalized after 2 pilot interviews and expert control. The research universe is composed of academicians companies active in Technoparks and this number is 956 according to the 2016 data. In order to address the whole of Turkey, minimum 2 interviews from 7 geographical regions total of 19 interviews were conducted. When referencing the participants in the findings "AE" referring academic entrepreneur will be used with the number (for example AE5). In this study, data were analysed using descriptive method. The themes and sub-categories were coded by determination of frequencies. Data gathered were tested by making necessary coding with the NVivo 11. As a result, the conceptual model consists of 8 themes which are individuals, universities, human capital, environment, technopark industry, access to finance and the government respectively

**Figure 1: Conceptual Model**

The results of the research show that individual characteristics have a great influence on the academicians' entrepreneurial activities. While various proposals have been made in order to create awareness in the perspective of the industry in Turkey, the entrepreneurial culture that should be spread in the academic arena is also underlined. While the deficiencies of existing technoparks in terms of physiological facilities and expert personnel are listed, their benefits in terms of consultancy and support are also emphasized. Results show that the supporting capacity of multidisciplinary studies at universities should increase and there is inadequacy of innovative human resources in technoparks. In addition to the favourable views of almost all academic entrepreneurs in accessing finance, the state is expected to make some improvements in supervision and bureaucratic functioning. The results of the study, along with providing comprehensive data, also provide suggestions for improvements that can be made in this area.

Additionally, auditing of the projects must be done by the experts who are in knowledge of the area in which the spinoff company is working. Additionally angel investment needs to be improved in Turkey. One of the most important results of the study is the need to market unique products and services developed throughout the country and transform them into social benefits and returns. In this respect, it is recommended to reduce the bureaucratic procedures in the project works and to manage the information requested from various and different institutions from a single portal

**Keywords:** Academic Entrepreneurship, Technoparks, Ecosystem of Academic Entrepreneurship

**Öz:** Bu çalışma, üniversite-sanayi işbirliğini etkinleştirerek üniversite araştırmalarının ticarileştirilmesini sağlayan akademik girişimcilik olgusu üzerine inşa edilmiştir. Sorunsalın altyapısında akademik girişimciliğin Türkiye’de henüz istenilen boyuta ulaşmamış olması yatmaktadır. Buna bağlı olarak çalışmanın temel amacı, akademik girişimciliğin içinde bulunduğu ekosistemde hangi unsurlardan etkilendiğini belirlemektir. Çalışmada Türkiye’nin 7 farklı coğrafi bölgesinden 19 aktif akademik girişimci ile yarı yapılandırılmış sorular eşliğinde derinlemesine görüşmeler yapılmıştır. Görüşmelerden elde edilen veriler NVivo 11 nitel analiz programıyla gerekli kodlamalar yapılarak test edilmiştir. Böylece, araştırma çerçevesinde oluşturulan kavramsal modelde sekiz tema belirlenmiştir. Bunlar sırasıyla, birey, üniversite, beşeri sermaye, çevre, teknopark, sanayi, finansa erişim ve devlettir. Araştırma sonuçları genel olarak göstermektedir ki, bireysel özellikler akademisyenlerin girişimcilik faaliyetlerinde bulunmalarında büyük bir öneme sahiptir. Türkiye kapsamında sanayi ve sanayicinin bakış açısında farkındalıklar yaratılması için çeşitli öneriler yapılırken, aynı zamanda çevre boyutuyla akademik arenada yayılması gereken girişimcilik kültürünün de altı çizilmiştir. Mevcut teknoparkların fizyolojik imkânlar ve uzman personel açısından yetersizlikleri sıralanırken, danışmanlık ve destek bakımından faydaları da vurgulanmıştır. Üniversitelerin multidisipliner çalışmaları destekleme kapasitelerinin artırılmasına duyulan ihtiyacın yanı sıra, Türkiye’deki inovatif insan kaynağı alanındaki yetersizlik üzerinde de durulmuştur. Finansmana erişim konusunda

neredeyse tüm akademik girişimciler olumlu görüş belirtse de, denetim ve bürokratik işleyiş açısından bazı iyileştirmeler yapılması beklenmektedir. Çalışmanın sonuçları kapsamlı veriler sunmakla birlikte, bu alanda yapılabilecek iyileştirmelere de öneriler getirmektedir.

**Anahtar Kelimeler:** Akademik Girişimcilik, Teknoparklar, Akademik Girişimcilik Ekosistemi

## Introduction

Many researchers agree that entrepreneurship contributes great deal in terms of its effect on economy and social life; therefore it is extremely important for all countries. Entrepreneurship as a field of study points to a multi-directional and multi-layered subject that affects individuals, their behaviour and interpersonal relationships, shapes existing business structures, contributes to the economic growth of the country in which it is located, and has positive effects on employment and productivity (Tabellini, 2005; Carree and Thurik, 2003; Van Praag and Versloot, 2007; Brockhaus and Horwitz, 1986; Naude, 2013; Portela et al., 2012; Cantillon, 1755; Smith, 1776; Marshall, 1969; Schumpeter, 1934).

Academic knowledge generated in universities finding its value in the industry through technology transfer is considered highly dependent on the level of importance given to research and development and innovation. The concepts of innovation and technology transfer, which are intertwined with each other, play an important role in the delivery of the product or service produced through the universities to the final target market. In order to achieve this goal effectively, it must be accepted that the existing legal regulations, public or private financing and many other factors have an effect (Dubickis and Gaile-Sarkane, 2015; Ungureanu, 2016; Işık and Kılınç, 2011; Preez and Louw, 2008; Ünlü, 2014).

Technoparks are very important places for the system that enables transfer of technology from university to industry. These institutions such as technology or science parks, innovation or incubation centres enable faculty members to carry out their own projects, open their own businesses and offer their products to the market. These activities, defined as academic entrepreneurship in the literature, are affected by many factors in practice. The main ones can be individual characteristics, incentive mechanisms and current legislation, cultural dynamics and environment (Etzkowitz, 2003; Wright et al., 2004; Siegel and Wright, 2015; Shane, 2004; O'Shea et al., 2004; Kenney and Patton, 2011; D'este et al., 2009; Clarysse et al., 2011; Erdös and Varga, 2010; Zhang, 2007; Chell, 2008; Brennan, 2006).

In addition to the economic contributions of academic entrepreneurship, in terms of technological and social benefits, encouraging and developing the level of academic entrepreneurship is very common in the international literature. Consequently, this study aimed to determine the factors that affect academic entrepreneurship in Turkey and the results can recommend some improvements based on the interviews made throughout the study.

### 1. Entrepreneurship and entrepreneurial university

Among the benefits of entrepreneurship, economic growth, employment and productivity are the best known contributions (Carree and Thurik, 2003; Van Praag and Versloot, 2007; Shane, 2008; Brockhaus and Horwitz, 1986; Naude, 2013; Portela et al., 2012). In order to provide all these benefits, entrepreneurs who see and evaluate ideas need to discover new opportunities and take initiatives to implement them. This is why Schumpeter emphasizes the innovative aspect of entrepreneurship and underlines that entrepreneurship promotes innovation and supports the new constantly (Schumpeter, 1943: 81).

The concept of entrepreneurship focuses on the creation of new businesses and the growth of existing businesses. Researches created in university campuses have become a growing source that drives entrepreneurial efforts and basic technologies. The idea of the commercialization of the

information produced through research programs in universities and the use of it for the purpose of generating income has brought up the concept of entrepreneurial university (Etzkowitz, 1983: 228), which enabled universities to take part in modern economic development activities. Although the concept of entrepreneurial university has survived in time, a more focused concept called “academic entrepreneurship” has taken its place in today's literature.

In line with Turkey's 2023 targets, within the framework of the Tenth Development Plan prepared by the Ministry of Development, the development of entrepreneurship is possible with the effective functioning of its ecosystems. According to the report, "The development of entrepreneurship in Turkey depends on the development of many factors that exist in these ecosystems. These factors are; the efficiency of the regulatory environment, the availability of market conditions, the amount and availability of funding sources, the formation and dissemination of knowledge, the level of entrepreneurial capabilities and the presence of a supportive entrepreneurial culture (Mason and Brown, 2014: 6; Isenberg 2010; Isenberg, 2011; Ahmad and Hoffman, 2007: 17).

Developing trends and research results around the world show that companies and universities that are the favourite of the industry are increasingly gaining a positive perspective on cooperation. On the one hand, private firms are gradually adopting open innovation strategies to better access and integrate external information sources and are more interested in cooperation with universities. On the other hand, from the 1990s onwards, the strategic mission of universities has been going beyond the tradition of teaching and research and moving towards a third mission to better address the needs of industry and contribute directly to economic growth and development (Guimon, 2013: 2).

## **2. R&D and technoparks in Turkey**

Science and technology is regarded as one of the building blocks required for development in the areas of R&D and it is among the topics of high importance given in Turkey today. OECD defines R&D as “comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge (including knowledge of man, culture and society) and the use of this knowledge to devise new applications” (OECD, 2013: 100).

The importance given to R&D needs to be increased in order to catch the global development trend in the field of technology. In line with the 2023 framework of policies, Turkey has set competitive targets especially for R&D (TÜBİTAK, 2015). Accordingly, main R&D indicators are to be mentioned to draw the current situation in Turkey. For example, one of the most important indicators is R&D expenditure of GDP and the score is % 0.96 by 2017. This has doubled the score for the last 15 years however still behind the targets (%3 of GDP) and worlds’ developed countries. Secondly, the number R&D personnel are almost 137 thousand by 2017 (TÜİK, 2017). PCT Patent application is 1065 by 2016 and this is far too low compared to China, Japan or Germany (WIPO, 2015: 88-91). Number of scientific researches is also accepted to be improved and from the exporting high technology aspect, Turkey is still on the importing side of the high technology (TÜBİTAK, 2016b, Eurostat, 2016.).

Advanced economies of the world put great attention to R&D; therefore universities and Technology Development Zones (TDZ) are essential places for many type of development. TDZs are academic, social and cultural organizations that support technological innovations, aim to transfer theoretical knowledge in universities towards practice in industry as well as improving the quality and processes of products and services produced, and enable the commercial and industrial activities to be utilized by universities and R&D centres. The first regulation on technoparks called “TGBK” in Turkey was issued in 2001. In the law, the concept of Technology Development Zones and Technoparks are used in a similar sense, as in the law they are “within or near the same

university, high-tech institute or R & D centre or institute; the area where the academic, economic and social structure is integrated or technopark with these features” (TGBK, 2001).

**Table 1:** Technology Development Zones by Years

Years	Number of TDZs in operation	Number of Businesses Operating in TDZs
2002	2	-
2003	6	169
2004	10	305
2005	10	463
2006	14	546
2007	16	787
2008	19	1154
2009	22	1254
2010	28	1515
2011	32	1800
2012	34	2174
2013	39	2569
2014	44	3016
2015	50	3890
2016	51	4335
2017	56	4988
2018*	64	5400

**Source:** GİSEP, 2015; BTGM, 2016; \* BSTB, 2018.

The legal framework was drawn up in 2001 and there are 51 actively operating out of a total of 64 TDZs and 4335 operating companies, within a 15-year period. TDZs include R&D centres, incubation centres, technoparks and universities, but they also include organizations that cooperate with industry in terms of operational activities. From this perspective, it is clear that TDZs can also benefit regional development. In addition, the firms established in the TDZs may be companies owned by academicians within the scope of the project or private sector firms for product development purposes. Some other data regarding TDZs recorded as of December 2016 are given in Table 2.

**Table 2:** Technology Development Zones

Firms owned by Academicians	956
Total number of Personnel	41.089
• R&D	33.297
• Support	2.141
• Other	5.651
Number of Projects (Completed and On going )	28.856
Total Sales (TL)	35 Billion
Total Exports (USD Dollar )	2.4 Billion

**Source:** BSTB, 2016.

According to the 2016 data in the table, the number of academician companies has increased from 956 to 1154 as of September 2019. The total number of personnel reached 55.940, and over 14 thousand personnel were recruited within three years. While total sales are 81.8 billion TL, total exports are around 4.3 billion dollars (BSTB, 2019). TDZs with review of operational guidelines, mentoring practices became common and are seen as it spread to the every part of Turkey (Teknopark İstanbul, 2017: 6).

### 3. Academic entrepreneurship

The concept of academic entrepreneurship, which we try to explore by taking into account some of the characteristics of entrepreneurship by nature, is a multi-faceted concept that includes many activities. For example, according to Llano (2010: 4), academic entrepreneurship can be defined as the discovery, evaluation and use of opportunities to transform knowledge into products, processes and services in the university environment. Some of the definitions of academic entrepreneurship commonly encountered in the literature are given in the table below.

**Table 3:** Definitions of Academic Entrepreneurship

Source	Definitions
Louis et al., 1989	"the attempt to increase individual or institutional profit, influence, or prestige through the development and marketing of research ideas or research-based products"
Klofsten and Jones-Evans, 2000	"all commercialisation activities outside of the normal university duties of basic research and teaching"
Colyvas and Powell, 2003	"an integration of novel roles and resources into existing organizational contexts, triggering the creation of new models of what a researcher should be doing"
Stuart and Ding, 2006	"transitioning to for-profit science"
Shane, 2004	"the establishment of a new company "to exploit a piece of intellectual property created in an academic institution"
Wright et al., 2007	"the development of commercialization beyond the traditional focus upon licensing of innovations to the creation of new ventures that involve the spinning-off of technology and knowledge generated by universities"

**Source:** Provasi and Squazzoni, 2006: 10.

In their study, Klofsten and Jones-Evans (2000: 300) identified eight specific areas that are generally accepted as academic entrepreneurship activities after a detailed literature review. These activities are outside the normally accepted tasks of academics which recognized by educational institutions in many countries, such as teaching and personal research. Therefore, any activity outside these two academic fields of study can be called an "entrepreneurial". These are shown in Table 4.

**Table 4:** Academic Entrepreneurship Activities

Activity	Description
<b>Large scale science projects</b>	Obtaining large externally funded research projects, either through public grants or through industrial sources
<b>Contracted research</b>	Undertaking specific research projects with the university system for external organisations
<b>Consulting</b>	The sale of personal scientific or technological expertise to solve a specific problem
<b>Patenting/licensing</b>	The exploitation of patents or licenses by industry from research results
<b>Spin off firms</b>	The formation of new firm or organisation to exploit the results of the university research
<b>External teaching</b>	Provision of short courses to non-university personnel/students and external organisations
<b>Sales</b>	Commercial selling of products developed within the university
<b>Testing</b>	Provision of testing and calibration facilities to non-university individuals and external organisations

**Source:** Klofsten and Jones-Evans, 2000: 300.

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Most of the academic researchers have tried to understand the organizational and social effects of this new phenomenon as well as working on conditional factors affecting the level and characteristics of academic entrepreneurship (Siegel et al., 2007). A wide literature on technology transfer has emphasized institutional arrangements to understand the way technology is transferred from university to industry (Shane, 2004; Gagliardi, 2012; Muscio et al, 2016). In the context of new institutionalism, the importance and relevance of institutions and history has been emphasized in explaining the diversity of forms and characteristics of academic entrepreneurship in various countries (Owen-Smith and Powell, 2001). Sociological-based academic entrepreneurship studies focus on the social consequences of commercialization of scientific knowledge (Siegel and Wright, 2015).

In their study of academic entrepreneurship and scientific innovation, Provasi and Squazzoni (2006) identified a theoretical framework based on Schumpeterian foundations and institutional infrastructure. A comprehensive literature review is presented below, showing the effects of regulatory and constituent institutions on the institutional characteristics dimension (economic, organizational, legal, university incentives) in academic entrepreneurship.

**Table 5:** The Impact of Regulatory and Constitutive Institutions on Academic Entrepreneurship

Institutional Features	Regulative institutions	Constitutive institutions
	Definition: <i>set of incentives upon individual action</i>	Definition: <i>set of possibilities/ constraints on individual cognition and identity at societal and cultural level</i>
	Carriers: <i>formal institutions/ formal rewards and sanctions on behaviour</i>	Carriers: <i>values, social norms, cognitive frames, socially shared models of behaviour/ social control</i>
Economic incentives	Can a scientific discovery be 'capitalised' by the inventors, at level of economic rewards or of career's advancement?	
Organisational incentives	Are there explicitly dedicated financial/human/university assets that can help scientists in commercialising their discovery?	
Legal incentives	Do regulations at national/local level clearly define features, boundaries, responsibilities and consequences of inventors?	
University incentives	Are there regulations at a local level that recognise the possibility to spend time and energy in entrepreneurial efforts and that promote this?	
Societal recognition of the mission of scientists		Is entrepreneurial mission of scientists approved at a societal level? Do scientists believe that AE is part of their mission?
Societal recognition of the competition principle along different dimensions (among scientists and universities)		Are competition and difference of resources focal principles that are embodied in the institutional settings presiding over universities and scientific communities?
Social acceptance of the market incentive within science		Is profit motivation of scientists formally or informally accepted by peers?
Degree of openness/ closure of scientific communities towards entrepreneurial efforts		Do scientists belong to scientific communities that share the entrepreneurial mission of science?
Degree of institutionalisation of AE within the academic culture of universities		Are there cultural and organisational pressures towards AE at the university level?

**Source:** Provasi and Squazzoni 2006: 42.

On the regulatory side, the existence of legal incentives, university-level economic rewards to inventors and access to resources, as well as the availability of regulations and laws that can manage potential conflicts are also important factors. The power of regulatory institutions over academic entrepreneurship activities is an undeniable fact. On the other hand, the approval of entrepreneurial missions of scientists, recognition of the principle of competition at the university-individual level, acceptance of profit motivations, belonging to scientific entrepreneurial

communities, cultural and organizational pressures at university level are also important in terms of constitutive institutions.

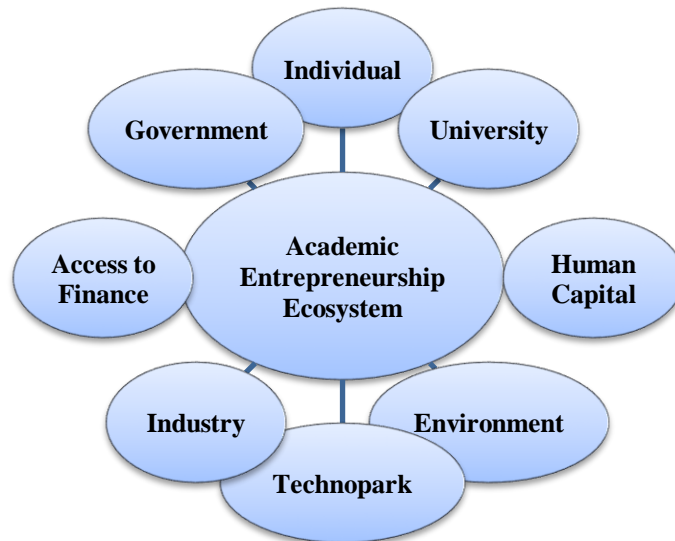
#### 4. Materials and methods

Academic entrepreneurship in Turkey is not advanced relatively and the targets have not yet been achieved. Therefore, this is the main problem of this research. There may be many underlying causes of this; however legal regulations on this issue have a recent history. In addition, Turkey's general status in terms of the share of R&D expenditures in GDP, employment in R&D, production of patents and scientific publications and export of high technology products confirm the better progress in this field needed. The aim of this research is to identify the factors that affect the development of academic entrepreneurship in various dimensions. Interviews were conducted with people who actively engaged in academic entrepreneurship in order to determine the activities taking place in the academic entrepreneurship ecosystem.

This study will provide a comprehensive research on academic entrepreneurship in Turkey as there are very limited studies in relative national literature and the results of this study can show the current status where can be some measures to be taken into account or some areas which can be praised.

In this study, a model has been developed in order to provide dimensions of the academic entrepreneurship ecosystem. The model was compiled from the studies in the current literature and was prepared in draft format and finalized with the interviews. Eight themes (individual, university, human capital, environment, technopark, industry, access to finance and government) were identified within the scope of the model. The findings of the study were categorized and presented in accordance with the research model.

**Figure 2: Research Model**



In this study, it was decided to follow the interpretivist method. The main reason for following an interpretivist approach despite positivist approach is primarily because of the suitability of the method to the research purpose, facilitating the questions of how and why and providing a better understanding of the social process (Altunışık et al., 2012: 64-66).

In the research, phenomenological design which is one of the qualitative research designs was used. This method focuses on concepts or phenomena that relevant people are aware however do not have in-depth and detailed idea. Such phenomena, concepts, orientations and changes may

occur in many different ways which may give us an idea about this concept or phenomenon that we are familiar with, but this does not mean that we are fully comprehend it (Yıldırım and Şimşek, 2013: 78-83). Therefore, in this study, the concept of academic entrepreneurship and the activities within this framework are examined in the phenomenology pattern and it is aimed to increase the intelligibility of the situation.

The “interview” method, which is frequently used in phenomenology design, was used as the main data collection tool in this research. The questionnaire was finalized after 2 pilot interviews and expert control. The research universe is composed of academicians companies active in Technoparks and this number is 956 according to the 2016 data. In order to address the whole of Turkey, minimum 2 interviews from 7 geographical regions total of 19 interviews were conducted. When referencing the participants in the findings AE referring academic entrepreneur will be used with the number (for example AE5). In this study, data were analysed using descriptive method. The themes and sub-categories were coded by determination of frequencies.

## 5. Findings

**Dimension of individual:** Achieving advancement in the career path of the academic profession requires the fulfilment of a number of tasks. In this respect, the opinions of the participants indicate that academic career and project works are challenging together.

*... Now let's say there is an academician, for example, a doctoral student, who works on a certain subject but you say that you come and work in this project with me. He says that I have to do a lot of things to prepare for proficiency exam, or I need to master my second language, so they have no time (AE10)*

On the other hand, it is a necessary and positive idea for academicians to look for spin-off firm establishment in order to provide consultancy services, while it may be seen as negative in terms of creative and innovative product and service production. In addition, the majority of the participants mentioned in particular that there is a false belief that they are making great deal of money from academic entrepreneurship.

*...Academicians are generally looking for a firm of consultancy where they can share their knowledge with the sector rather than creating a product (AE17).*

*...And everyone think that we're going to get millions of dollars and we'll be very rich,... But there's no such thing. I don't think you can do work on project to just make money (AE19)*

In terms of the effect of individual characteristics on academic entrepreneurship, some participants emphasized the researcher spirit, courage, patience, looking at different points of view and taking risks. In this respect, they argued that academicians with a role model may be more likely to be academic entrepreneurs. It is also mentioned that academicians having entrepreneur family member or having previous entrepreneurship experience may be more willing to participate in academic entrepreneurship activities.

*... Nowadays, academic entrepreneurship is very important in the transition from classical academics to dynamic academics. Researcher spirit, courage and patience are important personality traits and I think I have these (AE12).*

*... I started entrepreneurship after the age of 50. I did not know how to set up the company, how to pay the tax, how to calculate the insurance, how to interview, how to select employees when hiring. But if there had been a previous experience before, or if there had been an attempt, I would have gone very quickly. I wouldn't make the same mistakes I've made right now ... Someone's guidance may be a friend, a counsellor, a student. Sometimes even a student leads (AE16).*

In the study, the main source of motivation in the commercialization of academic research is stated as the desire to produce something new. According to the participants, the profession of academics has a mission of serving the society and this mission should be the main motivation of the academician and trigger the transformation of thoughts into products.

*... I had great success at a young age, but there was a place that did not satisfy me. This was the fact that the academician could not only publish articles in international arena but to do something to serve his/her country better. Entrepreneurship was an important opportunity for me to overcome this deficiency in my own way (AE5.)*

**Dimension of university:** University is the starting point for academic entrepreneurship activities. In this respect, the current university climate, academic achievements of faculties, interdisciplinary interaction/sharing, the presence of multidisciplinary work awareness, existing regulations and management structure appear to be factors affecting the formation of academic entrepreneurship.

In the study, participants mention that publications are evaluated by the quantity rather than quality. In addition, the lack of efficient communication among academics leads to the lack of unity and solidarity in projects as well as the lack of partnerships. Some of the participants stated that entrepreneurship activities were highly supported by both management and other academics in some universities, while some participants stated that they were exposed to jealousy and professional egos especially by their academic colleagues. Some of the opinions about these are below.

*... What bothers us is that there is no partnership to produce projects. In fact, everyone is hiding information from each other. In general academic structure there are very few collaborative works (AE3).*

*... The catalyser that I developed serves many academics in the department, but I don't know why they don't want to buy it from me (AE5).*

Another issue that academic entrepreneurs especially focused on was the multidisciplinary study. It is emphasized that especially in the projects put forward, experts from many different fields are needed and it is impossible to do quality projects without partnership, without having a multidisciplinary perspective.

*... These include those in the field of medicine, electronics, physics, chemistry and mathematics. Because, we have produced a sensor for the diagnosis and treatment of Alzheimer and cancer-based tumours in the brain. In other words, we need academicians from all discipline (AE7).*

Having a technopark within the university also helps university administrations to develop a flexible and supportive perspective on this issue. In addition, being clear on the university regulations on consultancy contracts and clear supportive attitude of management may contribute to the cooperation with the industrialists. The necessity of granting equal rights to all faculty members who are academic entrepreneurs of the university is also mentioned by the participants.

*... In other words, the legislation on working hours of academic staff may need to be flexible. I think that every faculty member in the Technopark should have the same conditions (AE12).*

*... For example, last year I wanted to participate in an international conference with a paper and I asked for support. They did not give any. I went with my own budget and I got an award there. I received the best paper and the best presentation award. Then the Vice-Rector wanted to meet me. That's when the support began (AE13).*

**Dimension of human capital:** Another subject in the academic entrepreneurship ecosystem is the human resources that can be channelled into this field. The majority of the human resources hired in spin-off firms are undergraduate, graduate or doctoral students of the academician who owns the project. Participants of the study stated that they have difficulty in finding workers with similar motivation, energy and desire to learn with them. This may be the result of current curriculums of Turkey which are not enough to train students for practice rather than only theory. It is a fact that starting from the undergraduate level, the participation of trainee students in such projects will count as great gains to the student rather than the project. However, the majority of undergraduate students are seen as too diploma-oriented.

*... We meet our own human resources even though they are rarely from undergraduate students, sometimes from graduate students, but mostly from doctoral students. For example, in a project that we are working on now, there is 1 master and 3 doctoral student. No undergraduate. But I believe it should start from the 3rd and 4th year of undergraduate (AE13).*

Participants mention that in Turkey, students especially from the basic sciences such as mathematics, biology, physics and chemistry is experiencing a decline in both number and quality. The importance of basic sciences is seen as very important in terms of raising new generations to work in this field. However, one participant stated that the newly graduated students were generally interested in the money and social security they would receive, and R&D and the project did not appeal to them. The majority of the academic entrepreneurs who participated in the study said that the innovative structure in their projects is under their responsibility. This suggests a general consensus that Turkey is deficient on innovative human resources.

*... Yes, there are many people who have studied, but when we look at the qualified ones, we are weak in terms of human capital that can really produce something and contribute. (AE14).*

**Dimension of environment:** Although the concept of environment seems to point to a very wide subject, the most important point is the association between academic and entrepreneurial culture and the cultural practices of the society. In this context, from the general point of view such as cultural dynamics, creating a special point of view by the social dynamics of the academician can help understanding the environmental elements.

Some of the academic entrepreneurs who participated in the study argued that whether or not the existing cultural structure in the environment supports entrepreneurship are also effective in academic entrepreneurship activities. In this respect it is observed differences in entrepreneurial culture according to regional and industrial development in Turkey.

*... Cultural differences affect this issue. The structure of our faculty here is more conservative, more closed. They also have different perspectives on the world and technology. Compared to other regions, there is a conflict between entrepreneurship and being academics because it is more difficult for them to adapt mentally and get used to it (AE5).*

It is very important for the academic entrepreneur that the product he/she produces turns into benefit, and some academicians put social benefit rather than financial gain in their priority areas. In this context, importance can be given to innovative products in Turkey. Participant in this study mentioned the lack of interest from domestic investors on a product he created which can recover Turkey being dependant to outside for that product. Eventually this participant has reached the stage of contract with the foreign investor about his product. It is important for Turkey to transform this and similar products to a national value.

*... Academic activities and the entrepreneurial steps of the academician should work together. Looking at America, it's America because these two are walking together. The*

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*academician should not stay away from the market. If you don't know the market, you don't know the practice; you can't do anything at the university (AE19).*

Social environment of the academician is another sub-dimension that can contribute to entrepreneurship activities. Academicians who have a wide social environment and open to interpersonal interaction can reach to the people who are in need of their projects more quickly and be more prone to produce joint projects. At the same time, the social environment is very important for the life of the spin-off company. Participants think that productive academics are more resilient to survive.

*... If you are in a closed world, you cannot go too far with your company if your social environment is not very wide (AE4).*

*... When your environment is wide and your interaction with your environment is intense, you can easily find the people you need for your project (AE9).*

**Dimension of technoparks:** The academic entrepreneurs interviewed during the implementation phase of the study gave many constructive suggestions as well as many ideas about technoparks established within the scope of TDZs. They stated that the article-based research structure in the current system should be replaced by R&D focused project activities.

*... In my opinion, Technoparks are places established only for software developers. It is not possible to carry out R&D for production. Now let's say I'm going to build a plane, build a machine, and do a chemical test. I cannot do this in the technopark, I must have a place in the industry or I have to go to the industry constantly (AE10).*

On the other hand, it is mentioned that the technoparks which established earlier are more effective, the personnel within the organization are more competent and their training and activities can contribute to university-industry cooperation better. However, especially in small cities and recently established technoparks are in the process of institutionalization.

*... Establishing a company, product development is a really hard way. After developing the product, everything has legislation. For example, labels have rules. We don't know that. I think that people who will be entrepreneurs in certain regions should be trained according to their field (AE11).*

Although there are some implementations that may vary from technopark to technopark, the changes in the management team may lead to different operational steps. For example; In order to benefit from some discounts such as tax exemption, the necessity of filling a certain shift in the technopark is contrary to the logic of R & D by the participants. At the same time, product development process requires time and effort, as well as the complexity of the products to be followed from labelling to sales increases the consultancy needs of academicians.

*... For example, I started with one product and I have three products now ... But I have been working for 3 years and I don't know how to sell them. I couldn't find customer. For example, if we produce products we depend on abroad better, there should be some support or encouragement in selling them by the government. But there is no such thing yet (AE11).*

Another issue that the participants emphasize is physiological opportunities of Technoparks. The lack of R&D laboratory facilities of some technoparks in Turkey is regarded as the biggest deficiency. In this context, some participants stated that they use university laboratories, however others say they cannot use. The necessity of developing the product in particular within the boundaries of the TDZs and the lack of laboratories despite this necessity stand out as a great dilemma. In addition, the participants emphasized that the human resources in technoparks should be composed of staff who have better understood the logic of university-industry cooperation by

striving from civil servant mentality. In fact, one participant argued that dedicated people should aspire to this work and that they should be motivated in many different wage systems.

*... In our technopark, for example, there were big problems with the previous management. In other words, what is the project, where to apply, what is the intellectual property right, what is a patent, they didn't know. So here in our university there are 1000 - 1300 academics, there are no patent applications. So when you think in this way, technoparks should pave the way for them, and they must have qualified personnel (AE13).*

**Dimension of industry:** An important point that needs to be emphasized in the academic entrepreneurship activities that come to life by technoparks which serve as an interface in ensuring university-industry cooperation is relations with industry. As mentioned earlier in the dimension of environment, this new collaboration, which requires change in the cultural dynamics of the society, also requires the change of the industrial sector as a mentality.

*... The issue of communication with the project markets and industry is being overcome. Technoparks have the function of bringing together industrialists and R&D but how efficient they are, I don't know (AE6).*

From the academic perspective, the participants think that industry stakeholders are not very knowledgeable about R&D and do not want to spend time and money for R&D. However, some participants who interacted with the industrialists stated that the industrialists could not fully trust the university to find solution to their problems. The views of some of the participants in this dilemma suggest that both sides should take responsibility and have good intentions in order to achieve university-industry cooperation. In this context, organizing training programs that will increase the value given to the R&D activities and university-industry cooperation by the industrialists and enable them to better understand the subject are among the topics suggested by the participants.

*... University – industry cooperation is best provided when both the university and industry step up to the plate. You will have good intentions and the other will have good intentions. Otherwise, you can't do anything if you don't provide this deal environment properly (AE4).*

**Dimension of access to finance:** In terms of Turkey, access to finance is one of the important and available areas when comparing with the other dimensions. Almost all of the academic entrepreneurs who participated in the study agree that anyone who has a creative idea and the ability to make a project can obtain different amounts of funds from many different institutions. It is thought that academician who is a good researcher can easily access the necessary information on this subject. Although it is thought that there is a complex structure on financing projects in the initial phase, however, by the time it becomes clear which kind of projects can be financed from which sources. In this respect, some academicians consider the existence of a consultancy system can help project owners about access to finance. In addition, taking measures to support objectivity in the evaluation of projects will increase the quality of the projects.

*... Look, when you start a company in the technopark today, the number of places you can get support is more than 10-15. So the incentives are really big, if there are enough innovative ideas, there are plenty of grants (AG13).*

In addition, the demand of the statistics requested from the academic entrepreneurs whose projects are accepted and operating in the technopark by many different institutions causes a waste of time and labour in this regard. Besides, the auditing of the projects, the participants stated that the current system is focused on form and paper checking. However they argued that the money should be spent to value adding creative ways. It is underlined that more effective methods can be

developed than just checking invoices and the auditors must be composed of experts who have worked in the project area.

*... For example, I have a company operating in the technopark; everyday government is asking information or report from us every day. What you do, how many workers you employ, how much is your turnover. How much of this was from research and development? How much is from different activities? How much do you spend on research and development? Technopark, University, TUBITAK, The State Institute of Statistics and the Ministry of Science and Industry they all ask for the same information separately. Believe me, sometimes I get depressed. I mean, I don't have time to try to give that information (AE14).*

According to the interviews, subject of angel investor is a new area for Turkey. Academic entrepreneurs think that angel investors in Turkey are keener on short term project with big return rather than the long-term R&D projects and they also desire to have the majority of the investment rather than a partnership. For academic entrepreneurs, perhaps one of the biggest problems in financing is the bureaucratic procedures in the current system. After the project is accepted, it is considered that all correspondence works carried out periodically from the company's establishment to the closure of the company are too much.

**Dimension of government:** The value that the state attaches to technological, innovative and creative products produced in university laboratories is increasing day by day. When looking at the source of R&D expenditure in Turkey, it can be seen that the biggest support to develop academic entrepreneurship comes from the government. In this context, participants state that the government's first mission should be identifying the technological needs of Turkey and form its objectives in accordance with these needs.

*... The most important thing I'll tell you is Turkey should determine its own technology needs and goals in a very realistic way. However, some business policies, technology policies come from Europe with copy-paste (AE10).*

Under this dimension, the most important issue that the participants emphasized was the support of a final product which produced through an R&D project. According to this view, these projects became a financial burden for the state and the academician made an intensive effort to turn this into a product. However, many of the projects whose prototypes are prepared end up at that point. At this stage, the state should support the prototype and provide marketing support for its use. On the other hand the state of Turkey can support the products which are exported therefore this can encourage local producers and create national value.

*... It is better if the institutions of the state benefit from the state-funded projects. A product that has been tested in different institutions, passed through the arbitration process and that has been an obligation to use by the governmental agencies will also provide significant benefits to Turkey's economy (AE9).*

The academicians participating in the study argue that the legislation on this issue can be revised with various improvements and can be arranged in a binding manner. In addition, the existing laws and regulations are generally found to be sufficient, but they need to be removed from too much bureaucracy in the functioning part.

*... I find the state very sincere. I have read the legislation in detail. I understand the philosophy under the law. It was created with the concern of contributing to the development of this country. But unfortunately, as I said the state has a cumbersome. It doesn't work as it's written on paper. You need to develop various functions, functions that make it easier. At least such critical things... They have to shorten the payment period. There are aspects where the state is good, those who prepare these works are very successful in allocating*

*their funds, but there are cumbersome in practice, there are points on which to mature (AE6).*

### **Conclusion and suggestions:**

The results of the research show that academic entrepreneurship activities and career path of academic profession should not be seen and perceived as different from each other. Since today's academic profession covers a wide range of activities besides teaching, it has a dynamic structure and adaptation to this is a must. On the other hand, the existence of a role model in terms of entrepreneurship activities and the personal characteristics of the academician are also undeniable in terms of academic entrepreneurship activities.

In order to improve the perspective of academic entrepreneurship activities within the university, creating an appropriate climate and increasing the sharing of knowledge among academics are also considered to have a positive impact on the development of these activities. Supporting the unity and solidarity in the projects from a multidisciplinary point of view by university management is considered as very essential.

On the other hand, the fact that the existing curriculum is not sufficient to train students for practice creates various disadvantages in terms of the need for additional staff to work in R&D field. The lack of innovative personnel to work in this field was particularly emphasized by the participants. Recommendations for investing in entrepreneurial culture in the environmental context are also mentioned.

By the innovative and entrepreneurial universities index of Turkey, R&D projects gained more value by being prestige for universities as well as return on points in the ranking. However, some participants' experience shows that even if the projects are supported by the government, the same support cannot be provided in the sales and marketing of the products. In particular, the importance of support in the marketing of national products was mentioned.

Another important result of the study is the various deficiencies in the physiological facilities of technoparks. Working conditions and staff competence within the Technopark are among the topics discussed.

On the other hand, the need for various improvements in the industrial sector in terms of R&D and cooperation with the university in terms of supporting industry-industry cooperation was also mentioned.

At present, almost all participants have a positive picture of projects to access finance while time-consuming bureaucratic procedures are the only negative point that mentioned. Auditing of the projects must be done by the experts who are in knowledge of the area in which the spinoff company is working. Additionally angel investment needs to be improved in Turkey. One of the most important results of the study is the need to market unique products and services developed throughout the country and transform them into social benefits and returns. In this respect, it is recommended to reduce the bureaucratic procedures in the project works and to manage the information requested from various and different institutions from a single portal.

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