YEDITEPE UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES

DETERMINANTS OF ACADEMIC ENTREPRENEURSHIP IN SCIENCE AND ENGINEERING

BY
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ABSTRACT

Academic entrepreneurship is defined as entrepreneurial activities engaged by faculty in order to commercialize research results and deliver societal and economic benefits. It is closely related to the "Entrepreneurial University" which extends the mission of universities beyond teaching and research. Higher education institutions and their affiliated faculty members in sciences and engineering disciplines are important actors of innovation ecosystems. Several studies approached the topic of academic entrepreneurship at individual, organizational, and institutional perspectives. Examining the determinants of academic entrepreneurship helps policy makers and university management design better strategies and action plans for leveraging regional innovation economies.

This study investigates the effect of percevied institutional support, academic self-efficacy and several moderating factors including gender, age, seniority, previous education, and experience on academic entrepreneurial intentions distinguished by soft level intentions (industry collaboration) and hard level intentions (spin-off formation). The data was collected between December 2015, and March 2016 from a national online survey of Turkish academics in science and engineering faculties at approximately 90 universities of which 402 full responses were gathered. Major methodology included multivariate analysis technique namely as Structural Equation Modelling.

This dissertation contributed to the body of knowledge about individual and organizatinal level determinants of academic entrepreneurship highligthing the effect of the support at sub-unit/ departmental level and age on the entrepreneurial

intentions. Within the scope of this dissertation, the constructs of academic entrepreneurship intentions, academic self-efficacy, and perceived institutional support were created and applied comprehensively in sciences and engineering disciplines in Turkey for the first time.

Keywords: Academic Entrepreneurship, Entrepreneurial University, Technology Transfer, Innovation, Entrepreneurship

ABSTRACT IN TURKISH

Akademik girişimcilik, araştırma sonuçlarının ticarileştirilmesi ve sosyal/ekonomik fayda yaratılması amacıyla, akademisyenler tarafından gerçekleştirilen girişimcilik aktiviteleri olarak tanımlanmaktadır. Akademik girişimcilik, üniversitelerin misyonunu eğitim ve araştırmanın ötesine taşıyan Girişimci Üniversite kavramıyla yakından ilişkilidir. Yüksek öğrenim kurumları ve onlarla bağlantılı olan, temel bilimler ve mühendislik alanındaki akademisyenler, yenilik ekosisteminin önemli aktörleridir. Bir çok çalışma, akademik girişimcilik konusuna bireysel, organizasyonel ve kurumsal bakış açıları ile yaklaşmıştır. Akademik girişimciliği belirleyen faktörleri anlamak politika yapıcıları ve üniversite yönetimlerinin, bölgesel yenilik ekonomilerini geliştirmek için daha iyi stratejiler ve aksiyon planları tasarlamalarına yardımcı olmaktadır.

Bu çalışma, yumuşak seviye (sanayi işbirliği) ve sert seviye (spin-off kurulması) olarak ayrılan akademik girişimcilik niyetlerinin üzerinde, algılanan organizasyonel/kurumsal desteğin, akademik öz-yeterliliğin, ve cinsiyet, yaş, pozisyon, daha önceki eğitim ve deneyim gibi düzenleyici faktörlerin etkisini araştırmaktadır. Veri, Aralık 2015 ve Mart 2016 tarihleri arasında, 90 üniversitede temel bilimler ve mühendislik alanında çalışan Türk akademisyenlere gerçekleştirilen, 402 tam cevabın elde edildiği, ulusal online anketten toplanmıştır. Ana yöntem, Yapısal Eşitlik Modellemesi adı verilen çok değişkenli analiz tekniğidir.

Bu tez, akademik girişimciliği bireysel ve organizasyonel seviyede belirleyen faktörler hakkındaki bilgi dağarcığına, bölüm/ alt-birim seviyesindeki desteğin ve

yaşın girişimcilik niyeti üzerindeki etkisine ışık tutarak katkıda bulunmuştur. Bu tezin kapsamında, akademik girişimcilik niyeti, akademik öz-yeterlilik ve algılanan kurumsal destek ölçekleri, Türkiye' de temel bilimler ve mühendislik alanında kapsamlı olarak ilk defa tasarlanmış ve uygulanmıştır.

Anahtar Kelimeler:Akademik Girişimcilik, Girişimci Üniversite, Teknoloji Transferi, İnovasyon, Girişimcilik.

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LIST OF ABBREVIATIONS

AVE: Average Variance Extracted

BTYK: Supreme Council for Science and Technology

CR: Critical Ratio

GOF: Goodness of Fit

IP: Intellectual Property

KBV: Knowledge Based View of the Firm

MAM: Marmara Research Center

NGO: Non-governmental Organizations

RBV: Resource Based View of the Firm

R&D: Research and Development

SAB: Scientific Advisory Board

SME: Small and Medium Sized Companies

TCE: Transaction Cost Economics

TGB: Technology Development Regions

TLO: Techology Licensing Office

TTO: Techology Transfer Office

TÜBİTAK: The Scientific and Technological Research Council of Turkey

USO: University Spin-Out Company

UITT: University Industry Technology Transfer

YPK: Higher Planning Council

1 INTRODUCTION

1.1 Background

Academic entrepreneurship is the knowledge phenomenon of the new economy in which scientific excellence is transformed into commercialized assets for societal and economic benefits. Economic value created at universities is the focus of economic development policies; universities are recognized as the regional engines of innovation and growth providing new technologies and business ventures (Laukkanen, 2003). Sciences and engineering disciplines form knowledge intensive industries and among other start-up firms. It requires a closer integration of university and industry with the aim of using specific high technology-capital intensive infrastructures and graduate level credentials of human capital from higher education institutions. Firms have emerged usually through the licensing option however the new paradigm of entrepreneurial universities and entrepreneur academics bring a new dimension to the industry. The emergence of knowledge-intensive entrepreneurship is dependent on the active involvement of scientists in this respect (Jain, George, & Maltarich, 2009). Many corporations in technology business had their origins as TLO start-ups including Genentech in biotechnology, Cirrus Logic in semiconductors, and Lycos in internet search engines representing an important mechanism for technology transfer transformed into economic activity(Di Gregorio & Shane, 2003).

The entrepreneurial university is defined to possess five traits according to Mora and Villarreal (2001): lower level of dependency on government with a diversified funding base, new modes of working, thought and training with new departments,

new managerial values combined with traditional academic ones, new set of goals and structural changes responsive to societal demands, integration of traditional departments into the new entrepreneurial culture.

The entrepreneurial process taking place within universities can be examined at individual, organizational and institutional levels. Entrepreneurial university is a global phenomenon with isomorphic development path yet individual level studies with different types of entrepreneurial engagement types have been limited (Etzkowitz, Webster, Gebhardt, & Terra, 2000; Klofsten & Jones-Evans, 2000a). Phan and Siegel (2006), in their taxonomy study about the successful commercialization of research results and technology, put it forward that, at the individual level, commercialization depends on academic entrepreneurs' expertise, previous experience, social networks, risk-taking propensities, definite skill sets, and the incentives they receive. Organizational and institutional level analyses include organizational design, incentive systems, culture which have implications from resource based view of the firm, knowledge based view of the firm, contingency theory, social network theory and agency theory in order to realize success aligned with stakeholders' expectations. The underlying argument in favor of commercialization strategy of the university is that the regional development goal of entrepreneurial universities with pay-off in the long term can be achieved by entailing higher risk with small business formation other than licensing and sponsored research.

Organizational perspective in university entrepreneurship policies and processes are reflected as either historical case in which academics individually pursue entrepreneurial activites in addition to their research and teaching roles, in the absence

of institutional mechanisms or structured case where institutional level infrastructures such as technology transfer offices manage the entrepreneurial process (Brennan, 2005). In this specific knowledge context namely as entrepreneurial university, Guerrero and Urbano (2014) discussed that entrepreneurial behavior of academics could be influenced by institional level policies. On the other hand, pull and push motivation theory of entrepreneurship elaborates a different perspective on how identifying and exploiting opportunities takes place in entrepreneurial process. In this regard, in the absence of institutional support, norms of necessity may originate from unavailable resources for academic entrepreneurship (L. De Silva, 2012). Academic success is claimed to be an indicator of entrepreneurial engagement as more senior academics with more social capital are more likely to attract industrial support for their projects (Perkmann et al., 2013). It translates into a considerable hypothesis that affiliation with lower ranked institutions may cause its motivated and successful academics to pursue resource mobilization activities such as industry relations.

Within the scope of this study, it has been adopted that technology transfer policies should investigate how to turn scientists into solution-oriented people for market and societal problems with an entrepreneurial mindset, rather than turning them into full-time entrepreneurs. A faculty member in Etzkowitz (1998) study about the new mission of universities-capitalization of knowledge-, pointed out that he is not looking to become a business person but create a meaningful impact for people' s lives clarifying the role of technology transfer office expertise and advice. It was furtherly discussed by Laukkanen (2003) that avoidance from academic entrepreneurship is either caused by academics' notions about the traditional mission of the university or practical issues such as the accessibility of practical tools, key

people and resources for technology transfer process. He suggested that direct Academic Entrepreneur involvement is administratively difficult and may include possible negative effects on the fundamental tasks of teaching and research. Along similar lines, Jain et al. (2009) claimed that scientists' s conflicts about the meaning of their work in terms of their skills and activities may be manifested in their role identity modifications.

As the commercialized research is both dependent on institutional research capacity and faculty motivation, the contextual instruments, policies, procedures and incentives in order to encourage academic entrepreneurship will not be successful unless they capitalize on scientific and professional prospects of entrepreneurial scientist. Adoption of organizational initiative at the individual level will trigger technology transfer process by initiating faculty disclosing behavior (Bercovitz & Feldman, 2008; Davies, 2001; Etzkowitz, 1998). Previous studies have shown that individual aspirations for academic entrepreneurship are best predictors of involvement within commercialized research whereas university incentives had little effect (Louis, Blumenthal, Gluck, & Stoto, 1989). The fundamental aim of this study is to investigate the determinants of academic entrepreneurship in the context of entrepreneurial universities in order to understand the effect of each level. This study will contibute to the literature by providing insights on whether social context can be leveraged to identify and trigger the possible entrepreneurial candidates for different sub-domains of entrepreneurial activity with respect to their level of commitment, self-efficacy, career trajectories and available resources.

1.2 Research Question and Conceptual Framework

The research study aims to contribute to the body of knowledge about the notion of "Academic Entrepreneurship" in the context of entrepreneurial universities. According to the currently available evidence, individual, organizational and institutional factors effect the emergence of technology transfer which has direct implications in societal and economic benefits. The success of Science and Technology progress is confirmed as long as it contributes to the advancement of knowledge based economy harnessing economic and social goals of development. The “entrepreneurial university” concept coined by Etzkowitz in 1998 carries out this mission with technology transfer and firm formation. The entrepreneurial university involves “extension from ideas to practical activity, capitalizing knowledge, organizing new entities, and managing risks” (Etzkowitz, 2013).

This research study aims to prove the hypothetical relationships below:

-The effect of entrepreneurial orientation of the affiliated institution on academic entrepreneurship intentions of science and engineering faculty.

-The effect of science for society orientation of the faculty on their academic entrepreneurship intentions.

-The effect of previous training, experience, self-efficacy, and perceived environmental risk of faculty on their academic entrepreneurship intentions.

-The moderation effect of several variables such as gender, graduate level studies abroad, discipline, previous training, previous experience on the hypothetical relationships.

The Notion of "Academic Entrepreneurship" is examined on individual and contextual levels. Prior to 2005, research studies about technology transfer had focused on wider contextual level factors such as the role of TTOs, whereas recent studies have examined individual and departmental implications (Clarysse, Tartari, & Salter, 2011). This study aims to offer a methodological approach to study those variables together in a structural model with the aim of examining the ultimate effect of each variable.

It is assumed to demonstrate the leverage points for policy makers and management strategists in order to boost academic entrepreneurship activity in national innovation systems where the pursuit of innovativeness is a function of both individual endeavors and organizational capacities. Moreover, new measurement scales to measure those constructs are offered based on indepth literature reviews, expert panels and tests for reliability, content, construct, criterion validity. Further research implications may include studies in different national contexts, integration of additional variables, and testing the scales for reliability and validity.

1.3 Dissertation Outline

The dissertation is organized as following. Chapter 2, Literature Review starts with a definition of academic entrepreneurship compared and contrasted by several scholars. Models of engagement in academic entrepreneurship is discussed enlightening the alternative mechanisms of part time and full time academic entrepreneur roles. Academic entrepreneurial intention is explained based on conventional entrepreneurial intention theories. Theoritical foundations of the notions of academic entrepreneurship and entrepreneurial universities are discussed at

individual, organizational, and institutional levels. Entrepreneurial universities are illustrated by the role of higher educations in the new economy, changing landscape of university industry relations, and contextual and historical facts in Turkey. Finally, literature review is completed with determinants of academic entrepreneurship compared and contrasted with the findings of previous studies.

Chapter 3 is organized as research methodology part explaining the survey design, design of instruments, survey methodology, hypotheses and variables in the model. In Chapter 4, the results of measurement and structural models are provided with the reliability, validity analyses, structural analysis, and moderation analyses based on pilot and field study data. In chapter 5 and 6, the results are discussed by theoritical and methodological contributions, limitations and further research implication are identified, implications for university management and policy makers are offered. The dissertation is concluded with brief bullet points.

2 LITERATURE REVIEW

2.1 Academic Entrepreneurship

2.1.1 Definitions of Academic Entrepreneurship

As universities are knowledge producers, conservers and disseminators in traditional sense, commercialization of research results in terms of entrepreneurial mission has been questioned with regards to traditional teaching and research mission of universities. The question is whether conducting basic research for solely pursuit of knowledge and science contradicts with the role of generating applied research and industry oriented activities for commercial exploitation both benefiting individuals, society and economy. Embedded in these arguments of entrepreneurial university coined by Etzkowitz and Leydesdorff (1997), academic entrepreneur can narrowly be defined as the faculty staff at a university who creates a new organization and bring his or her innovation/invention/solution to market as a commercial opportunity (see Table 1). Spin-off activity at universities in the form of business ventures based on academic research (S. A. Shane, 2004) is a concept which came out with the systematic analysis of MIT model by Roberts (1991). Actually "spinoff behavior is a reflection of individial actions and therefore is largely due to personality, ability, and willingness of the individual to engage successfully in entrepreneurial behavior."(O'Shea, Allen, O'Gorman, & Roche, 2004, p. 16). Samson and Gurdon (1993) defines academic entrepreneur as a lecturer or researcher affiliated with a university while pursuing a role in venture start-up.

Table 1

Definitions of Academic Entrepreneur

Roberts 1991	the founding of a new company by a researcher who previously worked at a laboratory or academic department where the technology originated
Radosevich (1995)	inventor–entrepreneurs who are or were laboratory employees and who actively seek to commercialize their own inventions, surrogate–entrepreneurs who are not the inventors but who acquire rights to the federally–sponsored technology.
Dickson et al, 1998	academic entrepreneur with entrepreneurial aspirations in addition to academic work; the entrepreneurial scientist who is full time involved in a business venture dedicating to scientific interests, scientific entrepreneurs who are involved in a firm both dedicated to business and scientific interests.
Shane 2004	a new company founded to exploit a piece of intellectual property created in an

	academic institution
Etzkowitz 1998	the entrepreneurial scientist more broadly as someone with "an entrepreneurial perspective in which results are scanned for their commercial as well as intellectual potential"
Jain et al. 2009	Any form of technology transfer which has some potential commercial benefit can be defined as academic entrepreneurship.
Murray 2004	Entrepreneurial activities by academics are complex and can vary in "the range from limited interaction, through extensive research collaboration at formal and informal levels, to scientists as fully-fledge entrepreneurial founders
Louis et al 1989	where academic entrepreneurship is defined as "the attempt to increase individual or institutional profit, influence, or prestige through the development and marketing of research ideas or research based products
Gurau et al 2012	• academic manager/entrepreneur mainly responsible for founding/leading the venture and

	day to day management, • academic project manager responsible for spesific scientific projects in existing firms and • academic scientific advisor of one or more firms, namely as the most senior one relative to the previous roles, mainly responsible for scientific advice and mapping opportunities.
Abreu and Grinevich, 2013	In addition to previous, Non commercial activities This category includes providing informal advice, giving public lectures, organising exhibitions, and publishing books for a general audience.
Samsom and Gurdon (1993)	an academic whose primary occupation, prior to playing a role in a venture start-up, and possibly concurrent with that process, was that of a lecturer or researcher affiliated with a Higher Education Institute.
Perkmann et al 2013	a sub-output of "academic engagement" which is wider than commercial exploitation of a spesific technology.
Perkmann and Walsh (2007)	Development and commercial exploitation

	of technologies pursued by academic inventors through a company they (partly) own (spin-off companies).

Dickson and others claimed in 1998 (Gurău, Dana, & Lasch, 2012; Lundqvist & Williams Middleton, 2013) that academic entrepreneurs possess three different profiles: academic entrepreneur with entrepreneurial endeavors in addition to academic work; the entrepreneurial scientist who is full time involved in a business venture dedicating to scientific interests, scientific entrepreneurs who is involved in a firm both dedicated to business and scientific interests. Gurău et al. (2012) in their study, identified three main categories of academic entrepreneurship based on the level of involvement in managerial and scientific roles; academic manager/entrepreneur mainly responsible for founding/leading the venture and day to day management, academic project manager responsible for spesific scientific projects in existing firms and academic scientific advisor of one or more firms, namely as the most senior one relative to the previous roles, mainly responsible for scientific advice and mapping opportunities. All roles network with scientific and business community.

Klofsten and Jones-Evans (2000b) defined the academic entrepreneurship activities, in addition to teaching and research roles of faculty, as following: large scale science projects obtained through public grants or industry support; contracted research for external organizations, sales of consulting for scientific or technological expertise; patenting and licensing research results to industry; formation of new firms

exploiting university research; teaching to non-university based individuals and organizations; commercial sales of products developed in the university; provision of testing and calibration facilities to non-university based individuals and organizations. This broad definition extends the role of academic entrepreneurship to a new level not limited to firm formation. Louis et al. (1989) also defined academic entrepreneurship in a similar form: large-scale science obtained through funds, consulting for knowledge, soliciting funds from industry, patenting and firm formation. Philpott, Dooley, O'Reilly, and Lupton (2011) defined the forms of academic entrepreneurship as following adopting from Jones-Evans and Louis et al.: creation of a technology park, spin-off formation, patenting and licensing, contract research, industry training courses, consulting, grantsmanship, publishing academic results, producing highly qualified graduates in contrast to Samsom and Gurdon (1993) limited definition of taking role in a venture start-up.

The process model of academic entrepreneurship by M. S. Wood (2011) argues whether academic entrepreneurship is initiated by the efforts of a technology transfer office (TTO), concluding only if the faculty are actively interested in commercialization or they have to do so by the policies. Academic entrepreneurship can be traced back to formation of research laboratories to obtaining funding for future research in a resource limited environment. Louis et al. (1989) had referred to patenting as an interest in commercial applications of research however academic entrepreneurship is not necessarily quantifiable and it can occur at many levels (Rasmussen, Moen, & Gulbrandsen, 2006). Knockaert, Foo, Erikson, and Cools (2015) referred to academic entrepreneurship in a broader sense including the overall patenting and licensing activity and university industry collaboration. Perkmann et al.

(2013) defined academic entrepreneurship as a sub-output of "academic engagement" which is wider than commercial exploitation of a spesific technology. One can claim that academic engagement is correlated with scientific productivity yet it is a question whether engagement is an antecedent of commercialization behaviour.

We can define the "academic entrepreneur" as a faculty at a university who brings his or her innovation/invention/solution to market or society as a commercial or non-commercial opportunity. Academic entrepreneurship is one of the channels through which scientific knowledge reaches the market. The "Entrepreneurial scientist" discovers the frontiers of knowledge and transfer them into commercial gains, societal benefits as well as intangible benefits such as recognition and prestige. "Entrepreneurial scientist"[1] (Etzkowitz, 2013) can be attached to the notion of academic entrepreneurship as the potential entrepreneur may engage in wealth creation and prestige seeking behavior while transferring the polyvalent[2] knowledge and science into practical and financial business (Etzkowitz, 2013; Etzkowitz & Viale, 2010).

In broader sense, as Abreu and Grinevich (2013) suggested, academic entrepreneurship should be extended to the overall set of activities beyond licensing, patents and spinoffs. However spinouts are more common in life sciences due to the nature of product development with the long time horizon of market entry. In social sciences consultancy and contract research are more common. They have conceptually framed academic entrepreneurial activities as; formal commercial

[1] "Seeking tangible rewards as well as prestige – weaving knowledge, money and power into a single framework – entrepreneurial scientists are creating a new and potent element in the ethos of science." (Etzkowitz, 2013)

[2] Etzkowitz and Viale (2010) explains polyvalent nature of knowledge being both theoritical and practical, both publishable and patentable.

activities including licensing and spinoffs, informal commercial activities beyond patent including consultancy, contract research, joint research projects; non-commercial activities providing informal advice, giving public lectures, organizing exhibitions, and publishing books for general audience.

Academic entrepreneurial styles can be adopted according to different degrees of involvement developed by Etzkowitz (2013):

1. Direct interest in the formation of a spin-off firm and leading role.
2. Interest in commercialization of discoveries and supporting role as a member of scientific advisory board.
3. Indirect interest in economic implications of research and handing over the role to technology transfer offices.
4. No interest in firm formation but supporting firm formation for advancement in research.

2.1.2 Models of Engagement in Academic Entrepreneurship

Academic entrepreneurship process includes different kinds of activities which require different parties with different skills, motivations, capital resources (including human, social and economic capital) and career trajectories. This fact has a direct implication in the models of engagement in entrepreneurship by academics, since entrepreneurial mission can be realized at teaching, research or spin-off levels. According to W. Ding and Choi (2011), the likelihood of pursuing entrepreneurial activities will differ on individual terms based on the level of dedication to the

different entrepreneurial roles with the available time, effort, and skills. Moreover, not all universities have the same weight of entrepreneurial mission in their activities, and they do not have to. Universities and public institutions should not send "ambiguous messages to academics about the relative value of teaching in relation to research." (McInnis, 2001, p. 52). Teaching is important as much as research, current bias towards research for the sake of being entrepreneurial would underestimate the critical junctures of teaching for entrepreneurial mission (Philpott et al., 2011).

Lockett, Wright, and Franklin (2003) discussed that the most common model in academic entrepreneurship is when the human capital of the academic inventor is exploited rather than pushing them to engage in day to day business operations in order not to distract from core roles such as teaching and research. Murray (2004) also studied the role of academic inventors in entrepreneurial firms and mechanisms of inventor relationship to the firm in terms of retaining full-time academic affiliation or not. According to her model (Table 2), scientis-inventor can become a full time member of company by fully moving from academia to the firm, may retain their academic affiliation.

Hereby, it is critical to note that, within the context of wider academic entrepreneurial notion which is not limited to spin-off formation, the academic faculty at universities need to be equipped with entrepreneurial mindset rather than turning into full time entrepreneurs. Vohora, Wright, and Lockett (2004, p. 163) claimed that;

> *"What makes some academics great scientists or engineers clearly does not usually give them the necessary entrepreneurial human capital to start and grow a business."*

Table 2

Scientist-Inventor Affiliation with the firm and academy

Affiliation with the firm	**Affiliation with the academy**
Full time member of the firm	No affiliation
Full time member of the firm	Departmental Affiliation
Involvement with the firm	Full time affiliation
No involvement with the firm	Full time affiliation

Note. Adopted from Murray, F. (2004). The role of academic inventors in entrepreneurial firms: sharing the laboratory life. *Research Policy, 33*(4), 643-659.

Academics in science and engineering are generally characterized by conformance to the situations with little ambiguity, limited knowledge and experience of business and entrepreneurship and avoidance from being told what to do and how to do it. Combined with institutional cultures that do not value commercialization of research results or do not provide the necessary incentives, the engagement of the academic scientist in entrepreneurial activities remains limited. No matter what career trajectory is followed by the academics (either by self-filing the patents/ exploiting licenses or remaining in research role), in order commercialization to be successful, appropriate level of entrepreneurial commitment by the scientist to the venture is required (Vohora et al., 2004). Donald S. Siegel, Waldman, Atwater, and Link (2004, p. 130) argued that;

"I know that our university wants to see more academic startups but I think that is the wrong way to go. I do not encourage my students or colleagues to

go down that road. We need to stop pretending that academics can be entrepreneurs, or at least good ones."

Along with similar lines, Göktepe-Hultén (2010) identified the common characteristics that successful serial inventors share as a means of engagement type. Serial inventors are selective in research, teaching, and patenting because they have already proceeded in their careers, they seek freedom in their employment contracts, they are familiar with delegation in teams since the research projects are being conducted by research teams, and they manage their teaching and research roles simultaneously.

Another consideration is how firm' s performance is affected by the existence of academics in managerial roles. Lack of time and lack of managerial skills/entrepreneurial experience may lead negative financial performance. The study of Armano and Scagnelli (2012) interestingly showed that companies with academic entrepreneurs may have worse financial performance; it depends on the level of involvement of the academics not only as knowledge providers but as active participants in company management with developing competencies.

In response to the managerial gap driven by those faculty who would be unwilling to join the entrepreneurial role, and are incapable of managerial skills at the scientific ventures, the concept of "Surrogate Entrepreneurs" emerged (Franklin, Wright, & Lockett, 2001; Radosevich, 1995). Surrogate entrepreneur is the one to whom the spinning-off role and the right to manage the venture is granted by the scientist-inventor. As a means of success at university based ventures, the growth is

substantial as long as the academic is fully committed to the entrepreneurial role which results in cutting ties with core responsibilities. Thus, the models of engagement with entrepreneurship require different routes to success at three pillars of academy; teaching, research, and entrepreneurship.

Academic spin-offs can be formed according to the degree of seperation of technology and academics from the parent organization: (Nicolaou & Birley, 2003). The performance of spinoff may be based on the form of the involvement and related degree of innovation capacity. Orthodox models can lead spinoff grow faster as the inventor is fully involved however hybrid and technology models can boost innovation as the mutual bonds for future research is kept.

- In Orthodox Model, both technology and academic inventor spin-off
- In Hybrid Model, the technology spins off and academic inventor' s place in the institution is retained on part time basis.
- In Technology Model, the technology spins off again and academic inventor may only have equity maintaining no connection with the spin-off company.

University spinoff framework developed by O'Shea et al. (2004; O'Shea, Chugh, & Allen, 2007) summarizes four factors which influence spinoff activity (Figure 1):

> "1. The academic's reasons for engaging in entrepreneurial activity (individual characteristics studies);
>
> 2. The attributes of universities such as human capital, commercial resources and institutional activities (organisational-focused studies);

3. The broader social context of the university, including the "barriers" or "deterrents" to spin-offs (institutional and cultural studies);

4. The external characteristics such as regional infrastructure that impact on spin-off activity (external environment studies).” (O'Shea et al., 2004, p. 24)

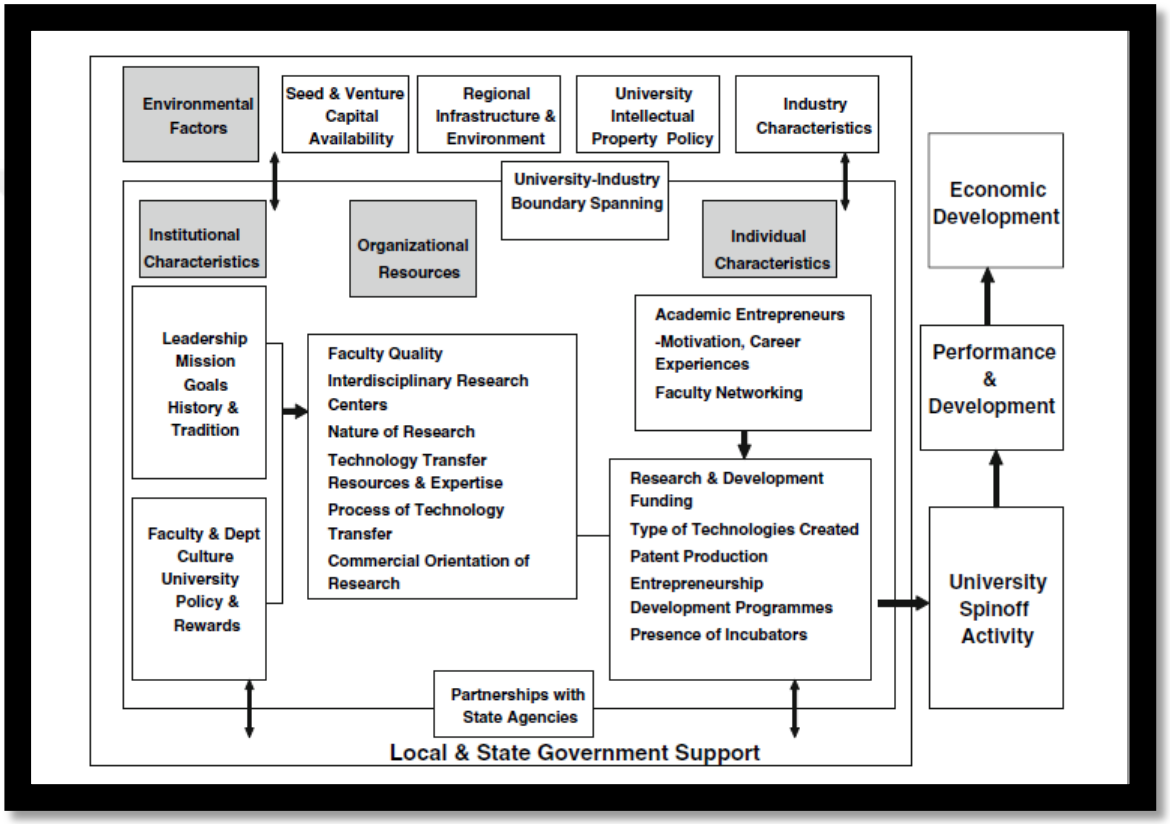

Figure 1 Determinants of University Spin-off Activity, Adopted from O'Shea, R., Allen, T. J., O'Gorman, C., & Roche, F. (2004). Universities and Technology Transfer: A Review of Academic Entrepreneurship Literature. *Irish Journal of Management, 25*(2).

2.1.3 Measuring Academic Entrepreneurial Intention

With regards to the Theory of Planned Behavior by Ajzen (1991) and Armitage and Conner (2001), the best predictive determinant of entrepreneurial activity is the "entrepreneurial intention". Within the scope of academic entrepreneurship, academic entrepreneurial intention can be defined as the intention for getting involved in entrepreneurial activities including formal commercial activities, informal commercial activities, and non-commercial activities adressed by Abreu and Grinevich (2013) (see Figure 2).

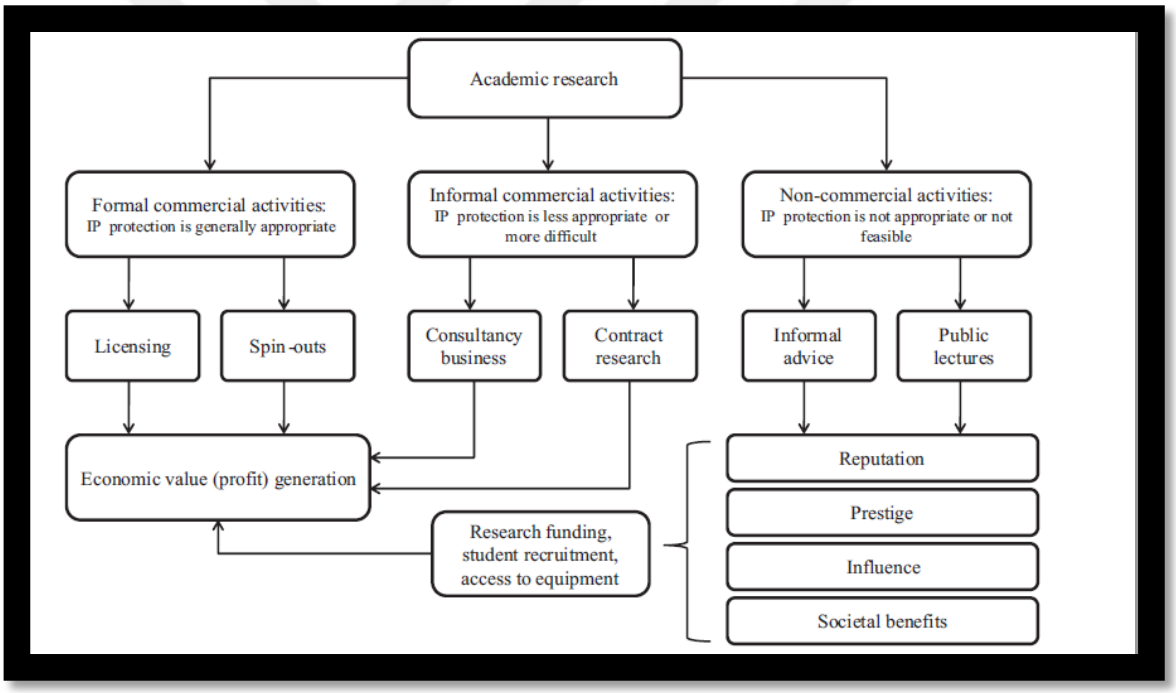

Figure 2 Academic Entrepreneurship Activities, Adopted from Abreu, M., & Grinevich, V. (2013). The nature of academic entrepreneurship in the UK: Widening the focus on entrepreneurial activities. *Research Policy, 42*(2), 408-422. doi: 10.1016/j.respol.2012.10.005

The available measurement constructs for entrepreneurial intentions include Entrepreneurial Decision Scale (Chen, Greene, & Crick, 1998), Entrepreneurial Intentions Scale (Krueger, Reilly, & Carsrud, 2000), Individual Entrepreneurial Intent Scale (Thompson, 2009), and Entrepreneurship Intentions Questionnaire (Liñán & Chen, 2009). Although those constructs are sufficient for analyzing adults' and students' intentions for entrepreneurship, the notion of academic entrepreneurial intentions require a narrow focus on specific activities such as intellectual property creation within the context of universities. Academic entrepreneurial intentions have been analyzed by Prodan and Drnovsek (2010) previously. However, the construct did not again provide the necessary narrow focus to target faculty. The most promising novel contribution was provided by the study of Huyghe and Knockaert (2014) (see Table 3).

Table 3

Comparison of Entrepreneurial Intentions Scales

Linan& Chen (2009), Entrepreneurship Intentions Questionnaire	I'm ready to make anything to be an entrepreneur – My professional goal is becoming an entrepreneur – I will make every effort to start and run my own firm – I'm determined to create a firm in the future – I have very seriously thought in starting a firm –

	I’ve got the firm intention to start a firm some day
Krueger et al. (2000), Entrepreneurial Intentions Scale	How likely are you to start up your business in next five years? What is the probability that you will start your own business in the next two/five years?
Prodan& Drnovsek (2010)	How interested are you in setting up your own business? How determined are you to have your own company? If you identified possibilities for a commercial application for or more of your inventions, you would seriosly consider becoming an entrepreneur to commercialize the opportunity. What is the probability that you will start your own business in the next two/five years?
Chen (1998) Entrepreneurial Decision Scale	How interested are you in setting up your own business? To what extent have you considered setting up your own business?

	To what extent have you been prepating to set up your own business? How likely it is are you going to try hard to set up your own business? How soon are you likely to set up your own business?
Thompson (2009), **Individual Entrepreneurial Intent Scale**	1. Intend to set up a company in the future 2. Plan your future varefully 3. Read business newspapers 4. Never search for business start-up opportunities(R) 5. Read financial planning books 6. Are saving money to start a business 7. Do not read books on how to start a company(R) 8. Plan your finances carefully 9. Have no plans to launch your own business(R) 10. Spend time on learning about starting a firm

Huyghe and Knockaert (2014)	How likely is it that, in the foreseeable future, You will engage in the founding of a university spin-off?, You will engage in the establishment of a company based upon an idea and/or technology developed at the university?, and You will participate in the founding of a firm to commercialize your research? You will apply for a patent resulting from your research at the university?, You will license some of your technological developments to the industry?, and You will become the owner of intellectual property rights (patent, copyright, trademark,…)? You will engage in collaborative research with industry? and You will engage in contract research or consulting activities with industry?

Aiming to offer a comprehensive measurement construct for academic entrepreneurial intentions within Turkish setting, adopted version of Huyghe and Knockaert was used and additionally, the soft side of the academic entrepreneurial activities such as publishing, placement of students in the industry, attendance to scientific meetings, and training in the industry was included as adressed by L. De Silva (2012). The results of construct analysis have been provided in further research methodology chapter.

2.2 Theoritical Foundations of Academic Entrepreneurship and Entrepreneurial Universities

Entrepreneurship is recognized as the catalyzer of modern economy. Entrepreneurial activity has been systematically studied since 1980s, with an interdisciplinary nature. Determinants of entrepreneurship has been analyzed on individual, organizational, and institutional levels deriving from the academic disciplines of psychology, sociology, organizations and economics (Audretsch & Keilbach, 2007).

Economics theories are interested in the notion of Entrepreneurship in terms of the definition of the Entrepreneur and his/her role in the economy and the society with equilibrium/disequlibrium effect. Adam Smith[3] attached a critical central role to the entrepreneur in economic growth building on Richard Cantillon' s description. The first economist in the history to use the term "Entrepreneur" is Richard Cantillon[4] integrating the entrepreneur as an actor to the economy-along with land owners and

[3]Adam Smith: Laying the foundations of classical free market economic theory, he claimed rational self-interest and competition can lead to economic welfare.
[4]Richard Cantillon: https://en.wikipedia.org/wiki/Richard_Cantillon

work force-who is a risk taker under uncertainty dealing with unfixed sales prices, has non-guarenteed income unlike waged laborers and acts on perceived arbitrage opportunities by possessing production, circulation and exchange of goods leading equilibrium in the market. Cantillon's theory is much more related to the functions of the entrepreneur rather than the personality. The precedents of Cantillon' s theory are Knight and Mises defining the entrepreneur as "who invests (in the sense of acquiring and employing resources) with the purpose of selling goods." (Brown & Thornton, 2013, p. 407).

Abreu and Grinevich (2013) recognized three pillars of entrepreneurship activity as willingness to bear the uncertain outcomes namely as risks of entrepreneurship, ability and effort to organize the managerial processes related to successful exploitation of recognized opportunities, and innovativeness. Built on the widely discussed works of Schumpeter (1934) and Kirzner (1973)[5], entrepreneurship theory treated opportunity recognition as the triggering effect on the whole process.

2.2.1 Academic Entrepreneurs

The most relevant explanation of the role of academic entrepreneurs in the society is based on the notion of Peter Drucker's Knowledge Worker[6] (Peter F. Drucker, 1998; Peter F Drucker, 1999; gestion & Drucker, 1995). He pointed out that the most critical asset of the modern society institutions are the knowledge workers which is an emerging dominant group in knowledge based economies. Knowledge workers are characterized by high qualification of skills, the need for innovative approaches to working, a different mindset and a habit of continous learning. Knowledge workers

[5]Schumpeter and Kirzner: https://en.wikipedia.org/wiki/Joseph_Schumpeter https://en.wikipedia.org/wiki/Israel_Kirzner

[6] The term was coined by Peter Drucker in 1959 in Landmarks of Tomorrow.

perform in team working environments as part of organizations and are not necessarily full time employees yet affiliated with institutions. The quality of the worker/employer relationship between faculty and the universities is defined by how university can arrange the effective work environment for its knowledge workers to perform successfully; it is not the individual but the organization that performs. The organization stocks the human capital[7]

Entrepreneurship have been studied by the individual characteristics and socio-psychological determinants. Traits theories focused on those personality characteristics which diminish the entrepreneur from the rest of the society, need for achievement theory motivates the entrepreneur to bring out solutions (McClelland, 1965) and internal locus of control leads the entrepreneur to place inner trust to oversee the outcomes of actions. The personality traits were associated with the profile of who the entrepreneur is. Personality perspective has been criticized by entrepreneurship scholars (Gartner, 1988) since the theory overlooked the effect of contextual factors on behavior, and the ability of the person to learn and change over time. As the originators of the idea that entrepreneurs are different than small business owners, Carland, Carland, and Hoy (2002) responded to Gartner' s debate about their 1984 dated article with persistence. They proposed that personality studies would be of interest in entrepreneurship research. Research in academic entrepreneurship (Roberts, 1991) supported the weight of personality studies in entrepreneurship as outgoing, extroverted personalities, and need for achievement were found to be associated with engagement in academic entrepreneurship.

[7] The size of the science and engineering workforce is an indicator of human capital in knowledge economies.

In response to the insufficient explanations of entrepreneurial behavior in trait theories paved the way for new contributions in social-cognitive and process studies. Entrepreneurial self-efficacy (Boyd & Vozikis, 1994; Chen et al., 1998; R. Wood & Bandura, 1989), which is defined as the individual' s belief in that he/she is capable of possessing entrepreneurial roles and tasks, has been nominated as a predictive antecedent of entrepreneurial intention (Bird, 1988; Krueger et al., 2000) when the entrepreneurial candidate is once confronted with entrepreneurial opportunities. Previous research (Erikson, Knockaert, & Der Foo, 2015; Goethner, Obschonka, Silbereisen, & Cantner, 2012; Huyghe & Knockaert, 2014; Prodan & Drnovsek, 2010) have shown that entrepreneurial self-efficacy has been significantly related to entrepreneurial intentions of academics.

Academic entrepreneurial self-efficacy is differentiated on the level of task specific conditions as the entrepreneurial opportunities are based on novelty in science and technology. Opportunities appear in novel science however their complexity will limit the number of people who will be able to recognize their potential according to (Zucker, Darby, & Armstrong, 2002). The differences among people who are able or not able to recognize, explore, and exploit opportunities mainly derive from either individual aspirations about entrepreneurship such as willingness to bear risks, preference for autonomy, and/or accessibility to critical financial, human[8,] social and experiential capital. It is shaped by attaching costs of becoming an entrepreneur to the anticipated benefits. Entrepreneurial resilience is built upon the availability of psychological capital (optimism, perseverance) together with human capital

[8] Human capital is dependent on education, it is one of the determinants of entrepreneurial ability (Becker, 2009; Schultz, 1971); innovative entrepreneurship is based on the growth of intellectual human capital residing in science and engineering based economic agents (Zucker, Darby, & Brewer, 1994).

(expertise, experience, education, knowledge and skills), and social capital (networking and relationships) (Baum, Frese, & Baron, 2014).

As a representative of disequilibrium theorists, Austrian economist Kirzner in 1973 (Alvarez, Barney& Young 2010) defined the entrepreneur as the one who possesses the ability to recognize and exploit opportunities already existing in the reality so that he/she can claim new possibilities which hold greatest potential to create business and profit. Kirzner distinguished entrepreneurs from non-entrepreneurs in several ways implying that opportunities are discovered and cannot be systematically studied in the relevant context. Entrepreneurial alertness of Kirzner (1973) exists in individuals who understands the potential value of a given resource by knowledge experts who are able to deliver expertise on subject matter (Alvarez & Busenitz, 2001). On the other hand constructionist view of entrepreneurship based on Berge and Luckmann' s study in 1966 (Alvarez, Barney, & Young, 2010); treats reality as a phenomena created by individuals who create their vision of opportunities and use the resources accordingly.

According to Schumpeter, application of new combinations of inventions into the market distinguishes the entrepreneur from the business owner. Innovative entrepreneurs are the people who bring new ideas as innovations into the market with their specific kind of human capital deriving from innovation based activities rather than managerial ones. In his book, The Theory of Economic Development, first published in German, 1911, Schumpeter adressed entrepreneurial activity as the source of creative acts leading endogenous change for economic development. Entrepreneur is the agent of change moving the equilibrium of steady economy to a new level by creating discontinuities in the market (Knudsen, 2005). Schumpeter

assumed that the role of individual in the entrepreneurial process is greater by creating new circumstances in contrast to Kirzner' s entrepreneurial decision making based on existing set of circumstances (Pittaway, 2005). Kirzner (2011), himself, elaborated how he acknowledged the "Schumpeterian" creativity in a broader sense without denial. He argued that "disruptive" Schumpeterian entrepreneur is in fact responsive to disequilibrium in the market to deliver efficient and socially valued innovations instead of creating discontinuties.

Process models in entrepreneurship theory focused on entrepreneurial intention deriving from Theory of Planned Behavior (Ajzen, 1991). Entrepreneurial intention is nominated as the best predictor of entrepreneurial behavior outcome. Attitudes (perceived desirability), subjective norms and percevied behavioral control (perceived feasibility/self-efficacy) are the antecedents of intention which is indirectly effected by individual and contextual factors (Bird, 1988). Academic entrepreneurial intention is affected by individual factors such as demographics of age and gender (Abreu & Grinevich, 2013; Perkmann et al., 2013), traits including need for achievement (McClelland, 1965), skills enhanced by training (Reitan, 1997), experience, knowledge, and network (Clarysse et al., 2011) and contextual (environmental support and influence) factors which owe much to network theories.

2.2.2 Academic Entrepreneurship and Organizations

Major concepts of transaction cost economics (TCE) (Williamson, 1979) building on the reason of the existence of firms (Coase, 1937) to govern economic transactions across economic agents, agency theory (Eisenhardt, 1989; Jensen & Meckling, 1976) ruling information and power relationships, resource dependence theory (Salancik &

Pfeffer, 1974), resource-based view (RBV) (Penrose, 1959; Wernerfelt, 1984) and knowledge based view of the firm (KBV) (Grant, 1996; Nonaka & Takeuchi, 1995), network theories (Burt, 2002; Dubini & Aldrich, 1991; Granovetter, 1983; Lin, 1999; Simmel, 1955; Uzzi, 1996) that treat the organization as embedded in wider social contexts, institutional theory (DiMaggio & Powell, 1991; Meyer & Rowan, 1977; Scott, 2005, 2006; Selznick, 1996a) which attaches legitimacy to organizations in order to operate successfully in their environments, and contingency theory (Lawrence & Lorsch, 1967) which assumes that organizations adopt their environments with different structures in response to contingency factors have dominated the paradigmal discussions about individual, organizational, and institutional aspects of academic entrepreneurship.

Academic entrepreneurship is a transaction cost based and agency involved process which includes primary researchers/inventors/scientists and university management in a dyadic relationship. Informational asymmetries across economic agents driven by high technology based ideas increase the level of uncertainty[9] and transaction costs, thus evaluation of the expected value of ideas might push entrepreneurial scientist to pursue academic entrepreneurship in the form of starting a new firm (Braunerhjelm, 2011). The academics is also confronted with the critical assessment of whether starting a firm or transferring the technology with intellectual property is a more convenient choice involving substantial differences in rewards, risks, information and transaction costs (Spulber, 2011). University management encourage academics to engage in spin offs when the tacit knowledge held by the

[9] Ideas with little proof of concept and high abstract in nature increases the level of uncertainty about the market potential.

academics results in limited transaction costs and less information problems (Petrakis, 2012; S. Shane & Stuart, 2002).

Audretsch, Lehmann, and Hinger (2014) examined the uncertain and asymmetric characteristics of knowledge itself which is associated with Knowledge Spillover Theory of Entrepreneurship claiming that tacit knowledge will be evaluated differently by economic agents with divergence in education, background and specializations, and lead to variance in decision-making thus leading higher transaction costs as addressed by Audretsch and Keilbach (2007). Audretsch and Keilbach (2007) furtherly elaborated the discussion about opportunity recognition as such; the knowledge spillover theory of entrepreneurship is based on the assumption that new knowledge and ideas which remained unexplored in terms of commercialization are source of opportunities leading new entrepreneurial initiatives. Knowledge spillover theory of entrepreneurship emerged to highlight the transformation of knowledge into commercial value overcoming knowledge filters (Acs, Audretsch, Braunerhjelm, & Carlsson, 2003)[10]. Arrow (1962) suggested that knowledge differs from traditional factors of the production in the sense that there is uncertainty about the relative materialization of the knowledge due to uncertainty of innovation in nature.

Resource dependence theory, RBV and KBV of the firm are related to network theories as the potential entrepreneur accesses knowledge, explore implications, recognizes opportunities and exploit them with critical resources embedded in wider social contexts (Alvarez & Busenitz, 2001; Ferreira, Reis, & Miranda, 2015).

[10] Knowledge filter: The gap between new knowledge and its commercialized value based on the variance about the valuation of the new idea by economic agents (Audretsch & Keilbach, 2007).

Academic entrepreneurs may engage in industrial relations in order to mobilize resources such as grants, funding, equipment and opportunities for students (Perkmann et al., 2013) in case of unavailability of critical resources at low ranking universities. In similar lines, in the absence of institutional support, norms of necessity may originate from unavailable resources for academic entrepreneurship (De Silva, 2012). Nicolaou and Birley (2003) identified four substantial benefits of networks such as opportunity identification, access to resources, timing advantages, and source of status.

Hine and Kapeleris (2006) confirmed the role of organizations on individual entrepreneurial behavior suggesting that institutional frameworks guide activity and coordinate the dispersion of knowledge. Collaboration in networks such as alliances, researcher networks, social networks improves resource efficiency, encourages innovation, and enriches knowledge. Incubators at universities build organizational networks in order to support incubator based firms for resource acquisition and business growth. Innovation ecosystems require inter-organizational networks rather than isolated single firms exploiting internal R&D resources. Moreover, management of innovation for economic growth required organic systems of organizations (Burns & Stalker, 1961), as new technology enabled further sophisticated forms, in the absence of entrepreneurial policies, barriers to entrepreneurship will emerge. Kirby, Guerrero, and Urbano (2011) proposed that organizational structure and university governance were reported as the biggest barriers to entrepreneurial universities.

Dynamic capabilities (Teece, Pisano, & Shuen, 1997) grew out of the weak explaining power of resource based approaches for sustained competitive

performance in uncertain and fast changing contexts. It has been related to the ability of organizations to reconfigure and develop resources base and competences in order to be responsive to rapidly changing environments (Borgevad & Vendrig, 2015). Teece (2007) claimed that maintaining dynamic capabilities requires entrepreneurial management style which is more related to sensing and seizing opportunities, finding innovative ways of coordinating the ecosystem in non routine settings rather than analysis and optimization. Entrepreneurial universities, in this regard, are confirmed to be organizations maintaining dynamic capabilities in order to deliver an institutional environment for academic entrepreneurship.

2.2.3 Academic Entrepreneurship and Institutions of New Economy

The emergence of the role of applied vs. basic science in public policies in industrial countries is traced back to the the late period of World War II when federal governments started to invest in technological innovation led by scientific developments in order to remain competitive in post war years. Vannevar Bush, in his report of "Science, the Endless Frontier"[11] in 1940s (Stokes, 1997) claimed that technological development is mainly driven by the progress in basic science. Bush had proposed a linear form of innovation, which in the following years have been challenged by more complex economic transactions, policies and research paradigms. Stokes argued that research orientation of the scientists cannot be analyzed based on single dimension of basic vs. applied sciences. Stokes (1997) framed the Quadrant Model of Scientific Research (see Figure 3) which conceptualized the notion of science and technology driven by the attempts for fundamental understanding and/or

[11] Vannevar Bush was wartime director of Office of Scientific Research and Development in Roosevelt government in United States of America.

practical implications. This research orientation is completely reflected in scientists' s motivations to deliver knowledge with commercialization potential.

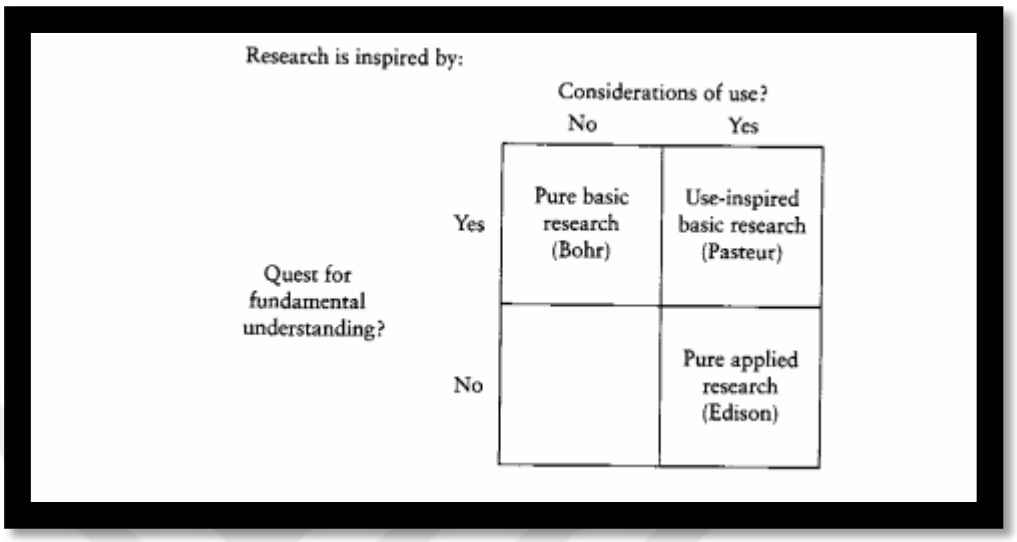

Figure 3 Quadrant Model of Scientific Research, Adopted from Stokes, D. E. (1997).*Pasteur's quadrant: Basic science and technological innovation*: Brookings Institution Press.

According to the conceptual framework, Bohr scientists are driven by basic research with no interest in practical implications whereas Edison scientists are purely driven by practical use of research with no considerations for development of scientific theory. Pasteur scientists are those who are subject to the theory of Academic Entrepreneurship with coupled motivations of basic and applied research. The Entrepreneurial University will contain a critical mass of Pasteur scientists with entrepreneurial aspirations who undertakes the responsibility of delivering third mission activities in a legitimate understanding (Baba, Shichijo, & Sedita, 2009; Crystal, Ping, & Kam; Stokes, 1997; Yasuda, 2011)

As Suchman defined in 1995 (Scott, 2006) legitimacy is assigned to entities when their actions are assumed as acceptable within the framework of norms, values, beliefs and definitions. The concept of legitimacy is associated with how organizations relate to their institutional environments. In 1960, Parsons (Selznick, 1996b) stated that organizations must pertain to societal values if they would like to receive legitimacy. Legitimacy is hard to acquire because of different social actors and their relative levels of influences on organizations. Meyer and Scott in 1983 (Selznick, 1996b) had evaluated how the degree of cultural support for an organization provided legitimacy but it can also be negatively affected by the inconsistency about how it is to function. As Selznick referred to Powell and Maggio' s work in 1991, organizations are sensitive to the cultural environments they belong; legitimacy justifies the particular forms and practices leading institutional isomorphism because organizations tend to follow similar organizations which they perceive as more legitimate and successful (Selznick, 1996b).

Free from any doubt, contribution to the economic development is a legitimized function of an entrepreneurial university as an institutional member embedded in society. However anti entrepreneurial activity at universities can be traced back to the individual assumptions about the role of university challenged by the notion of "Academic Capitalism"[12].

The "Entrepreneurial University" is a value identifier/curator propositioning the possible mobility and opportunity areas to be seized by research directions,

[12] A description of universities, academics, and academic knowledge that suggests these are increasingly being driven by commercial values and goals. http://www.oxfordreference.com/view/10.1093/acref/9780199599868.001.0001/acref-9780199599868-e-6?rskey=qK7uUv&result=3

academic engagement and collaboration efforts, and commercialization outcomes in the pursuit of sustainable development. There are multiple methods of creating value with university-industry collaboration such as "introducing new sources of ideas into the academic research agenda, adressing scientific concerns as well as practical problems, increasing the university' s financial independence through its own income-generating capacities, and contributing more directly to sustainable regional development and societal advancement." (Etzkowitz, 2013, p. 504).

As Florida in 2006[13] discussed the role of universities in the creative economy, he asserted that universities as engines of innovation do not only contribute to the economy with commercialization activities but with a broader sense of innovation for the society as a whole (Peters & Besley, 2008). Quadruple Helix Model leverages the outreach of university mission to a new level by articulating and realizing its role in the creative economy in cooperation with stakeholders. Trencher, Yarime, McCormick, Doll, and Kraines (2014) identified "co-creation for sustainability" as this new role namely of "transformative universities" which hold the greatest potential to manifest societal and technological changes with the goal of realizing sustainable development in regional and societal sub-system contexts. The concerns raised for the benefit of Open Science in the Triple Helix Model are overcome by the different domains of engagement in the transformative university which is nominated as the creator of transformations beyond the limited role of contributing to the economic development (see Table 4). Fourth mission does not neccessarily eliminate the third mission activities but enhance the scope and diversity of them.

[13] Richard Florida is an urban systems theorist with a focus on social and economic theory. https://en.wikipedia.org/wiki/Richard_Florida

Table 4

Evolving Mission of Universities into Co-Creation for Sustainability

Mission	Third Mission	Fourth Mission
Objective	Technology Transfer	Co-creation for Sustainability
Model of Innovation	Closed and Isolated	Open
Catalyst	Technical/Scientific Problems	Sustainability
Tools	Patents/Licenses	Green Clusters
	Spin-offs	Infrastructure Projects
	Conferences/Publications	Natural Environment Restorations
	Consulting/ Training	Socio-technical experiments
	Collaborative Research	

Note. Adopted from Trencher, G., Yarime, M., McCormick, K. B., Doll, C. N., & Kraines, S. B. (2014). Beyond the third mission: Exploring the emerging university function of co-creation for sustainability. *Science and Public Policy*, *41*(2), 151-179.

2.3 ENTREPRENEURIAL UNIVERSITY

2.3.1 Changing Role of Higher Education Institutions in Economy

Quick and far-reaching regional development is built on integration of trained personnel, suppliers, and financing systems forming similar enterprises in high technology industries (Chrisman, Hynes, & Fraser, 1995). The entrepreneurial university with its traditional mission of teaching and research, contributes to the advancement of knowledge with applied research and it is entrepreneurial as long as it is responsive to the stakeholders namely as other higher education institutions, chambers of commerce, development agencies, industry, financing institutions, NGOs, media (Philpott et al., 2011) (Davies, 2001). In order to be responsive, knowledge stock should be aligned with regional and/or industry needs leading a new third task environment and culture which requires the faculty to acquire new

knowledge, skills; and the university management to define strategies and tasks in order to motivate and encourage academic entrepreneurship. "The entrepreneurial university" value is built upon the perceived excellence by its stakeholders namely as university scientists, TTOs, and firm/entrepreneur (Siegel et al., 2003).

Etzkowitz (1998; Etzkowitz, 2013) discussed about academic revolutions that have taken place in higher education system. Research function of universities additional to teaching tasks has been integrated into the higher education system with the first academic revolution in the late 1800s in the U.S and Germany. The Humboldt[14] convergence between research and teaching laid the foundations for mutually supportive task environments at universities in later 20th century. Second academic transition initially took place with entrepreneurial mission in Massachusetts Institute of Technology (MIT) and successive Stanford University undertaking economic and social development missions. Creating and possessing intellectual commons on behalf of society has been a legitimate function of universities in U.S (Argyres & Liebeskind, 1998). The entrepreneurial university discourse is based on proactive characteristics of the organization itself that the modern university initiates, regulates, steers and adapts to complex and uncertain environments (Clark, 2001). Entrepreneurial university is the central focus for innovation theory and practice (Etzkowitz, 2013), sustained competitiveness in the global economy is based on the ability to develop new technologies and products and delivering to the markets with best practices in talent management and organizational strategies (Klofsten & Jones-Evans, 2000a).

[14] Wilhelm von Humboldt's synthesis of the humanities and sciences at the University of Berlin, based on the ideas of Fichte and Schleiermacher, provided the theoretical framework for the research university.

Farsi, Imanipour, and Salamzadeh (2012) elaborated an input-process-output-outcome model of entrepreneurial universities fostering debate on the dynamic system including;

- Special Inputs namely as Resources, Rules and regulations, Structure, Mission, Entrepreneurial capabilities, and Expectations of the society, industry, government and market
- Processes namely as Teaching, Research, Managerial processes, Logistical processes, Commercialization, Selection, Funding and financial processes, Networking, Multilateral interaction, and Innovation, research and development activities
- Outputs namely as Entrepreneur human resources, Effective researches in line with the market needs, Innovations and inventions, Entrepreneurial networks, and Entrepreneurial centres.
- The Overall aim to mobilize all of its resources, abilities and capabilities in order to fulfil its Third Mission.

On the basis of the evidence currently available, it seems fair to suggest that an entrepreneurial university is the one which is not only adaptive to its environment but is proactively seeking sound strategies and new configurations to shape its environment by standing a good financial position, selecting the best students and teachers, attracting best researchers, creating new insights in traditional teaching and research missions, developing innovative management styles, building the context for interaction and collaboration between university, industry, government and stakeholders (Inzelt, 2004; Kirby, 2006; Leydesdorff & Meyer, 2006).

The success of S&T is confirmed as long as it contributes to the advancement of knowledge based economy harnessing economic and social goals of development. The vital role of knowledge production is based on the level of competitiveness created by effective applications of innovation (Kharbanda, 2011). Economy theories are interested in the applications of science and technology for increased productivity. Comparative advantage of national and regional economies is related to accumulation and competitive use of knowledge for innovation as critical as the process of capital accumulation (O'Shea et al., 2004).

Economic value created at universities is in demand by economic development policies; universities are recognized as the regional engines of innovation and growth providing new technologies and business ventures (Laukkanen, 2003). “Entrepreneurial university” is the third mission attached to these institutions in addition to their role in research and education; the key economic actor of the future is expected to be the cluster of firms associated with knowledge producing institutions such as universities (Etzkowitz, 2013).

Universities being less supported by public research grants have experienced budget cuts on many administrative levels leading a transformation in academics’ entrepreneurial thinking for self-generating funds and financial sources. The case of University of Calgary (Chrisman et al., 1995) shows that economic development can be enhanced encouraging faculty members to be resource seeking and entrepreneurial as long as budget cuts are well planned.

Commercialization of university research results has been realized at two waves according to Rasmussen et al. (2006). The first wave in the beginning of 1980s involved establishment of traditional science parks, aimed at attracting industry for collaboration and private funding. Second wave, starting from last half of 1990s, there was a stronger focus on licensing, patenting and spin-off formation reflecting the contribution of university as an active participant in the knowledge economy. In USA, Bayh-Dole Act in 1980[15] facilitated the commercialization of research results at universities equipping them with the authorization to turn research into practical use and to generate income and funding for future activities. However the issue whether this legislation had effected the commercialization process has been a controversial issue (Grimaldi, Kenney, Siegel, & Wright, 2011; Mowery, Nelson, Sampat, & Ziedonis, 2001; Mowery & Ziedonis, 2002; Sampat, 2006; Tseng & Raudensky, 2014).

The expected outcome of governmental, industrial, and university spending on R&D can be realized as science and technology based spin-offs. Spinoffs have been studied in the context of entrepreneurial university starting with Roberts (1991) study on MIT. MIT is the common format of academy and industry relations having developed "consulting, patenting and firm formation into a knowledge-based regional development strategy" (Etzkowitz, 2013). According to research in US (S. A. Shane, 2004), spinoffs are more likely to create jobs, to go to public and to survive than average businesses.

[15] U.S. Congress issued Bayh-Dole act in order to remove barriers to technology transfer by allowing universities to own patents arising from federally funded research which in turn university management of intellectual property accelerated commercialization (Phan & Siegel, 2006)

O'Shea et al. (2004) adressed the possible research dimensions of fields of interest in spinoff research. Future studies should adress why some universities are more successful than others in spinoff activity and complex causes that lead to different forms of cultures, organizing and academics' engagement. (Di Gregorio & Shane, 2003; O'Shea et al., 2004; Vohora et al., 2004). Rasmussen et al. (2006) framed a successful commercialization system as an integrated set of actors and bodies in cooperation such as innovation centers, incubators, patenting offices, seed capital funds, universities, public agencies, NGOs, and private companies.

The transition from industrial to knowledge-based society has been realized with regional innovation coming from application of university research into use. The "entrepreneurial university" concept coined by Etzkowitz in 1998 carries out this mission with technology transfer and firm formation. However the innovation process is not necessarily linear; the daily problems of production may bring out the solutions by research. The entrepreneurial university involves "extension from ideas to practical activity, capitalizing knowledge, organizing new entities, and managing risks" (Etzkowitz, 2013, p. 489). The entrepreneurial university has three main products; advanced knowledge originated not only conserved, human capital and high-tech firms yet the entrepreneurial university is itself composed of quasi-firms[16] which is a concept deriving from research group activities at universities.

[16] Quasi-firms are university research groups organized by managerial capacity to deliver outcomes and acting without profit motive (Etzkowitz, 2013).

Entrepreneurial University develops on a three phase model: (Etzkowitz, 2013)

1.University Entrepreneur One is the model when the academic institution takes its own strategic direction and priorities to raise and manage resources exempt from total state control. Main concern is responding to the contextual demands of government or industry for problem solutions.

2.University Entrepreneur Two is when the research activities of internal academics are realized as intellectual property and commercialized by the academic institution capable of transferring technology in a systematic and coordinated way.

3.University Entrepreneur Three is actively involved in university industry collaboration and contributes to regional economic development by proactively encouraging non-linear model of innovation and firm formation. The interactive model works with technology transfer offices introducing the research with commercial potential to industry and with liason offices bringing industrial problems and potential to the research agenda of university. The university fully realizes its role in regional economic development and gets involved in the process proactively.

According to Etzkowitz (2013), entrepreneurial mission can be realized through various channels at universities;

1.Teaching Mission Oriented; introducing entrepreneurial training into the curriculum. Students take the research out the university, becomes technical

entrepreneurs and firm formation is based on entrepreneurial training rather than advancing research at faculty. This model is prevalent in European countries, especially in Sweden.

2.Faculty Research Oriented; the direct entrepreneurs in managerial roles are academics, taking their own research to market, prevalent in US.

Policies in Europe recognized the importance of faculty research oriented mission in order to facilitate higher rates of innovation coming from value added science and technologies. As a part of National Innovation System[17] concept widely recognized in 1990s, the "Scientific System" included the most critical actors-universities as producers and educators of scientific knowledge.

2.3.2 University-Industry Cooperation

University-Industry cooperation as a part of quadruple helix concept[18] has been fostered by organizational (technology transfer offices) and institutional level (science parks and incubators) mechanisms (Phan & Siegel, 2006). Galán-Muros and Plewa (2016) defined that university industry relations are all kinds of formal and informal voluntary interactions between universities and businesses for mutual benefits regarding teaching (curriculum design, lifelong learning[19] (LLL), student mobility),

[17] National Innovation System as a term originated in Freeman and Lundwall' s studies in 1980s assigning a critical role to universities for the flow of technology and information.
[18] It is argued that extending the Triple Helix Model to the fourth or fifth level requires critical observed data to understand the phenomenon and nominate it as a new dimension: http://www.leydesdorff.net/ntuple/
[19] "The provision of adult education, permanent education and/or continuing education involving the acquisition of skills, knowledge, attitudes and behaviors by universities to people employed by external organizations" (Galán- Muros & Plewa, 2016, p. 370)

research (Professional mobility, joint R&D activities, contract research, consulting, research projects, joint publications) and entrepreneurial (commercialization of intellectual property assets) missions of universities.

Perkmann and Walsh (2007) conceptualized the nature of university industry collaboration at three levels of intensity: low, medium and high levels indicating that each level is composed of different activities (see table 5). Research partnerships and services are most intensive level of collaboration which include collaborative R&D, contract research and consulting. Academic entrepreneurship defined as the commercialization realized by academic inventor, in contrast to the definitional scope of academic entrepreneurship in this study, is regarded as medium level of intensity along with reciprocal training of human resource at universities and industry. Commercialization of IP is a low form of transfer, and social networking and diffusion of scientific knowledge apply to all level of university-industry collaboration.

Table 5

Nature of University Industry Collaboration

HIGH RELATIONSHIPS	MEDIUM MOBILITY	LOW TRANSFER
Research Partnerships	Academic Entrepreneurship	Commercialization of IP
Research Services	Human Resources Transfer	
Scientific Publications and Informal Interaction		

Note. Adopted from Perkmann, M., & Walsh, K. (2007). University–industry relationships and open innovation: Towards a research agenda. *International Journal of Management Reviews*, *9*(4), 259-280.

Technology Transfer Offices perform the role of screening the research output with commercial application and introducing this value to external capital providers. However the nature of the business and the interests of the stakeholders may lead to different barriers faced by TTOs which are interested in long term returns of university spin-out companies (USOs) . Wright, Lockett, Clarysse, and Binks (2006) argued angel investors will focus on long term growth potential while venture capital funds will be exit oriented for short term financial returns. In their systematic analysis of organizational practices for managing university-industry technology transfer (UITT), Donald S Siegel, Waldman, and Link (2003) argued that, TTOs should act as facilitators of knowledge transfer from both directions; university to industry and industry to university.

Licensing, research joint ventures, intellectual property are additional key mechanisms for technology diffusion from universities to industry besides university spin-offs or university based start-ups (Phan & Siegel, 2006). TTOs are primarily interested in marketing intellectual property to the industry with exclusive rights and fast "time-to-market" (Donald S. Siegel et al., 2004). In order to be effective in technology diffusion, TTOs should extend their boundary spanning roles to a further level by screening external environment for innovative ideas and information about potential applications of knowledge created at universities. Furthermore, Markman, Phan, Balkin, and Gianiodis (2005) have argued that focusing on licensing IP rights for cash flows and minimizing risks, TTOs' s strategic choice will lead to decrease in new venture creation at universities. Licensing arrangements may also be less relevant in cases when such nature of technology may not be suitable for protection by patent

transactions or university/inventor may seek out capturing more value driven by transaction costs with direct involvement by spin-outs (Lockett et al., 2003; Vohora et al., 2004). Even though technology transfer effectiveness is measured by licensing revenues, the introduction of new products and services, and spin-offs (Phan & Siegel, 2006), it is a mutual form of involvement of both academy and industry either for university based inventions taken to market by industry and/or academic inventor, or improved products with academic knowledge (Etzkowitz, 1998).

Technology transfer offices- going beyond patent and license administration- emerged as an organizational arrangement to actively manage the engagement of faculty for the disclosure of inventions and marketing them to private firms. Actually technology transfer is the overall contribution of a university to society' s knowledge base according to the principles adapted by other institutions such as MIT, Georgia Tech according to Argyres and Liebeskind (1998). Clarysse et al. (2011) argued how the entrepreneurial capacity of the research scientist can predict the potential engagement in academic entrepreneurship. They have defined the entrepreneurial capacity as "the skill which individuals have to spot, recognize and absorb opportunities" (p. 1086). TTOs can focus on stimulating entrepreneurial activities such as entrepreneurship training in addition to their role of protecting and formalizing intellectual capital. The effect of TTOs on entrepreneurial activity will be limited unless changes in hiring, promotion and reward decisions based on entrepreneurship are in place.

Science parks or technology parks are technology intensive hubs for spin-off and start-up companies[20] developing relevant expertise, opportunities and resources around those technology based firms (Phan & Siegel, 2006). Technoparks trace back to the early 1970s, when governments focused on the payback of investments in Research and Development. Science and technology policies in the World have elaborated the ecosystem of commercialization of research results with those other mechanisms such as strategic alliances, incubators and joint research centers of university and industry. Science and technoparks brought public, research institutes and industry together in the name of organizing the conditions for technology development. As a result, there has been a tremendous increase in the number of licenses, patents, spin-off companies primarily in developed economies such as USA and Europe. Universities had a special role in this process as the knowledge producer, educator of scientists, researchers, entrepreneurs, and other qualified people and disseminator of knowledge.

2.3.3 Science, Technology, Innovation and Entrepreneurial Universities in Turkey

The systematic coordination of science and technology based economic development in Turkey was started by the foundation of The Scientific and Technological Research Council of Turkey (TÜBİTAK) in 1963. Responsible for planning and coordinating national research& development agenda, the institution acts as the advisory agency to the Turkish Government and is the Secretariat of the Supreme Council for Science and Technology (BTYK-founded in 1983) as the highest science and technology policy making body in Turkey. In 1983, The Turkish

[20] Spin-offs can be defined as start-up companies based on a technology developed at universities and founded by faculty or students whereas start-ups do not necessarily derive from spesific research projects (Nicolaou & Birley, 2003)

Science Policy 1983-2003 was released as a formal guideline for managing scientific and technological advancements for economic and societal development. Supreme Council for Science and Technology-BTYK was founded as a result of the Policy and for the first time in Turkish Republic, research and development capacity of the country was reported, the long term planning in science was determined, and scientific and research priorities for economic and societal development had been proposed. Developments in institutional arrangements in 1980s and 1990s (including the launch of Marmara Research Center-MAM following TUBITAK) were minimal initiatives in order to the transform universities in Turkey regarding university-industry relations. Unfortunately the realization of scientific and technological development policy goals could not be achieved due to the insufficient demand driven by the composition of the industry in the mean time and the relative embracement of the policy by formal authorities (Göker, 2004).

As an early type of technopark mechanism, Istanbul Teknik University and Chamber of Commerce and Industry of Istanbul cooperated in 1985 and the technopark started operating in 1986 (Bülbül& Özbay, 2011). In 2001, The Law for Regions of Technology Development (no. 4691) had been issued assigning legal status for Technoparks with the mission of encouraging cooperation between universities, research institutions and industry. The law enabled universities to secure their rights on the inventions, to transfer and commercialize the Technologies developed at those organizations. The most substantial claim adressing university industry relations for the first time in Development Plans was reported in Fifth Development Plan (1985-1989) reinforcing the specialization of universities for industrial collaborations (ODTÜ TEKPOL, 2011).

The second meeting of BTYK in 1993 delivered Turkish Science and Technology Policy 1993-2003 document which also had place in Seventh Five Year Development Plan in 1997. The National Innovation System emerged as the Money-Credit Coordination Council of Turkey issued the decision to engage in support for Research and Development in 1995. The launch of Turkish Patent Institute (1994), National Metrology Institute (1992), Turkish Academy of Sciences (1993), Turkish Accreditation Agency (1999), Turkish Competition Authority (1994), and Technology Development Foundation of Turkey (1991) have been major milestones for National Innovation Policy in Turkey.

SMEs Strategy and Action Plan for 2007-2009 was adopted by YPK (Higher Planning Council) of Turkey approaching university-industry relations as the mechanism to create added value for SME productivity and innovation. Supreme Council for Science and Technology-BTYK, in 2011, decided to design policies for supporting innovation and entrepreneurship at universities by supporting technology transfer offices, incubator centers, reconfiguring academic promotion criteria in favor of innovativeness and entrepreneurship.

In Turkey, university-industry collaboration is facilitated with top-down strategy, not as an actual result of open demand by industry (Klofsten & Jones-Evans, 2000a). Autonomous organizations are meant to provide an organically developing entrepreneurial culture based on bottom-up approach (Goldfarb & Henrekson, 2003) and according to research, academics support that structured, top-down push to stimulate entrepreneurial activity would actually decrease the level of activity (Philpott et al., 2011). European universities suffer the same genetic problems relying too much heavily on centralized coordination and finance of governments in the past compared to USA (Etzkowitz, 2013). Fifth university reform in Turkish Higher

Education system in 1981 attempted to shift from Continental Europe to Anglo-Saxon based model avoiding "Science for Science" mindset and encouraging to overcome common barriers to entrepreneurial university model including academics' perceptions about the notion of "Science" in a knowledge based economy (BASKAN, 2001; Kirby, 2006). However, clustering of industrial firms in definite regions (such as Marmara region) seems to hinder the benefits coming along with entrepreneurial universities of the country; above all, the bureaucracy in the higher education system limits the autonomy in universities. With regards to entrepreneurial university model, Technology Development Regions (TGB) Law authorized by the 2001 regulation, offered the incentives for entrepreneurial faculty to commercialize their research in university spin-offs (Özer, 2011) and engage in technology push models evident in weak entrepreneurial ecosystems creating insufficient demand for innovation (Clarysse, Wright, Lockett, Van de Velde, & Vohora, 2005). By December 2015, 63 TGB (technology development regions) are in place of which 49 are in operation. The number of technology firms in those regions is 3744[21], and those firms employed 38.239 personnel. Exported technology goods and services amounted 2.4 billion US dollars reaching out to US, Japan, UK, and other developed countries.

Turkey Scientific and Technological Research Institution (TUBITAK, 2015) releases an annual index of top 50 entrepreneurial and innovative universities aiming to foster the development of entrepreneurship ecosystems within and around higher education institutions. The universities are assessed with five sub-domains including 23 quantitative indicators namely as;

[21] See the link: http://www.tgbd.org.tr/WebContent/WebContent/4707

1. Scientific and Technological Research Competence;

2. Intellectual Property Pool;

3. Cooperation and Interaction;

4. Entrepreneurship and Innovation Culture;

5. Economic Contribution and Commercialization.

Universities have been assigned the role to raise qualified innovative and entrepreneurial workforce as well as to commercialize technological knowledge. On the other hand, the industry mostly recognizes the universities in Turkey as an incompetent source of applied knowledge because of cultural clash in the mindset for delivering solid results at a common pace. The scientists are not interested in disclosures mostly because of their normative beliefs about science, or they do not feel competent enough to deliver commercialized science. As a result, performance indicators of entrepreneurial universities are limited to some extent presenting a narrow picture of entrepreneurial university ecosystem. Furthermore, current patent system in Turkey (decree law for protecting patent rights no. 551[22] [23]) allows individual ownership for scientific discoveries which have been built in universities. It means that scientific faculty full time affiliated with a university can apply for a patent for his/her own claims independently from their universities and licensee/transfer the rights to a third party like a university later. In conclusion, the

[22] http://cipoforum.blogspot.com.tr/2013/05/evolving-intellectual-property-regimes.html
[23] http://www.mevzuat.gov.tr/MevzuatMetin/4.5.551.pdf

official disclosure of a scientist through technology transfer offices requires deeper understanding of individual motives, resource endowments and contextual factors.

2.4 Determinants of Academic Entrepreneurship in Science and Engineering

Predictors of entrepreneurship in academic community can be traced back to the early individual and organizational studies including factors such as personal motivation, age, gender, cultural support, organizational structures and policies etc. However a typical model of "entrepreneurial scholar" (Louis et al., 1989) could not be developed because of different motivations and contextual factors. For example, Louis et al. (1989) have found that nontraditional forms of entrepreneurship such as forming a new company may be moderated by institutional norms based on selecting these spesific supportive institutions, work group identification, organizational culture, strategic management of the university to position themselves for increased prestige and income.

W. Ding and Choi (2011) investigated how different kind of academic activities such as disclosure, patenting, advising, and founding companies were based on the stage of academic career, time and effort, different financial and social resources, and whether different activities trigger each other. Institutional factors such as the ranking of the affiliated institution, existence of a technology transfer office and the number of filed patent applications were also included. Placement of research scientists in Scientific Advisory Boards (SAB) of technology intensive companies is a quite common informal governance structure. In their study they have distincted the role of advising with the role of founding a firm consistent with previous findings. Advising role was more related to building academic networks, whereas founding a firm was related to building task spesific social network ties. Affiliation with

universities with technology transfer offices raises the probability to found a firm more than being an advisor. Long- term research productivity is more related to advising behavior and becoming an advisor decreases the probability of founding a firm. For a scientist working at a lower ranked university, being involved in founding a firm is likely to take place earlier than the peers at a higher ranked university whereas higher ranked universities' members deliver advising roles earlier than others due to academic reputation of their institutions.

Krabel and Mueller (2008)investigated the individual factors effecting the nascent entrepreneurship among scientists and found out that patenting activity is followed by commercialization activities in a linear sequence. Scientists who have previously experienced industrial dynamics in terms of applied research and previous entrepreneurship have engaged in commercialization activities. There is a strong peer effect in the same research field as a means of institutional context. Scientists do not engage in commercialization if they perceive this activity as time consuming or they claim that public access to research results is critical.

Based on previous research (Kidwell, 2013; O'Shea et al., 2004; O'Shea et al., 2007; Vohora et al., 2004)we can propose common barriers to academic entrepreneurial activity as follows;

- Disinterest of academics in commercialization and financial gains
- Unawareness of commercial potential of the research
- Unfavorable leave of absence policies
- Unwillingness to delay publications due to patent and licensing process.

- Unfavorable royalty policies
- Weak leadership by institution to encourage the process
- Weak ties between university and industry
- Limited funding base
- No promotional strategies to encourage individual entrepreneurial endeavor
- Absence of entrepreneurial culture in the institution.
- Low R&D expenditure
- Absence of role models as an academic entrepreneur
- Conflict between institional rewards of publication and individual rewards of ownership
- Inexperience in taking ventures to the marketplace.
- Concerns about the mission of science for public
- Lack of business and communication skills
- Scientific success
- Absence of clear policies and guidelines
- Absence of surrogate entrepreneurs[24]

Perkmann and Walsh (2007) framed the factors in terms of individual, organizational, and institutional levels and outputs of engagement by academic reseachers in terms of scientific, educational, and commercial dimensions (See Figure 4).

[24] Surrogate entrepreneur concept was originated in Radosevich' s study in 1995. The surrogate entrepreneur is granted the right to initiate a company on the scientist' s behalf (Franklin et al., 2001).

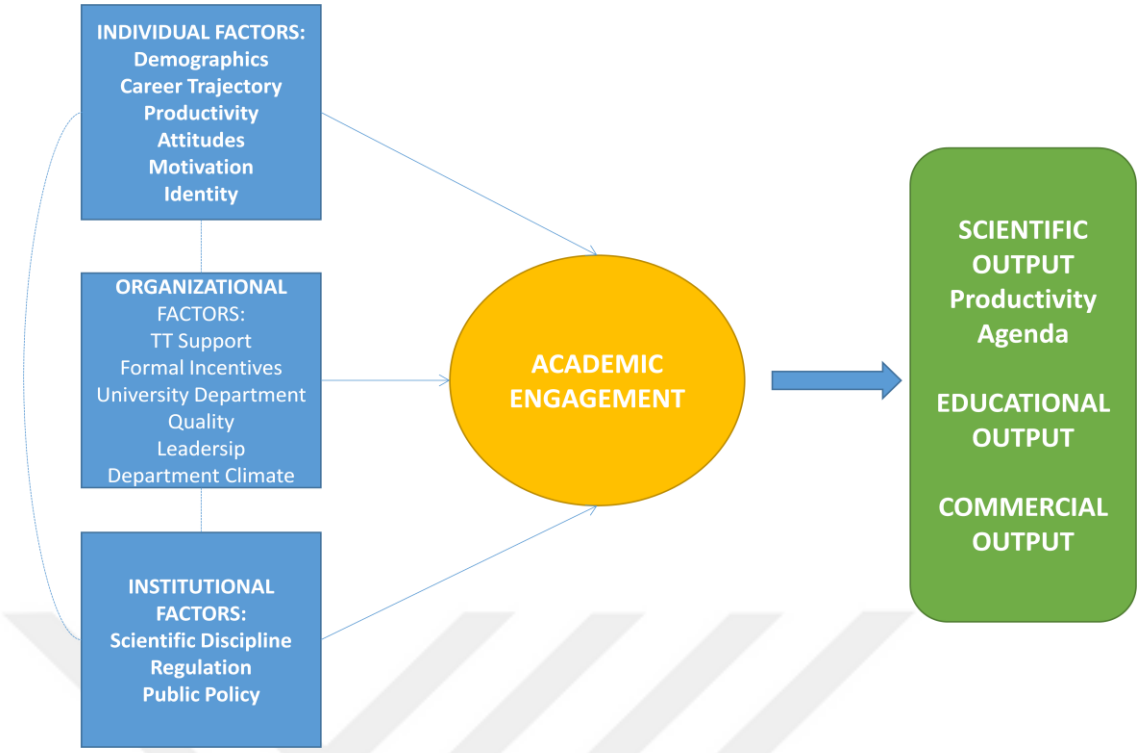

Figure 4 Factors and Outputs of Academic Engagement, Adopted from Perkmann, M., & Walsh, K. (2007). University–industry relationships and open innovation: Towards a research agenda. *International Journal of Management Reviews, 9*(4), 259-280.

McInnis (2001) explained that design of suitable conditions and incentives in order to transform universities towards entrepreneurial cultures require leadership and understanding of shared motives of values of academics including work orientations and daily work habits. The question of who becomes academic entrepreneurs can be discussed at two levels based on supply and demand side perspective of Thornton' s taxonomy (Jain et al., 2009). At the organizational level, universities as the institutions at which the potential entrepreneurs embedded can facilitate the academic entrepreneurship with strategic vision, organizational policies, incentives, training and procedures. The individual level of analysis will focus on to be entrepreneurs and their individual aspirations to get involved in academic entrepreneurship such as

previous experience, training, individual intention, quality of research, networks. Etzkowitz (1998) also supported that uprising commercialization of academic research is the result of both the institutional capacities and individual motivations of faculty and administrators. Institions have to enhance their capabilities in terms of technology transfer functions, reward systems, and training for academic entrepreneurs/ to be (Phan & Siegel, 2006). Substantive or symbolic adoption is also under consideration when the individual academics comply with the local norms if only for symbolic reasons (Bercovitz & Feldman, 2008), previous commercialization experience also effects peer entrepreneurial activity (Stuart & Ding, 2006). Furthermore, many academics may just engage in soft level income activities such as consultancy thus they are no eager to learn new competencies that a full time entrepreneurial role requires (Klofsten & Jones-Evans, 2000a).

2.4.1 Gender

Examining involvement of women academics in science and engineering entrepreneurship is a long tradition tracing back to the studies on gender gaps in senior managerial positions, entrepreneurial intentions, self-efficacy, academic career advancement, research productivity, disclosure behavior, social networks and access to resources. Long, Allison, and McGinnis (1993) study showed that women academics promote to associate and full professorship slower than men, all else being equal and argued that women experience mentorship and collaboration less than men peers. Research center affiliations were proposed as an institutional mechanism with resource and networking opportunities for women compared to non-affiliated women peers yet it remains limited compared to men (Corley & Gaughan, 2005). Academic success is attributed to external factors by women academics implying that they are

more receptive to external barriers than men (Fox & Ferri, 1992). Women scientists are less likely to join scientific advisory boards of biomedical companies and existence of a formal technology transfer office improves overcoming the barriers to engaging in commercialization activities experienced by women (W. W. Ding, Murray, & Stuart, 2010).

Murray and Graham (2007) conceptualized the gender gap in commercialization of research results based on supply and demand side perspectives and reported the results based on their qualitative study. Women scientists receive less industrial collaboration proposals than men either by referrals or recognition in public. Furthermore, the scope of networks for future opportunities remains incompetitive for women based on limited experience with industry in the past. On the other hand, women scientists either express interest in taking roles in commercialization activities but at a lower, nonassertive manner or they were biased at the level of commercialization norms of science. Abreu and Grinevich (2013) suggested, old and senior academics are more likely to engage in all types of activities consistent with previous findings whereas female academics are less likely to engage in all types of activities however the gap is larger for more informal activities. Due to limited scientific career progress with less collaboration and productivity, gender gap arises in commercialization phase and women are less likely to disclose inventions as a potential result of being in a less advantegous position for resource mobilization than men, as well (Boardman & Ponomariov, 2009; Perkmann et al., 2013). Institutional support is suggested as a mechanism to overcome gender gap in this matter (Murray & Graham, 2007).

2.4.2 Age and Seniority

Boardman and Ponomariov (2009) claimed that age and seniority have a mixed effect on academic entrepreneurship when human and social capital are utilized for entrepreneurship by senior academics whereas younger scientists have already been trained and guided on the norms of university-industry linkages. Clarysse et al., 2011 supported that non tenured academics are less likely to engage in entrepreneurial activities since they have to comply with tenure requirements and tasks that the career advancement requires or they completely quit academia to realize their entrepreneurial intents. W. Ding and Choi (2011) supported that opportunity cost of engaging in entrepreneurial activities for young scientists is too high at top ranked universities where research productivity is competitive and critical for obtaining tenure.

In contrast, McInnis (2001) explained that early career academics are more prone to cultural transformation into entrepreneurial universities. W. Ding and Choi (2011) supported that older scientists have internalized the old academic value system which is skeptical about the radical transition to the commercialization of to be public science. Bercovitz and Feldman (2008) acknowledged that young scientists are trained in environments supportive of commercialization thus they favor disclosing for entrepreneurial activities.

On the other hand, academic life cycle theory (Stephan & Levin, 1996) claims that early years of academic career will focus on building human and social capital, thus senior scientists having spent years in the research are more likely to become academic entrepreneurs. The effect of age on academic entrepreneurship is also

discussed based on the necessity vs opportunity entrepreneurship, Vohora et al. (2004) expressed that younger academics are mostly driven by necessity when being placed in a full time position is under risk in academic employment market.

2.4.3 Perceived Institutional Support

Organizational culture and climate of universities are institutional artifacts and realized experiences of academics settled at these organizations. Culture reflects the values, beliefs, history, traditions, etc., reflecting the deeper foundations of the organization; it is about what the university values. Climate is recurring patterns of behavior, attitudes, and feelings that characterize life in the organization; what organization members experience. A university may reflect its third entrepreneurial mission in its mission statements, reward systems, existence of role models which may affect the entrepreneurial intentions of academics (Huyghe & Knockaert, 2014).

According to Göktepe-Hultén (2010) in her case study, scientists are overburdened with demanding tasks of teaching, research and other responsibilities at their institutions so without a sufficient method of motivation such as academic merit and recognition, they will not be oriented to spend time on the third mission of the university. “In most cases, commercial activities are seen as a distraction from the usual path of academic development….There is the need for both institutional and organizational support for scientists with less experience and time for entrepreneurial activities. ” (Göktepe-Hultén, 2010, pp. 525, 527). Experienced serial inventors, on the other hand, do not usually accept the role and involvement of technology transfer offices in their patenting activities. The motivation of the scientist to commercialize and the business plan of TTOs differ in terms of dedicated capacity and resources,

ownership of patents and centrality. Scientists may avoid disclosure and/ or bypass TTOs to bring their research into market. The entrepreneurial activities of more experienced scientists are not necessarily the result of institutional and organizational structures but their own built capacity to act.

Donald S Siegel and Wright (2015) proposed that measuring entrepreneurial performance of universities will require diversity since pursuit of academic entrepreneurship is an organizational decision based on spesific aspects and heterogenious strategies. Reitan (1997) claimed that spin-off activity will be determined by the type of commitment brought out by the university for its entrepreneurial mission and it has been furtherly confirmed by Di Gregorio and Shane (2003) that university status enhances the credibility of the entrepreneur to access critical resources for spin-off company creation.

Donald S Siegel and Wright (2015) discussed how universities promote entrepreneurial activity based on operational reasons even if their cases are not relevant for academic entrepreneurs in terms of organizational culture, research base and incentives; universities have to be competitive and can be directed towards a popular strategy among leading institutions and peer universities. Increasing pressure for revenue generation, and support and funding as public policy for pursuit of academic entrepreneurship can also lead the universities to entrepreneurial mission. On the other hand, Perkmann et al. (2013) argued that academic entrepreneurship is not necessarily affiliated with institutional support at lower ranked institutions when engagement is a substitute for resource mobilization

Rasmussen et al. (2006) defined three main reasons for university spin-off activity; spin-offs turn out to be future contractors and partners for the university; formation of new firms are supported by public in slow progress of economy in order to contribute to job creation and industrial activity; and their measure of success in the economy is more visible in the context of new economic activity. According to their exploratory study, concerns about academic freedom and negative effects on teaching and research mission can be eliminated by "indicating a soft emphasis on commercialization" (p.524), which means commercialization should be stimulated as a voluntary activity, not obligatory, and individuals should be left free to proceed with publishing results. The main solution is understanding how to organize the commercialization activity understanding that commercialization expands the research not changing it. Moreover, the purpose of such transformation has to be clarified in order to provide the suitable climate for change (Laukkanen, 2003) and possible conflicts of interests between teaching, research and full time entrepreneurial roles of academics should be adressed (Lockett et al., 2003).

However Donald S Siegel et al. (2003) adressed the entrepreneurial motives in their study that scientists are driven by gaining recognition in the science community rather than financial gains. Universities may actually leverage innovation as long as they deviate from the role of "ivory tower". Actually little support is being found for possessing "Ivory Tower" image for the mindset of scientific discovery among scientific community. There are multiple methods of creating value with university-industry collaboration such as "introducing new sources of ideas into the academic research agenda, adressing scientific concerns as well as practical problems, increasing the university' s financial independence through its own income-generating

capacities, and contributing more directly to sustainable regional development and societal advancement." (Etzkowitz, 2013, p. 504).

Clarysse et al. (2011) found out that environmental effect on entrepreneurial engagement of academics is yet much weaker than the effect of individual factors such as entrepreneurial capacity.

2.4.4 Science, Society and Sustainability

Legitimacy of the third mission of universities is in question though, it has created an opposition questioning the mission of university claiming that academic capitalism harms pure science and it would effect academic freedom. Divergence from teaching and research role may lead to getting under control of industry. Argyres and Liebeskind (1998) argued that commercialization process may be hindered by the traditional commitment of universities to societal benefits in the form of intellectual commons[25]. The case of industrial biotechnology emerged with the discovery of gene-splicing technology by Cohen and Boyer[26] representing the conflict between research and business; granting broad property rights to private firms could limit the sequential research, encourage anti-competitive behavior, and block the evaluation and potential replication of findings by other scientists which is essential for science governance and further discovery. Concerns about the privatization of intellectual property, ownership conflicts, manipulated incentives for faculty promotion, scientific objectivity, licensing rights, and distribution of royalty were raised in order to be responsive to commercialization process effectively.

[25] "A knowledge archive openly accessible to all members of society… intellectual commons is not a commons in the usual sense; it is not a finite, exhaustible resource like a pasture or a mineral deposit, where common ownership can result in inefficient use." Argyres and Liebeskind, pp. 428-429

[26] 1973

Boardman and Ponomariov (2009) claimed that industrial interaction of academics is related to the level of purely science driven research norms (Mertonian norms[27]) possessed by the scientist. Conventional university cultures try to survive under knowledge society revolution which raises pressure for delivering applied research (Davies, 2001). Furthermore, scientist is interested in commercialization of research results to the extent that the proprietary rights[28] are granted as a reward for scientific excellence or they will seek reputation with full disclosure (Stephan & Levin, 1996). Lockett et al. (2003) claimed that opportunity recognition in the entrepreneurial process is not only limited to the lack of ability to recognize potential implications of knowledge but disinterest of the scientist in the commercialization process driven by traditional academic values.

Sustainable development calls for actions systematically integrated into the research, policy and industry activities. As the world faces global challenges such as food security, energy supply, water supply, biodiversity loss, climate security and desertification, green economy can be realized with a quadruple helix model of innovation delivering the solutions based on advanced science, technology and market opportunities (Gouvea, Kassicieh, & Montoya, 2013). Decoupling approach to economic growth is built on technological innovations which in turn is the result of market conditions supporting the continous development of new efficient and effective technologies (Franceschini & Pansera, 2015). There are ultimate limits to growth yet knowledge accumulation and technological innovation delivering both market and social value can enhance the capacity of resource base (Brundtland, 1989).

[27] Norms of communality for science against being private property (Stuart & Ding, 2006)
[28] Patents, copyrights, trade secrets, and licenses which provide the owner an exclusive right to receive economic benefits for a fixed period of time (Stephan & Levin, 1996).

Environmental, economic and social priorities of development identify major industries and opportunities to tap as adressed by United Nations Technological Needs Assessment program (Dougherty & Fencl, 2009).

Sustainable entrepreneurship is at the nexus of economic, social and environmental goals of development enhancing the profit orientation of conventional entrepreneurship and creating value in a system of collaboration beyond placing cost burden on old-fashioned competition. Knowledge based entrepreneurship is not just about the transfer or acquisition of existing knowledge but the creation of knowledge at the very base to introduce entrepreneurial attempts bringing innovative solutions and future research directions. The knowledge is not necessarily technological yet it has to be innovative to map incremental or radical changes for the betterment of economy and society. As a sub-domain of sustainable entrepreneurship, environmental entrepreneurship may derive from environmental market failures. Likewise, one other pillar of sustainability asserts that continous innovation serves not just private value but social values recognizing new opportunities to seize (Dees, 1998). Halt and Milstein (1999) argued that global sustainability challenges provide a wide range of radical opportunities to be seized by the next generation of companies, industries and entrepreneurs beyond incremental improvements in product and processes, in fact they had nominated sustainable development as one of the biggest opportunities in the history of commerce based on Schumpeter' s creative destruction process.

In corporate settings, Björkdahl and Linder (2015) discussed the role of environmental vision for the development and commercialization of environmental innovations. Responsiveness to opportunities brought by the reformulation of problems and solutions will boost innovation efforts. One can claim that similar

attempts by joint effort of quadruple helix actors to raise considerations for sustainable development will reformulate the research directions of "creative universities" with a mission of delivering novelty for economic and societal benefits.

2.4.5 Previous Training, Experience and Academic Self-Efficacy

Academic spin-offs of which founders have been exposed to previous experience and leveraged their entrepreneurial skills with training, mentoring, and coaching are more likely to survive (Soetanto & Jack, 2016). Previous entrepreneurial experience and training is a determinant of entrepreneurial activity (Abreu & Grinevich, 2013; Klofsten & Jones-Evans, 2000a).

TTOs mainly serve the mission of training academics in business, negotiation, marketing and management skills in addition to formal licensing services. Moreover TTOs support exposure to venture investors and other critical social network actors which help creation and growth of the academic spin-offs (Nicolaou & Birley, 2003). On the other hand, serial inventors who have learned about the commercialization processes, developed necessary skills and reached out to the industrial contacts by themselves barely accept TTO' s role in technology transfer (Göktepe-Hultén, 2010).

Based on the light of previous experience, and training either by formal support or individual attempt, entrepreneurial self-efficacy in the theory of planned behavior for entrepreneurial activity is the individual' s perceived ability to successfully perform the roles and tasks of an entrepreneur (Prodan & Drnovsek, 2010). It was also named entrepreneurial capacity as a measure of personal belief that the respondent is capable

of posessing special interests such as interest in ideas which can be converted into new product or services (Clarysse et al., 2011).

3 RESEARCH METHODOLOGY

3.1 Participants

3.1.1 Background of Participants

The data for this study conducted between December 2015 and March 2016 were drown from a national survey of Turkish academics at sciences and engineering/technology faculties. The scientific disciplines of the participants included biology, physics, chemistry, mathematics, statistics, molecular biology, biotechnology, chemical engineering, civil engineering, environmental engineering, electronics engineering, computer science and engineering, materials engineering, nanotechnology, software engineering, mechanical engineering, genetics engineering.

Table 6

The Characteristics of Participants

	No of Participants (n=404)	**% of Participants (in total sample)**
Gender		
Male	258	63,9
Female	146	36,1
Position		
Research Assistant/Graduate Student	133	32,9
Research Assistant or Instructor with PhD	41	10,1
Assistant Professor	77	19,1

Associate Professor	67	16,6
Professor	86	21,3
Discipline		
Sciences	124	30,7
Engineering	280	69,3

3.1.2 Selection of Participants

Target population of this study is science and engineering faculty affiliated with Turkish universities[29]. In order to obtain a representative sample response rate, approxiamately 17.000 academics at 90 universities were contacted via online survey invitation of which 404 responses have been gathered using contact information available on university websites and the sample was stratified based on disciplines (Abreu & Grinevich, 2013; Guerrero & Urbano, 2013). The list of faculty at the universities which has been contacted was determined by the university ranking lists of TUBITAK and ODTU URAP[30]. The list of invited and represented universities are listed below with locations (see table 7).

Table 7

Participants' Universities

Name of University	**Participation**	**Location**
1. Abant İzzet Baysal	No	Bolu
2. Adıyaman	Yes	Adıyaman
3. Adnan Menderes	Yes	Aydın
4. Afyon Kocatepe	No	Afyon

[29] https://istatistik.yok.gov.tr/
[30] http://tr.urapcenter.org/

5. Abdullah Gül	Yes	Kayseri
6. Akdeniz	Yes	Antalya
7. Anadolu	Yes	Eskisehir
8. Ankara	Yes	Ankara
9. Atatürk	Yes	Erzurum
10. Atılım	Yes	Ankara
11. İnönü	Yes	Malatya
12. İzmir Yüksek Teknoloji Enstitüsü	Yes	İzmir
13. İzmir	Yes	İzmir
14. İzmir Ekonomi	Yes	İzmir
15. İzmir Katip Çelebi	Yes	İzmir
16. Bahçeşehir	Yes	İstanbul
17. Başkent	Yes	Ankara
18. Bülent Ecevit	Yes	Zonguldak
19. Bilkent	Yes	Ankara
20. Boğaziçi	Yes	Istanbul
21. Bozok	No	Yozgat
22. Bursa Teknik	Yes	Bursa
23. Çanakkale 18 Mart	Yes	Çanakkale
24. Çankaya	No	Ankara
25. Celal Bayar	Yes	Manisa
26. Çukurova	Yes	Adana
27. Dicle	Yes	Diyarbakır
28. Doğuş	No	Istanbul
29. Dokuz Eylül	Yes	İzmir
30. Dumlupınar	Yes	Kütahya
31. Düzce	Yes	Düzce
32. Ege	Yes	İzmir
33. Erciyes	Yes	Kayseri
34. Erzurum Teknik	Yes	Erzurum
35. Fatih	Yes	Istanbul
36. Fırat	Yes	Elazığ
37. Gazi	Yes	Ankara
38. Gaziantep	Yes	Gaziantep
39. Gaziosmanpaşa	Yes	Tokat

40. Gediz	Yes	Istanbul
41. Gebze Teknik	Yes	İzmit
42. Hacettepe	Yes	Ankara
43. Harran	No	Şanlıurfa
44. Hasan Kalyoncu	No	Gaziantep
45. Işık	No	Istanbul
46. Istanbul	Yes	Istanbul
47. Istanbul Teknik	Yes	Istanbul
48. Istanbul Sabahattin Zaim	No	Istanbul
49. Istanbul Şehir	No	Istanbul
50. Kadir Has	No	Istanbul
51. Kahramanmaraş Sütçü İmam	Yes	Kahramanmaraş
52. Karadeniz Teknik	No	Trabzon
53. Kastamonu	Yes	Kastamonu
54. Kırıkkale	Yes	Kırıkkale
55. Koç	No	Istanbul
56. Kocaeli	Yes	İzmit
57. Maltepe	Yes	Istanbul
58. Marmara	Yes	Istanbul
59. Istanbul Medeniyet	Yes	Istanbul
60. Medipol	No	Istanbul
61. MEF	Yes	Istanbul
62. Melikşah	Yes	Kayseri
63. Mersin	Yes	Mersin
64. Muğla Sıtkı Koçman	Yes	Muğla
65. Mustafa Kemal	Yes	Hatay
66. Necmettin Erbakan	Yes	Konya
67. Namık Kemal	Yes	Tekirdağ
68. Nevşehir Hacı Bektaşi Veli	Yes	Nevşehir
69. Niğde	Yes	Niğde
70. ODTÜ	Yes	Ankara
71. Okan	No	Istanbul
72. Ondokuz Mayıs	Yes	Samsun
73. Eskişehir Osmangazi	Yes	Eskişehir
74. Özyeğin	Yes	Istanbul
75. Pamukkale	Yes	Denizli

76. Recep Tayyip Erdoğan	Yes	Rize
77. Sabancı	Yes	Istanbul
78. Sakarya	Yes	Sakarya
79. Süleyman Demirel	Yes	Isparta
80. Selçuk	Yes	Konya
81. TOBB	No	Ankara
82. Toros	No	Mersin
83. Trakya	Yes	Edirne
84. Turgut Özal	No	Ankara
85. Uludağ	Yes	Bursa
86. Üsküdar	No	Istanbul
87. Yeditepe	Yes	Istanbul
88. Yıldız Teknik	Yes	Istanbul
89. Yeni Yüzyıl	Yes	Istanbul
90. Zirve	No	Gaziantep

,

3.2 Research Design

3.2.1 Research Methodology

As a second generation multi-variate analysis technique, Structural Equation Modelling method was adopted for the purpose of this study which relies on theory based testing of a model including multiple variables (Hair, Black, Babin, & Anderson, 2010).

3.2.2 Survey and Instrument Design

Based on currently available literature, and previous research, it was decided to develop new constructs for the purpose of the specific research study based on the scale development principles and steps suggested by Karakoç and Dönmez (2014) (Figure 5).

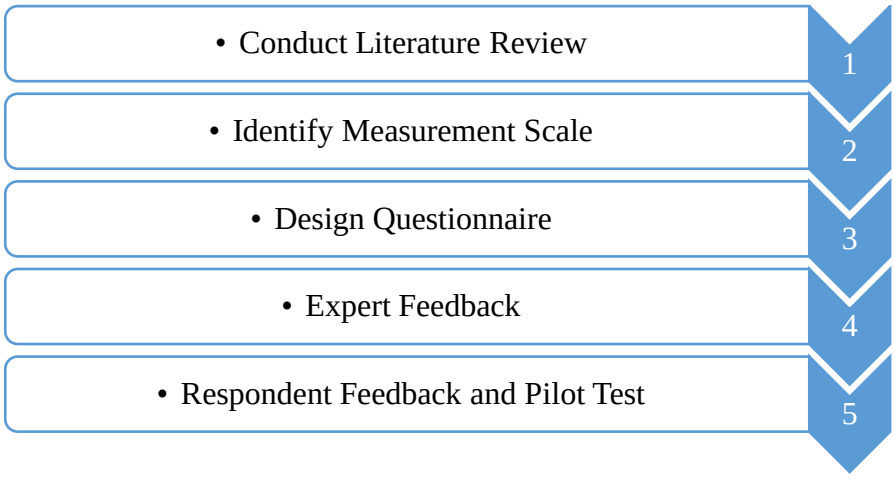

Figure 5 Principles of Scale Development

There are some evidence of previous research for measuring perceived entrepreneurial orientation of universities such as Organizational Creativity Perceptions of Academic Staff study of Balay (2010) or University Entrepreneurship study of Bulut, Tutuncuoglu, and Halac (2012) adopted from Todorovic, McNaughton, and Guild (2011). Science/market orientation of the faculty is a complicated topic tracing back to the norms of science deriving from philosophical insights. However it has been a preliminary attempt of this research in order to understand whether quantitative studies can derive generalizations about the topic.

Self-efficacy and entrepreneurial intent constructs in entrepreneurship studies focus on self-efficacy, entrepreneurial and proactiveness abilities of general adults however a more specific construct needs to be designed for targeting academics of whom entrepreneurial activity is more different than entrepreneurial trajections of adult careers. In order to be responsive to the objectives of this specific research, a more comprehensive sets of items were generated based on several constructs and

theory used in previous studies. Initial item generation has been completed based on those constructs and theoretical foundations (see table 8).

Table 8

New Constructs Adopted From Available Evidence

Construct Name	**Adopted From**
Perceived Entrepreneurial Orientation of the University	(Todorovic et al., 2011) (Kalar & Antoncic, 2015) (Rothaermel, Agung, & Jiang, 2007) (Clarysse et al., 2005) (L. R. De Silva, Uyarra, & Oakey, 2012)
Science/Society Orientation of the Faculty	(Kharbanda, 2011); (Krabel & Mueller, 2008); (Jain et al., 2009); (Donald S Siegel et al., 2003); (Glenna, Welsh, Ervin, Lacy, & Biscotti, 2011)
Academic Self-Efficacy	(Chen et al., 1998) (Clarysse et al., 2011) (Prodan & Drnovsek, 2010) (Vohora et al., 2004) (Kidwell, 2013)
Academic Entrepreneurial Intentions	(Huyghe & Knockaert, 2015)

Questionnaires in the form of measurement instruments have been developed following the effective questionnaire development procedures adressed by Peterson (2000) (Figure 6). A cover letter adressing participants of the study was included explaining aim and scope of the study (see appendix A).

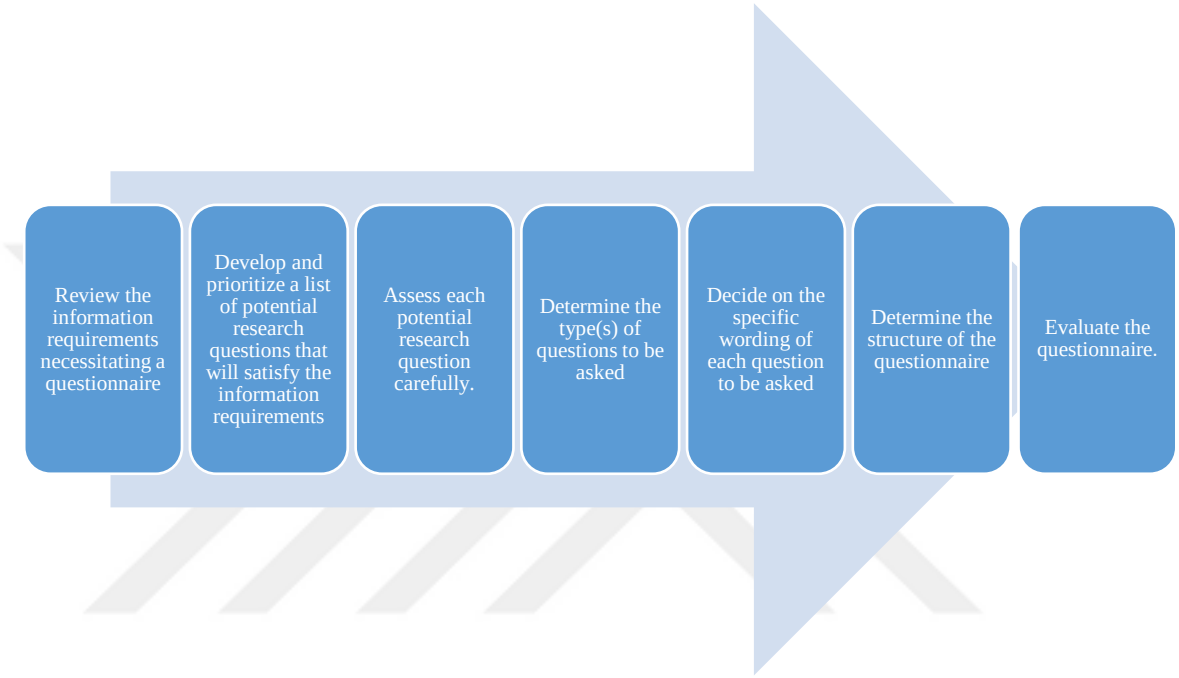

Figure 6. Effective Development of Questionnaires, Adopted from Peterson, R. A. (2000). *Constructing effective questionnaires* (Vol. 1): Sage Publications Thousand Oaks, CA.

Secondly, expert feedback has been retrieved from following respondents and relevant adjustments have been made on items accordingly:

-PhD Candidate with MBA in Knowledge and Innovation Management

-Professor of Entrepreneurship

-Professor of Entrepreneurial Finance

-Top Executive at Technology Transfer function

Following expert feedback, respondent reviews have been conducted by actual respondents for item evaluation in terms of objectivity, ethical considerations, relevance and cognitive penetrability (see Appendix B).

The questionnaire scale was designed on likert type scale[31] in order to measure favorable or unfavorable attitudes on towards the topic of interest with graded responses on each statement.

3.2.3 Survey Methodology

Based on suggested adjustments, final versions of the constructs have been used in web survey tool. Web-based survey method has been adopted as the respondent profile is qualified in terms of education and familiarity with technology. Furthermore, internet based surveys provide decreased costs, and faster response rates (Reynolds, 2006).

[31] A Likert scale is a summated rating scale used for measuring attitudes. The method was developed by Rensis Likert in 1932.

3.2.4 Hypotheses and Variables

Based on exploratory analysis, structural model consisted of ten exogenous variables, two endogenous variables and ten group variables. Exogenous variables are Perceived Entrepreneurial Orientation of the University (Affiliated Institution), Perceived Department Industry Relations, Reputation of the institution, Age, Years at Institution, Seniority, and Perceived Environmental Risk, Business Academic Self-Efficacy, Scientific Self-Efficacy and Collaboration Self-Efficacy. Endogenous variables are Soft Academic Entrepreneurial Intentions, and Hard Academic Entrepreneurial Intentions. Group variables are gender, discipline, studies abroad, previous training at three categories (business/ management, entrepreneurship, intellectual property), previous experience at seven categories (spin-off, research collaboration, intellectual property, industrial trainer, professional experience) (see Figure 7).

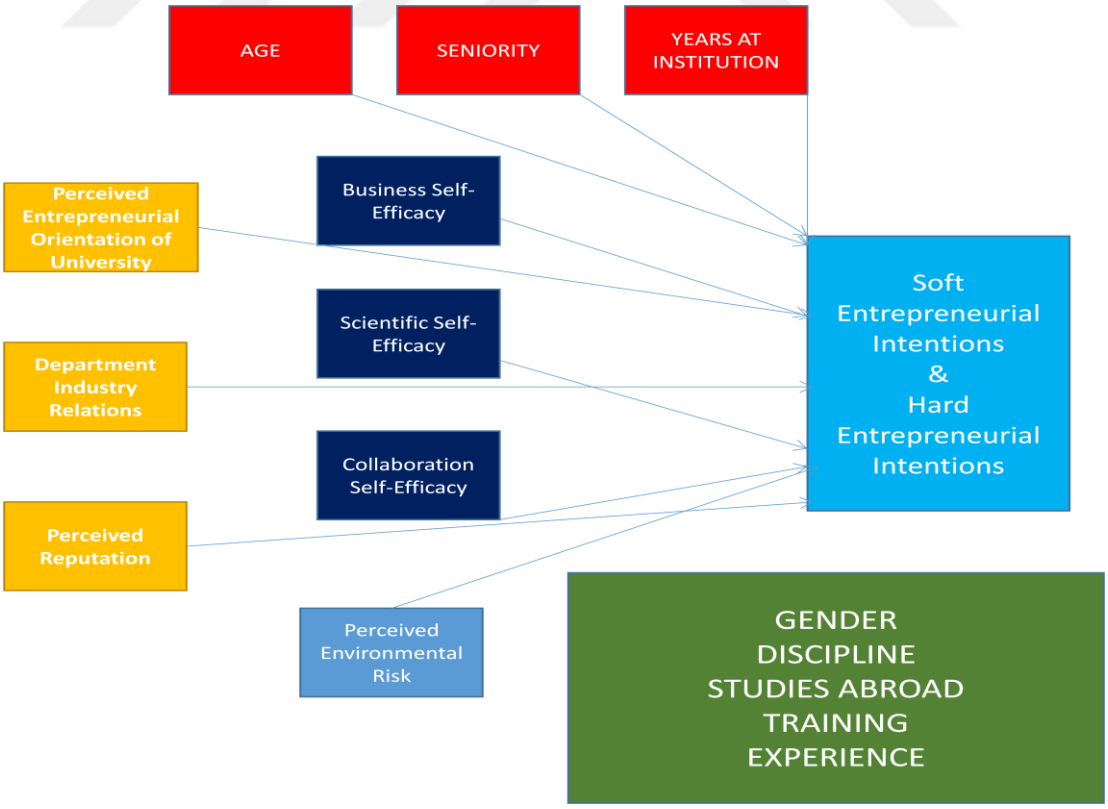

Figure 7. Conceptual Framework

Hyphoteses are listed below:

Hypotheses	Relationship	
H1	Individuals who perceive their affiliated university as entrepreneurial are more likely to engage in soft entrepreneurial activities.	PerUni>SoftAE (+)
H2	Individuals who perceive their affiliated university as entrepreneurial are more likely to engage in hard entrepreneurial activities.	PerUni>HardAE (+)
H3	Individuals who perceive their affiliated department has industrial relations are more likely to engage in soft entrepreneurial activities.	DepUni>SoftAE (+)
H4	Individuals who perceive their affiliated department has industrial relations are more likely to engage in hard entrepreneurial activities.	DepUni>HardAE(+)
H5	Individuals who perceive their affiliated institution has reputation are more likely to engage in soft entrepreneurial activities.	Rep>SoftAE (+)
H6	Individuals who perceive their affiliated institution has reputation are more likely to engage in hard entrepreneurial activities.	Rep>HardAE(+)
H7	Individuals who possess business self-efficacy are more likely to engage in soft entrepreneurial activities.	BSE>SoftAE(+)
H8	Individuals who possess business self-efficacy are more likely to engage in hard entrepreneurial activities.	BSE>HardAE(+)
H9	Individuals who possess collaboration self-efficacy are more likely to engage in soft entrepreneurial activities.	CSE>SoftAE (+)
H10	Individuals who possess collaboration self-efficacy are more likely to engage in hard entrepreneurial activities.	CSE>HardAE (+)
H11	Individuals who possess scientific self-efficacy are more likely to engage in soft entrepreneurial activities.	SSE>SoftAE (+)
H12	Individuals who possess scientific self-efficacy are more likely to engage in hard entrepreneurial activities.	SSE>HardAE (+)
H13	Individuals who are older are more likely to engage in soft entrepreneurial activities.	Age>SoftAE (+)
H14	Individuals who are older are more likely to engage in hard entrepreneurial activities.	Age>HardAE (+)
H15	Individuals who have spent more years at their recent institution are more likely to engage in soft entrepreneurial activities.	Yearsat>SoftAE (+)
H16	Individuals who have spent more years at their recent institution are more likely to engage in hard entrepreneurial activities.	Yearsat>HardAE(+)
H17	Individuals who are more senior are more likely to engage in soft entrepreneurial activities.	Seniority>SoftAE (+)
H18	Individuals who are more senior are more likely to engage in hard entrepreneurial activities.	Seniority>HardAE (+)
H19	Individuals who perceive certain environmental	IndRisks>SoftA

	issues as risky are more like to engage in soft entrepreneurial activities	E (+)
H20	Individuals who perceive certain environmental issues as risky are more like to engage in hard entrepreneurial activities	IndRisks>Hard AE (+)
Hypotheses 21,22,23,24, 25,26,27,28, 29,30	Multigroup comparisons for binary variables	Gender, Discipline, Study Abroad,Training ,Experience

4 RESULTS

4.1 Exploratory Factor Analyses with Pilot Data

As Hair et al. (2010) suggested, exploratory factor analyses have been conducted both with pilot and field study data in order to understand the underlying structure of the variables and make a comparison between the potential dimensions of the constructs. The exploratory results have been used to contribute to theory development and to set confirmatory factor analysis structure.

4.1.1 Perceived Entrepreneurial Orientation of the University

The results of KMO and Bartlett' s test proved that the construct is appropriate for conducting exploratory factor analysis. The analysis resulted in three dimensions explaining 65.8% of total variance (Table 9).

Table 9

KMO and Bartlett' s Test

KMO	Barlett' s	Sig.	Dimensions	Variance Explained
,910	2440,852	,000	Departmental University Industry Relations Support for Academic entrepreneurship Perceived Reputation	65.8%

4.1.2 Academic Self-Efficacy

The results of KMO and Bartlett' s test proved that the construct is appropriate for conducting exploratory factor analysis. The analysis resulted in three dimensions explaining 64.7% of total variance (Table 10).

Table 10

KMO and Bartlett' s Test

KMO	Barlett' s	Sig.	Dimensions	Variance Explained
,835	589,209	,000	• Business Self-Efficacy • Scientific Self-Efficacy • Collaboration Self-Efficacy	64.7%

4.1.3 Academic Entrepreneurial Intentions

The results of KMO and Bartlett' s test proved that the construct is appropriate for conducting exploratory factor analysis. The analysis resulted in three dimensions explaining 64.7% of total variance (Table 11).

Table 11

KMO and Bartlett' s Test

KMO	Barlett' s	Sig.	Dimensions	Variance Explained
,843	783,212	,000	• University Industry Relations Intention • Spin-off Intention • Intellectual Property Intention	71.7%

4.3 Field Study Data

4.3.1 Perceived Entrepreneurial Orientation of the University

Based on initial results with the field data, variables 7 and 21 were eliminated. Variables 26 and 14 were not acceptable at 0.50 level and were eliminated. The final results for KMO and Barlett' s test showed that the construct is appropriate for conducting exploratory factor analysis. The analysis resulted in three dimensions explaining 64.7% of total variance with cronbach alpha reliability of ,963 for all

items (Table 12). Principle components analysis has been conducted and factor based reliability analysis are shown below (See Table).

Table 12

KMO and Bartlett' s Test

KMO	Barlett' s	Sig.	Dimensions	Variance Explained	Cronbach' s Alpha
,962	8827,668	,000	• Perceived Entrepreneurial Orientation of the University • Perceived Department and Industry Relations • Perceived Reputation	61,39%	,963

Table 13

Factor Loadings from Principal Component Factor Analysis with Varimax Rotation for a Three-Factor Solution for Perceived Entrepreneurial Orientation of Institution Questionnaire (n=404)

Factors / Items	Perceived Entrepreneurial Orientation of the University α=0,954	Perceived Department and Industry Relations α=0,920	Perceived Reputation α=0,862
29	0,789		
23	0,773		
27	0,770		
19	0,758		
25	0,749		
28	0,714		
18	0,703		
35	0,700		
33	0,699		
36	0,695		
22	0,670		
17	0,652		
20	0,650		

16	0,648		
30	0,642		
31	0,641		
34	0,591		
32	0,520		
24	0,517		
5		0,781	
8		0,778	
3		0,751	
4		0,747	
6		0,737	
13		0,689	
9		0,633	
10			0,748
11			0,737
15			0,670
12			0,633

Note. Loadings <0.40 are omitted.

4.3.2 Academic Self-Efficacy

Based on initial results with the field data, variable 73 was eliminated not acceptable at 0.50 level. The final results for KMO and Barlett' s test showed that the construct is appropriate for conducting exploratory factor analysis. The analysis resulted in three dimensions explaining 64.19% of total variance with cronbach alpha reliability of ,890 for all items (Table 14). Principle components analysis has been conducted and factor based reliability analysis are shown below (see table 15).

Table 14

KMO and Bartlett' s Test

KMO	Barlett' s	Sig.	Dimensions	Variance Explained	Cronbach' s Alpha
,891	2262,880	,000	• Business Self-Efficacy • Collaboration Self-Efficacy • Scientific Self-Efficacy	64,19%	,890

Table 15

Factor Loadings from Principal Component Factor Analysis with Varimax Rotation for a Three-Factor Solution for Academic Self-Efficacy Questionnaire (n=404)

Factors / Items	Business Self Efficacy α=0,864	Scientific Self Efficacy α=0,790	Collaboration Self Efficacy α=0,759
67	0,827		
70	0,817		
69	0,793		
68	0,727		
72	0,619		
66	0,582		
71		0,785	
74		0,769	
62		0,661	
61		0,656	
64			0,853
65			0,817
63			0,608

Note. Loadings <0.40 are omitted.

4.3.3 Academic Entrepreneurial Intentions

Based on the analysis with the field data, final results for KMO and Barlett' s test showed that the construct is appropriate for conducting exploratory factor analysis. The analysis resulted in three dimensions explaining 64.20% of total variance with cronbach alpha reliability of ,910 for all items (Table 16). Principle components analysis has been conducted and factor based reliability analysis are shown below (Table 17).

Table 16

KMO and Bartlett' s Test

KMO	Barlett' s	Sig.	Dimensions	Variance Explained	Cronbach' s Alpha
,893	2262,880	,000	• Soft Entrepreneurial Intentions • Hard Entrepreneurial Intentions	64,20%	,910

Table 17

Factor Loadings from Principal Component Factor Analysis with Varimax Rotation for a Two-Factor Solution for Academic Entrepreneurial Intentions Questionnaire (n=404)

Factors / Items	Soft Entrepreneurial Intentions α=0,882	Hard Entrepreneurial Intentions α=0,875
109	0,789	
111	0,785	
108	0,760	
113	0,745	
110	0,726	
112	0,688	
103		0,861
104		0,847

102		0,806
106		0,622
105		0,621
107		0,511

Note. Loadings <0.40 are omitted.

4.3.4 Perception of Environmental Risk

Based on the initial analysis with the field data, variable 81 and 85 were eliminated due to close factor loadings on multiple dimensions. Final results for KMO and Barlett' s test showed that the construct is appropriate for conducting exploratory factor analysis. The analysis resulted in three dimensions explaining 60.80 % of total variance with cronbach alpha reliability of ,940 for all items (Table 18). Principle components analysis has been conducted and factor based reliability analysis are shown below (see table 19).

Table 18

KMO and Bartlett' s Test

KMO	Barlett' s	Sig.	Dimensions	Variance Explained	Cronbach' s Alpha
,939	5076,147	,000	• Soft Entrepreneurial Intentions • Hard Entrepreneurial Intentions	60,8 %	,940

Table 19

Factor Loadings from Principal Component Factor Analysis with Varimax Rotation for a Three-Factor Solution for Perceived Environmental Risk Questionnaire (n=404)

Factors / Items	Indirect Ecological Risks α=0,911	Direct Industrial Risks α=0,887	Resource Extinction Risks α=0,832
Global Warming var 78	0,816		
Acid Rains var 77	0,811		
Ozone Layer var 79	0,777		
Atmosphere-Heavy Metals var 84	0,689		
Eutrophication var 86	0,663		
Drilling for Oil var 80	0,661		
Pesticides var 85	0,610		
GMO var 88		0,734	
Urbanization effect on wildlife habitats var 91		0,727	
Industrialization effect on wetlands var 93		0,650	
Sewage var 87		0,634	
Surface Runoff var 94		0,607	
Invasive Species Carried by Human var 89		0,603	
Radiation var 82		0,577	
Clear-cut logging var 90		0,546	
Overgrazing var 96			0,803
Commercial Fishing var 98			0,791
Human Population Growth var 99			0,668
Open Mining var 95			0,645
Damming of Rivers for Electric Power var 92			0,579
Sports and Entertainment Hunting var 97			0,566

Note. Loadings <0.40 are omitted.

4.4 Measurement Models

4.4.1 Face and Content Validity

As one of the sources of validity evidence (Cook & Beckman, 2006), face and content validity is related to the construct' s ability to measure the intended topic. Starting from item generation, every step must be taken carefully in order to prove the construct' s face and content validity. As in similar studies (Axler, 2015; Kilian, Schubert, & Bjørn-Andersen, 2015), in-depth review of literature, pre-tests with experts and respondents, and relevant modifications ensured face and content validity of the constructs.

4.4.2 Goodness of Fit

Hair et al. (2010) framed the rules of thumb for structural equation modelling starting with measurement model specifications. In order to test structural model hypotheses, goodness of fit indices of measurement model constructs should meet criteria values. As Hair et al. (2010) suggested fundamental measures of goodness of fit indices may represent chi-Square, degree of freedom, statistical significance of chi square, RMSEA as one type of absolute indices; Normed Fit Index (NFI), Tucker Lewis Index (TFI), Comparitive Fit Index (CFI), or Relative non-centrality index (RNI) as one type of incremenal fit indices, and Adjusted Goodness of fit index (AGFI) or Parsimony Normed Fit İndex (PNFI) as part of parsimony fit indices. They claimed that reporting chi square, degrees of freedom, RMSEA, CFI or TLI, provide sufficient evidence to prove a model' s acceptability.

4.4.2.1 Perceived Entrepreneurial Orientation of the University

All observed variables loaded to their latent variables above 0.50 threshold value. Final model showed goodness of fit with two covariates between error terms (Table 20)

Table 20

Goodness of Fit Indices for Perceived Entrepreneurial Orientation Construct

Models	χ^2	df	χ^2/ df	RMSEA	CFI	Sig.
Basic Model	1204,213	402	2,996	,070	,907	,000
Model 1	1133,739	401	2,827	,067	,915	,000
Model 2	1073,166	400	2,683	,065	,922	,000

4.4.2.2 Academic Self-Efficacy

All observed variables loaded to their latent variables above 0.50 threshold value. Final model showed goodness of fit with one covariate between error terms (Table 21).

Table 21

Goodness of Fit Indices for Perceived Entrepreneurial Orientation Construct

Models	χ^2	df	χ^2/ df	RMSEA	CFI	Sig.
Basic Model	241,657	62	3,898	,085	,919	,000
Model 1	214,829	61	3,522	,079	,931	,000

4.4.2.3 Academic Entrepreneurial Intentions

Var 112 loaded below 0,50 threshold value and was eliminated. Variables 103 and 102 were eliminated due to cognitive bias potential with extreme covariation between error terms. Final model showed goodness of fit with no more than three modifications (Table 22).

Table 22

Goodness of Fit Indices for Academic Entrepreneurial Intentions Construct

Models	χ^2	df	χ^2/ df	RMSEA	CFI	sig
Basic Model	535,381	53	10,102	,150	,839	,000
Model 1 (var 112 eliminated)	487,641	43	11,340	,160	,845	,000
Model 2 (var 103 eliminated)	195,329	34	5,745	,109	,933	,000
Model 2 (Var 102 eliminated)	89,841	26	3,455	,078	,971	,000

4.4.2.4 Perceived Environmental Risk

All observed variables loaded to their latent variables above 0.50 threshold value. Final model showed goodness of fit with one covariate between error terms (Table 23).

Table 23

Goodness of Fit Indices for Perceived Environmental Risk Construct

Models	χ^2	df	χ^2/ df	RMSEA	CFI	sig
Basic Model	773,089	186	4,156	,088	,882	,000
Model 1	715,284	185	3,866	,084	,893	,000
Model 2	644,423	184	3,502	,079	,907	,000

4.4.3 Convergent Validity

As a means of testing construct validity, additional to confirmatory factor analysis with goodness of fit (GOF) indices, factor loadings, composite reliability[32] (CR) and average variance extracted[33] (AVE) are reported for convergent validity (Fornell & Larcker, 1981). Results for analyses were reported below.

[32] The automated formula on the link was used for composite reliability calculations using factor loadings of the AMOS output: http://www.thestatisticalmind.com/calculators/comprel/comprel.htm

[33] AVE was calculated based on the Formula; total of square factor loadings divided by number of items of the latent variable.

4.4.3.1 Perceived Entrepreneurial Orientation of the Institution

Table 24

Factor Loadings, AVE and CR

Construct	**Items**	**Factor Loading (>0.50)**	**AVE (>0.45)**	**CR (>0.70)**
Perceived Entrepreneurial Orientation of University	var24	0,557	0.53	0.955
	var32	0,515		
	var34	0,555		
	var31	0,696		
	var30	0,696		
	var16	0,754		
	var20	0,677		
	var17	0,761		
	var22	0,714		
	var36	0,748		
	var33	0,714		
	var35	0,769		
	var18	0,831		
	var28	0,816		
	var25	0,755		
	var19	0,796		
	var27	0,833		
	var23	0,769		
	var29	0,798		
Perceived Department University Industry Relations	var9	0,797	0.61	0.918
	var13	0,825		
	var6	0,753		
	var4	0,738		
	var3	0,743		
	var8	0,795		
	var5	0,841		
Reputation	var12	0,678	0,61	0.865
	var15	0,858		
	var11	0,831		
	var10	0,762		

4.4.3.2 Academic Self-Efficacy

Table 25

Factor Loadings, AVE and CR

Construct	**Items**	**Factor Loading (>0.50)**	**AVE (>0.45)**	**CR (>0.70)**
Business Self-Efficacy	var66	0,613	0,52	0.868
	var72	0,696		
	var68	0,726		
	var69	0,781		
	var70	0,772		
	var67	0,741		
Scientific Self-Efficacy	var61	0,755	0,46	0.776
	var62	0,78		
	var74	0,565		
	var71	0,615		
Collaboration Self-Efficacy	var63	0,719	0,53	0.774
	var65	0,8		
	var64	0,667		

4.4.3.3 Academic Entrepreneurial Intentions

Table 26

Factor Loadings, AVE and CR

Construct	**Items**	**Factor Loading (>0.50)**	**AVE (>0.45)**	**CR (>0.70)**
Soft Entrepreneurial Intentions	var110	0,663	0,62	0.890
	var113	0,733		
	var108	0,879		
	var111	0,759		
	var109	0,884		
Hard Entrepreneurial Intentions	var107	0,732	0,62	0.865
	var105	0,849		
	var106	0,929		
	var104	0,604		

4.4.3.4 Perceived Environmental Risks

Table 27

Factor Loadings, AVE and CR

Construct	**Items**	**Factor Loading (>0.50)**	**AVE (>0.45)**	**CR (>0.70)**
Indirect Ecological Risks	var78	0,823	0,60	0.915
	var77	0,794		
	var79	0,821		
	var84	0,755		
	var86	0,774		
	var80	0,734		
	var85	0,752		
Direct Industrial Risks	var90	0,691	0,50	0.890
	var82	0,606		
	var89	0,731		
	var94	0,799		
	var87	0,744		
	var93	0,758		
	var91	0,728		
	var88	0,599		
Resource Extinction Risks	var97	0,591	0,46	0.837
	var92	0,643		
	var95	0,726		
	var99	0,606		
	var98	0,75		
	var96	0,75		

4.4.4 Discriminant Validity

Fornell and Larcker (1981) reported that discriminate validity exists when the level of square root of AVE is greater than the intercorrelations between constructs. Hair et al. (2010) suggested that intercorrelations between the constructs below 0.90 value indicate no multicollinearity. In absence of sufficient discriminant validity and in the presence of multi-collinearity issues, some scholars suggested (Cohen, Cohen, West, & Aiken, 2013; Farrell, 2010) that excluding collinear variables from the model is a solution for enhancing model' s validity. Results are reported below for the constructs.

4.4.4.1 Perceived Entrepreneurial Orientation

Table 28

Discriminant Validity

	PerEOUni	DepUniIndustry	Reputation
PerEOUni	√AVE 0,728*		
DepUniIndustry	0,696	√AVE 0,78*	
Reputation	0,688	0,816	√AVE 0,78*

Note. *Diagonal elements report the square root AVE and other matrix entries report the correlation estimation between them.

4.4.4.2 Academic Self-Efficacy

Table 29

Discriminant Validity

	Business Self-Efficacy	Scientific Self-Efficacy	Collaboration Self-Efficacy
Business Self-Efficacy	√AVE 0.72*		
Scientific Self-Efficacy	0,608	√AVE 0.67*	
Collaboration Self-Efficacy	0,523	0,715	√AVE 0.72*

Note.*Diagonal elements report the square root AVE and other matrix entries report the correlation estimation between them.

4.4.4.3 Academic Entrepreneurial Intentions

Table 30

Discriminant Validity

	Soft Entrepreneurial Intentions	Hard Entrepreneurial Intentions
Soft Entrepreneurial Intentions	√AVE 0,78	
Hard Entrepreneurial Intentions	0,708	√AVE 0,78

Note. *Diagonal elements report the square root AVE and other matrix entries report the correlation estimation between them.

4.4.4.4 Perceived Environmental Risks

For the purpose of this study, and referring to potential multi-collinearity issues, only direct industrial risks dimension was used for perceived environmental risk construct in order to assess sentiments for applied science in sustainability issues.

Table 31

Discriminant Validity

	Indirect Eco. Risks	Direct Ind. Risks.	Resource Extinction Risks
Indirect Eco. Risks	√AVE 0,77*		
Direct Ind. Risks.	0,858	√AVE 0,70*	
Resource Extinction Risks	0,697	0,716	√AVE 0,67*

Note.*Diagonal elements report the square root AVE and other matrix entries report the correlation estimation between them.

4.4.5 Concurrent Criterion Validity

As Karakoç and Dönmez (2014) claimed, concurrent criterion validity is the measure of how a new construct or its sub-dimensions are correlated with similar constructs namely as criteria constructs assumed to measure similar concepts. For the purpose of this study, respondents were asked to report voluntarily on the additional

questionnaires which represent the criterion constructs. Results showed that new constructs provide availability of criterion validity (see Table 32, see Appendix C) based on significance of the correlation.

Table 32

Constructs Compared with Criteria

Construct	**Criterion**
Perceived Entrepreneurial Orientation of the University	Level of perceptions of academic staff about organizational creativity at managerial dimension (Balay, 2010)
Perceived Department Industry Relations	
Reputation	
Business Self-Efficacy	General Self-Efficacy (Sherer et al., 1982; YILDIRIM & İLHAN, 2010)
Scientific Self-Efficacy	
Collaboration Self-Efficacy	
Soft Entrepreneurial Intentions	Proactive Personality[34] (Bateman & Crant, 1993)
Hard Entrepreneurial Intentions	

4.5 Structural Model

In order to analyze the dependence relationships between the hypothesized model' s constructs, structural model was set with latent and observed variables (Hair et al., 2010). The final model built based on modifications are provided below with goodness of fit indices. The hypothesized model fitted the data only moderately well (CFI = 0·892) (Table 33, see Figure 8).

[34] Translated into Turkish by Kızıldağ in 2010: http://acikerisim.aku.edu.tr/xmlui/bitstream/handle/11630/1745/380494.pdf?sequence=1&isAllowed=y

Table 33

GoF Results of Structural Model

Models	χ^2	df	χ^2/ df	RMSEA	CFI	Sig
Basic Model*	3755,195	1861	2,018	,050	,884	,000
Model 1	3707,086	1860	1,993	,050	,887	,000
Model 2	3654,671	1859	1,966	,049	,890	,000
Model 3	3618,895	1858	1,948	,048	,892	,000

*significant at p<0,000.

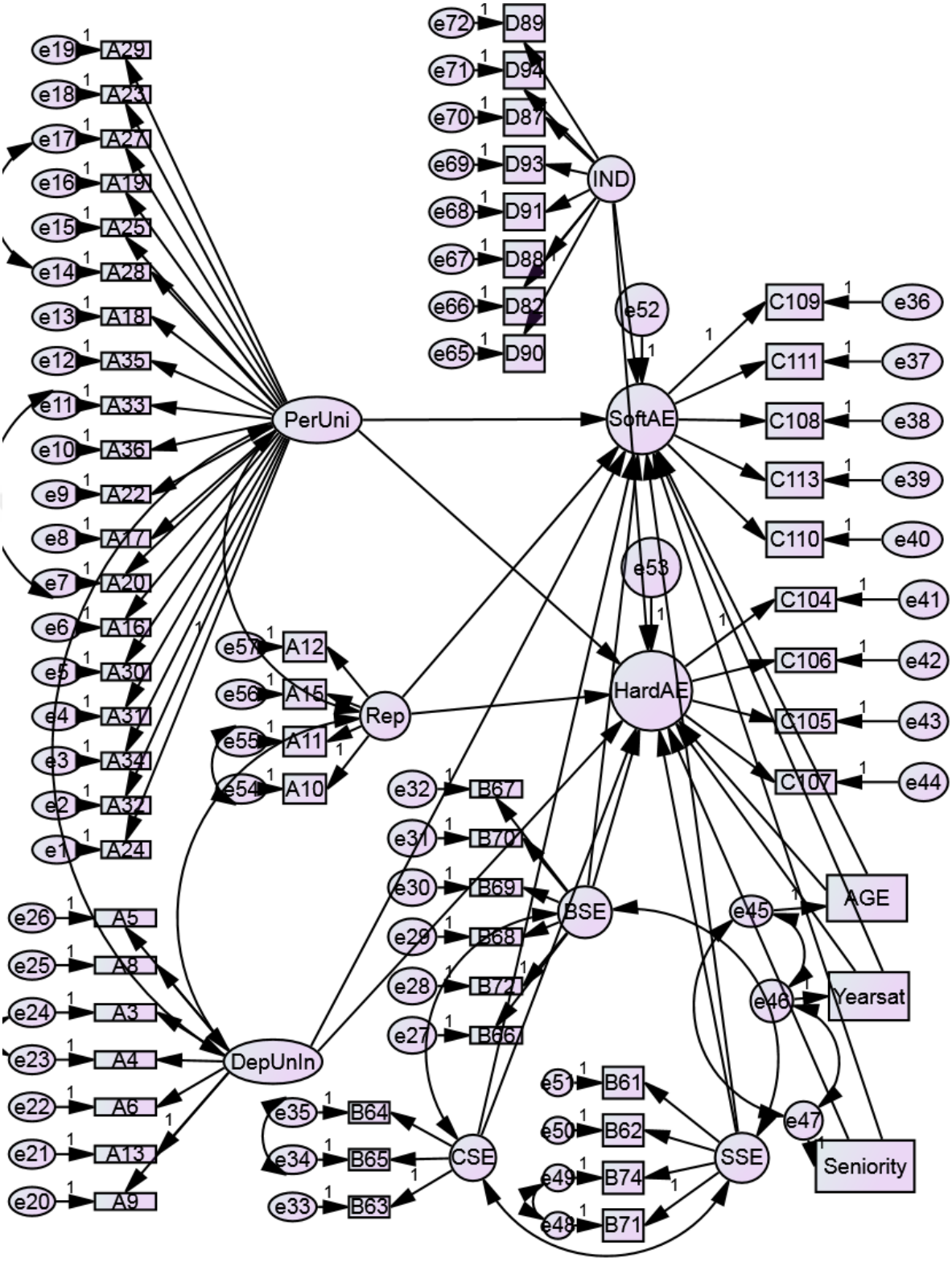

Figure 8 Structural Model

Based on the hypotheses, results are provided for supported relationships between the constructs (Table 34, Figure 9) and Table 35 shows the GOF indices of the final model.

Table 34

Results for Direct Hypotheses

Hypotheses	**Relationship**	**Estimate**	**Sig.**	**Result**
H1	PerUni>SoftAE(+)	-,188	,063	Not Supported
H2	PerUni>HardAE(+)	-,046	,551	Not Supported
H3	DepUni>SoftAE(+)	,389	,000*	Supported
H4	DepUni>HardAE(+)	,105	,222	Not Supported
H5	Rep>SoftAE (+)	-,022	,878	Not Supported
H6	Rep>HardAE(+)	,004	,972	Not Supported
H7	BSE>SoftAE(+)	,695	,003*	Supported
H8	BSE>HardAE(+)	,581	,009*	Supported
H9	CSE>SoftAE (+)	-2,360	,000*	Not Supported
H10	CSE>HardAE (+)	-2,350	,000*	Not Supported
H11	SSE>SoftAE (+)	2,877	,000*	Supported
H12	SSE>HardAE (+)	3,097	,000*	Supported
H13	Age>SoftAE (+)	-,186	,060	Not Supported
H14	Age>HardAE (+)	-,157	,004*	Not Supported
H15	Yearsat>SoftAE(+)	,018	,681	Not Supported
H16	Yearsat>HardAE(+)	,011	,844	Not Supported
H17	Seniority>SoftAE	,013	,801	Not Supported
H18	Seniority>HardAE	-,010	,789	Not Supported
H19	IndRisks>SoftAE	,079	,340	Not Supported
H20	IndRisks>HardAE	,021	,747	Not Supported

*p<0,05 level.

Table 35

Final Model GOF Indice

Models	χ^2	df	χ^2/ df	RMSEA	CFI	Sig.
Basic Model*	1056,579	392	2,695	,065	,903	,000

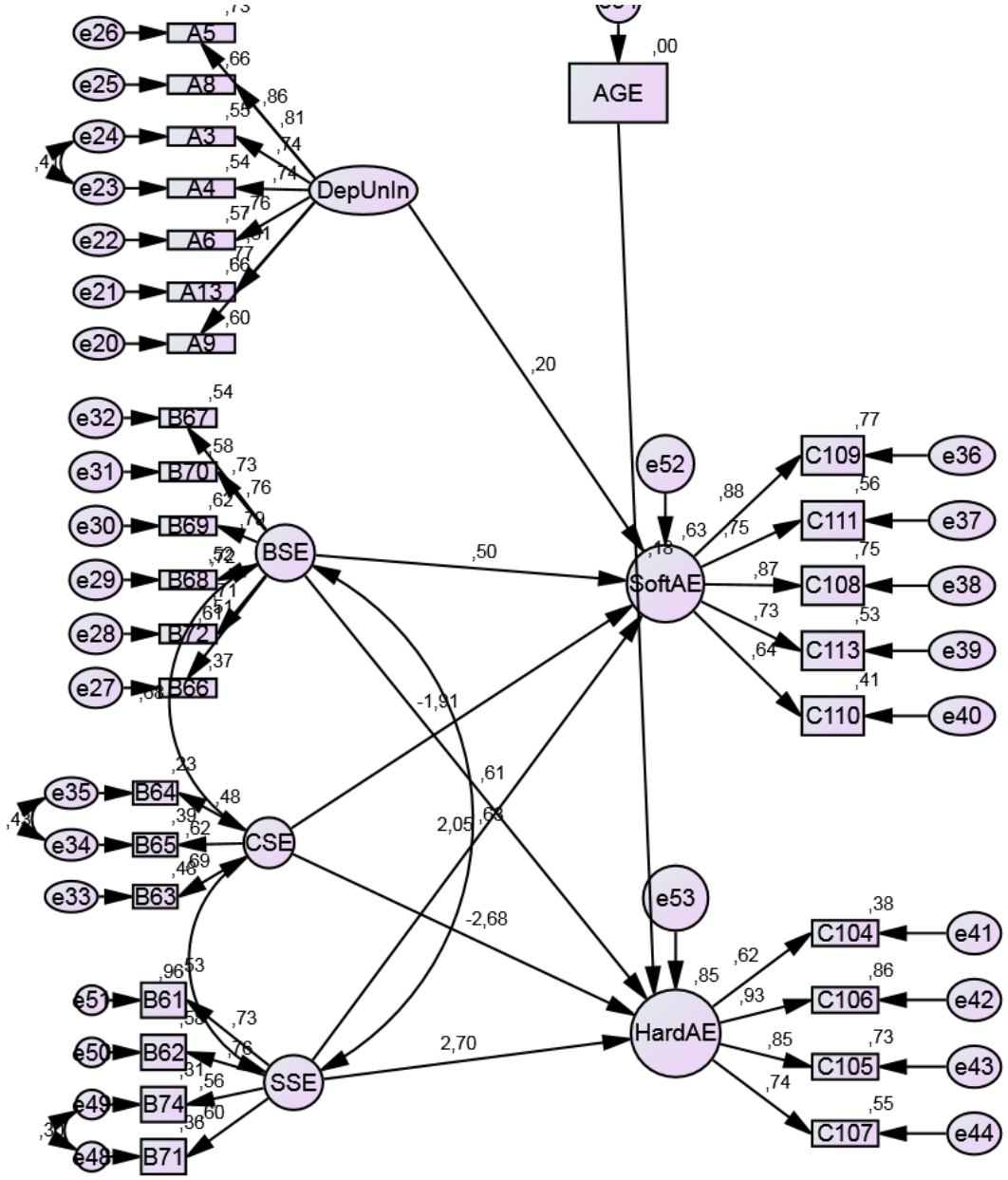

Figure 9 Final Model with Standardized Estimates

4.6 Multi Group Moderation with Critical Ratios

Following the approved theoritical model with significant relationships, multi-group moderation with critical ratios methodology was adopted such as in Gaskin, 2011 and Gaskin, 2012. Using pairwise parameter comparison matrices and regression weights for both groups in each moderator variable, provided by AMOS analysis, the results were calculated with the automated excel syntax. Moderator variables included gender, having completed masters/doctoral degree abroad or not, discipline (science and engineering), having found a spin-off company or not, having joined a research collaboration or not, experience of intellectual property or not, having trainer experience in the industry or not, having professional experience or not, business/management education, entrepreneurship education, intellectual property education. The results are provided below.

4.6.1 Gender

It was found that gender did not moderate any relationship in the model.

Table 36

Multi Group Comparison for Gender

			Men		Women		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,250	0,000	0,171	0,063	-0,744
SoftAE	<---	BSE	1,179	0,017	0,554	0,119	-1,028
HardAE	<---	BSE	1,823	0,139	0,186	0,457	-1,302
SoftAE	<---	CSE	-3,572	0,013	-2,447	0,003	0,679
HardAE	<---	CSE	-6,322	0,197	-1,784	0,007	0,918
HardAE	<---	SSE	7,963	0,186	1,974	0,000	-0,990
SoftAE	<---	SSE	4,858	0,008	2,674	0,000	-1,109
HardAE	<---	Zage	-0,109	0,003	-0,159	0,002	-0,806
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.2 Studies Abroad

Having completed a masters or doctoral degree abroad moderated the path from business self-efficacy to soft academic entrepreneurial intentions and business self-efficacy to hard academic entrepreneurial intentions. Having **not** completed masters/doctoral degree abroad strenghtened the positive effect of business self-efficacy on both soft and hard academic entrepreneurial intentions (estimates 1,762 and 1,351).

Table 37

Multi Group Comparison for Studies Abroad

			Yes		No		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,241	0,000	0,240	0,000	-0,003
SoftAE	<---	BSE	0,182	0,504	1,762	0,011	2,122**
HardAE	<---	BSE	0,166	0,602	1,351	0,024	1,749*
SoftAE	<---	CSE	-1,921	0,004	-3,758	0,008	-1,178
HardAE	<---	CSE	-2,621	0,024	-3,110	0,015	-0,283
HardAE	<---	SSE	4,269	0,016	2,947	0,008	-0,631
SoftAE	<---	SSE	3,632	0,000	3,540	0,004	-0,057
HardAE	<---	Zage	-0,074	0,093	-0,157	0,000	-1,348
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.3 Discipline

Being based in engineering discipline moderated the path from business self-efficacy to soft academic entrepreneurial intentions (Estimate 0,781).

Table 38

Multi Group Comparison for Discipline

			Science		Engineering		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,228	0,008	0,151	0,001	-0,781
SoftAE	<---	BSE	-1,313	0,206	0,781	0,013	1,929*
HardAE	<---	BSE	-3,538	0,267	1,621	0,096	1,547
SoftAE	<---	CSE	-1,652	0,027	-2,544	0,003	-0,787
HardAE	<---	CSE	-2,820	0,227	-5,118	0,122	-0,567
HardAE	<---	SSE	7,836	0,195	4,708	0,090	-0,470
SoftAE	<---	SSE	4,704	0,010	2,884	0,000	-0,917
HardAE	<---	Zage	-0,117	0,011	-0,145	0,000	-0,488
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.4 Spinoff Experience

Spinoff experience moderated the paths from collaboration self-efficacy to soft academic entrepreneurial intentions and hard academic entrepreneurial intentions, from scientific self-efficacy to soft academic entrepreneurial intentions and hard academic entrepreneurial intentions. Being an academic without spinoff experience weakens the negative effect of collaboration self-efficacy on soft and hard academic entrepreneurial intentions. Being an academic without spinoff experience strenghtens the positive effect of scientific self-efficacy on soft and hard academic entrepreneurial intentions.

Table 39

Multi Group Comparison for Spinoff Experience

			No		Yes		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,257	0,000	0,241	0,003	-0,174
SoftAE	<---	BSE	0,598	0,059	0,157	0,494	-1,126
HardAE	<---	BSE	0,520	0,114	0,133	0,504	-1,004
SoftAE	<---	CSE	-3,105	0,000	0,009	0,965	3,52***
HardAE	<---	CSE	-3,381	0,008	-0,025	0,895	2,61***
HardAE	<---	SSE	3,762	0,004	0,960	0,093	-1,961**
SoftAE	<---	SSE	3,718	0,000	0,657	0,222	-2,885***
HardAE	<---	Zage	-0,130	0,000	-0,151	0,045	-0,261
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.5 Research Collaboration Experience

Research collaboration experience moderated the path from departmental university industry relations to soft academic entrepreneurial intentions. Being an academics with research collaboration experience strenghtened the positive effect of high level perception of departmental industry relations on soft academic entrepreneurial intentions.

Table 40

Multi Group Comparison for Research Collaboration Experience

			No		Yes		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,125	0,060	0,306	0,000	1,922*
SoftAE	<---	BSE	0,786	0,219	0,910	0,011	0,170
HardAE	<---	BSE	0,523	0,313	1,847	0,219	0,833
SoftAE	<---	CSE	-4,221	0,028	-2,301	0,008	0,911
HardAE	<---	CSE	-3,445	0,035	-5,951	0,281	-0,435
HardAE	<---	SSE	5,064	0,026	6,386	0,256	0,218

SoftAE	<---	SSE	6,247	0,019	2,845	0,003	-1,200
HardAE	<---	Zage	-0,085	0,059	-0,164	0,000	-1,321
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.6 Intellectual Property Experience

Intellectual property experience moderated the path from business self-efficacy to soft academic entrepreneurial intentions, from collaboration self-efficacy to soft and hard academic entrepreneurial intentions, from scientific self-efficacy to soft and hard academic entrepreneurial intentions. Having IP experience strenghtened the positive effect of business self-efficacy on soft academic entrepreneurial intentions (based on previous contacts). Having no IP experience weakened the negative effect of collaboration self-efficacy on soft and hard academic entrepreneurial intentions. Having no IP experience strenghtened the positive effect of scientific self-efficacy on soft and hard academic entrepreneurial intentions.

Table 41

Multi Group Comparison for Intellectual Property Experience

			No		Yes		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,239	0,000	0,297	0,000	0,586
SoftAE	<---	BSE	0,552	0,122	1,871	0,007	1,683*
HardAE	<---	BSE	0,519	0,147	1,090	0,035	0,908
SoftAE	<---	CSE	-3,360	0,000	-1,070	0,056	1,985**
HardAE	<---	CSE	-3,478	0,007	-0,790	0,070	1,981**
HardAE	<---	SSE	4,364	0,003	0,943	0,030	-2,205**
SoftAE	<---	SSE	4,485	0,000	1,208	0,023	-2,492**
HardAE	<---	Zage	-0,139	0,000	-0,183	0,006	-0,595
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.7 Trainer Experience

Trainer experience did not moderate any relationship.

Table 42

Multi Group Comparison for Trainer Experience

			No		Yes		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,238	0,000	0,255	0,000	0,200
SoftAE	<---	BSE	0,906	0,037	0,358	0,287	-0,998
HardAE	<---	BSE	0,755	0,058	0,689	0,352	-0,079
SoftAE	<---	CSE	-3,338	0,005	-2,489	0,010	0,554
HardAE	<---	CSE	-3,021	0,014	-5,992	0,212	-0,599
HardAE	<---	SSE	4,101	0,008	6,243	0,195	0,424
SoftAE	<---	SSE	4,834	0,002	2,556	0,009	-1,253
HardAE	<---	Zage	-0,105	0,004	-0,188	0,000	-1,229
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.8 Professional Experience

Having previous professional experience strenghtened the positive effect of business self-efficacy on soft academic entrepreneurial intentions.

Table 43

Multi Group Comparison for Professional Experience

			No		Yes		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,247	0,000	0,200	0,001	-0,530
SoftAE	<---	BSE	-0,376	0,416	1,787	0,126	1,723*
HardAE	<---	BSE	-0,362	0,377	10,938	0,803	0,258
SoftAE	<---	CSE	-2,855	0,001	-3,341	0,126	-0,206
HardAE	<---	CSE	-2,489	0,006	-21,829	0,806	-0,218
HardAE	<---	SSE	3,932	0,003	17,502	0,800	0,197
SoftAE	<---	SSE	4,652	0,000	3,292	0,057	-0,623

HardAE	<---	Zage	-0,139	0,000	-0,107	0,023	0,544
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.9 Business/Management Education

Business/management education did not moderate any relationship.

Table 44

Multi Group Comparison for Business/Management Education

			No		Yes		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,218	0,000	0,162	0,143	-0,465
SoftAE	<---	BSE	0,302	0,223	-6,816	0,493	-0,715
HardAE	<---	BSE	0,329	0,169	10,640	0,776	0,276
SoftAE	<---	CSE	-2,364	0,000	7,903	0,481	0,914
HardAE	<---	CSE	-2,505	0,000	-12,016	0,770	-0,231
HardAE	<---	SSE	3,390	0,000	4,314	0,735	0,072
SoftAE	<---	SSE	3,541	0,000	-1,949	0,637	-1,307
HardAE	<---	Zage	-0,146	0,000	-0,078	0,120	1,141
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.10 Entrepreneurship Education

Having no entrepreneurship education strenghtened the positive effect of scientific self-efficacy on soft and hard academic entrepreneurial intentions.

Table 45

Multi Group Comparison for Entrepreneurship Education

			No		Yes		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,255	0,000	0,218	0,002	-0,404
SoftAE	<---	BSE	0,143	0,633	3,252	0,102	1,545
HardAE	<---	BSE	0,167	0,505	3,377	0,259	1,070
SoftAE	<---	CSE	-2,672	0,000	-3,166	0,091	-0,244
HardAE	<---	CSE	-2,375	0,002	-3,545	0,239	-0,376
HardAE	<---	SSE	3,205	0,000	0,942	0,238	-1,834*

SoftAE	<---	SSE	3,880	0,000	0,748	0,247	-2,728***
HardAE	<---	Zage	-0,133	0,000	-0,115	0,034	0,283
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

4.6.11 IP Education

Intellectual Property education did not moderate any relationship.

Table 46

Multi Group Comparison for IP Education

			No		Yes		
			Estimate	P	Estimate	P	z-stat
SoftAE	<---	DepUnIn	0,230	0,000	0,316	0,000	0,790
SoftAE	<---	BSE	1,226	0,016	0,685	0,416	-0,548
HardAE	<---	BSE	1,202	0,067	0,805	0,475	-0,305
SoftAE	<---	CSE	-3,838	0,005	-2,259	0,101	0,816
HardAE	<---	CSE	-4,454	0,054	-2,877	0,205	0,487
HardAE	<---	SSE	4,624	0,038	4,163	0,152	-0,126
SoftAE	<---	SSE	4,239	0,002	3,464	0,052	-0,348
HardAE	<---	Zage	-0,128	0,000	-0,076	0,274	0,686
Notes: *** p-value < 0.01; ** p-value < 0.05; * p-value < 0.10							

5 DISCUSSION

5.1 Theoritical and Methodological Contributions

This research first extends the body of knowledge and understanding of academic entrepreneurship in Turkey setting by considering different level of determinants such as individual, organizational and institutional factors. Secondly, previous research studies in the field of academic entrepreneurship in Turkey focused on a wide range of disciplines missing a focus on the determinants at science and engineering disciplines which are critical to technological innovation. In practice, this study will help policy makers and university managers gain a new perspective on how to trigger "entrepreneurial university" imperative and how to encourage the engagement of academics in entrepreneurial activities.

As Perkmann et al. (2013) discussed, organizational level determinant of academic entrepreneurship is the quality of university or the department that the academics are affiliated with. On the other hand, at lower ranking institutions and insufficient resource contexts, academic entrepreneurship may be adopted by academics as a form of resource mobilization for research activity. This study showed that only perceived institutional support at departmental level effects soft level academic entrepreneurial intentions such as publishing, industrial consultancy, research collaboration. One can claim that soft level academic entrepreneurship is built on disciplinary based collaborations by nature and solid support is more observable through departmental guidance and routine than university based general principles. It is also possible that sub-cultural[35] norms exist at departmental level which do not align with general university policies. According to Becher and Trowler

[35] "A subculture can thus be described as a group of individuals within an organization with similar cultural values, which distinguishes them from other subgroups." (Lammers, 2015, p. 22)

(2001) academic sub-cultures reflect group based norms, values, beliefs mainly distinguished from any other departments by disciplinary backgrounds.

Hard academic entrepreneurial intentions are not related to any organizational level support including university or department. Based on the previous discussions of Perkmann et al. (2013), motivated and successful individuals who possess academic entrepreneurial intentions are not necessarily affiliated with high ranking institutions. The results are also consistent with Turkish context at which successful individuals perceive academic entrepreneurship as an alternative resource creation or career process where limited opportunities shape alternative seeking behaviors. In a recent study conducted at two Turkish universities (Uysal & Çatı, 2016), it was concluded that managerial level academics at both higher ranking and lower ranking universities (referring to entrepreneurial universities index of Turkey) perceive their affiliated universities more entrepreneurial based on their perceived motivation in organizational psychology. On the other hand, at the lower ranking university, the negative dimension of organizational psychology namely as the intention to quit the job reversely effects the entrepreneurial university perception. The results do not present how perceived institutional climate effects their individual academic entrepreneurship intent, however it is a possibility that intention to leave their positions reflects alternative seeking behaviors at lower ranking settings.

This study also presented that all types of academic entrepreneurial self-efficacy (business, collaboration, and scientific self-efficacy) effect both soft and hard academic entrepreneurial intentions only with a negative relationship between collaboration self-efficacy and soft/hard academic entrepreneurial intentions. It is an

interesting result that high level intentions are related to low level collaboration self-efficacy. Examining the statements of collaboration self-efficacy more in-depth (persuasion, communication skills, leadership abilities, team working), one can claim that those skills are not possessed by the typical "Scientist" by nature, and as a result they are not perceived essential in academic entrepreneurial journey. However, when intents are realized as solid entrepreneurial efforts, those skill deficiencies in potential Turkish academic entrepreneurs may effect the future success of their soft and hard level academic activities since "Science" is a collaboration business. Leske (2007) defined research& development collaboration as joint efforts to create and diffuse knowledge since modern science is not about collection of findings by individuals but about groups in collaborative activity. When those skills are not available in certain star scientists, surrogate entrepreneurship strategy may be adopted as a substitute for non-managerial and/or disinterested scientists.

Age, seniority, and years spent at the current institution did not effect soft and hard academic entrepreneurial intentions except that age had a negative effect on hard academic entrepreneurial intentions. It is consistent with the previous findings that older academics are more prone to the traditional mindset of scientific settings which approach commercialization of research results more critically. On the other hand, it is a posssibility that, young scientists at Turkish universities are more demanding in terms of rewards and prestige, and seek those payback of scientific excellence in hard academic entrepreneurship activity as an alternative source of career. It may be a sign of low level motivation at their institutions, not as a sign of entrepreneurial readiness, and should be carefully approached by policy makers.

Not having been trained abroad for masters/doctoral degree strenghtened the positive effect of business self-efficacy on both soft and hard academic entrepreneurial intentions. One can claim that time and money investment in an academic degree abroad results in scientific focus in career more than entrepreneurial orientation. Another possibility is that local degree owners may have developed local industrial connections more than their abroad trained peers, thus it transforms into stronger effect of business self-efficacy on entrepreneurial intentions. Being based in engineering discipline strenghtens the effect of business self-efficacy on soft academic entrepreneurial intentions possibly due to the effect of applied nature of engineering notion so that the academics realize direct implications in industry.

The study distinguished the effect of previous experience and education on supported relationships, as well. Being an academic without spinoff experience weakens the negative effect of collaboration self-efficacy on soft and hard academic entrepreneurial intentions. It may be concluded that academics who have taken place in spin-off foundation and management might have practiced negative experiences (such as not being able to coordinate their teams effectively) which leads the negative effect of collaboration self-efficacy on academic entrepreneurial intentions turn worse. Being an academic without spinoff experience strenghtens the positive effect of scientific self-efficacy on soft and hard academic entrepreneurial intentions. It is possible that this effect derives from the fact that inexperienced academics mostly do not realize how hard an entrepreneurial journey is when a simple idea, or scientific discovery transforms into a value added, commercialized product or service innovation. There is stronger effect of perceived departmental university-industry relations on soft academic entrepreneurial intentions for academics with research

collaboration experience. This result may imply that research collaboration is an experience initiated by local norms of department, thus soft academic entrepreneurial intentions are more positively effected by departmental support when the academics had already experienced how critical a department is for research collaboration activity.

Having IP experience and professional experience strenghtened the positive effect of business self-efficacy on soft academic entrepreneurial intentions as can be expected based on previously created networks and tacit knowledge. Having no IP experience weakened the negative effect of collaboration self-efficacy on soft and hard academic entrepreneurial intentions similar to the previous finding and explanation about the effect of negative experiences. Having no IP experience and no entrepreneurship education strenghtened the positive effect of scientific self-efficacy on soft and hard academic entrepreneurial intentions similar to the explanation about the scientific fancifulness about the real implications of the abstract ideas or concepts in the industry.

Critical unsupported relationships included the effect of gender and perceived industrial risks on soft and hard level academic entrepreneurial intentions. This study distinguished between individual factors and organizational level determinants examining them in a structural model. It is concluded that unless entrepreneurial university level efforts are realized in sub-cultural norms at departmental level, the entrepreneurial scientists will not align with university level objectives for university-industry interactions. Hard level academic entrepreneurial intentions can be explained less comprehensively compared to soft level academic entrepreneurial intentions. This

study adopted different entrepreneurial intentions scales and applied it to the entrepreneurial university context in Turkey comprehensively for the first time. Additionally, the study developed and applied academic entrepreneurial self-efficacy scale, and perceived institutional support of entrepreneurial university scale in Turkish for the first time.

5.2 Implications for Public Policy and University Management

An important point of discussion is whether efficient patent systems trigger entrepreneurial university activities. Swedish system had been similar to Turkish system where individual inventors are granted the right to claim the ownership of patents. The study conducted by Goldfarb and Henrekson (2003) showed that when IP is awarded to universities rather than individuals, commercialization system works more efficiently. Thus, current intellectual property and patent rights law in Turkey should be examined and relevant adjustments have to be delivered immediately. Policy makers recently announced that the first patent law of Turkish Republic will be enacted 137 years after Ottoman Empire based patent law[36].

University management should understand that unless the entrepreneurial university policies are adopted at departmental level, the academics will not be engaging in soft level academic entrepreneurship activities which relates more to official industry university relations than hard level activities such as spin-off formation. It means that managerial functions which are carried out by faculty of departments in Turkey should be carefully empowered in order to be responsive to strategic priorities. Furthermore, the entrepreneurial academics may possess role identity conflicts mostly driven by combined teaching and research tasks, and

[36] https://indigodergisi.com/2016/05/turkiye-cumhuriyetinin-ilk-patent-kanunu-cikiyor/

university managers should approach them within the framework of country legislations and local university policies.

Managing higher educational institutions with entrepreneurial mission needs innovative approaches. It is suggested that alternative models such as “Surrogate Entrepreneurship” system should be tested and applied in certain pilot settings in order to see the end results.

5.3 Limitations

This research was conducted with a medium response rate of 402 among invited participants of 17,000 academics in science and engineering disciplines in Turkey. The author acknowledges that higher representativeness and new applications in different country settings may present different results both for tested scales and tested hypotheses, thus general applicability of the study in the world is limited.

5.4 Further Research

The interesting finding is that the reasons and moderating factors behind hard level academic entrepreneurial intentions including spin-off formation and intellectual property generation can be explained less comprehensively compared to soft level academic entrepreneurial intentions. Hard level academic entrepreneurial activity is an alternative career route to some extent, thus should be analyzed more in-depth in future studies asking the questions whether it is a result of scientific excellence or absence of satisfying rewards of a scientific career.

Future research should also adress the source of the fact that why younger scientists are more eager to adopt entrepreneurial trajectories more than older scientists. Is it the result of traditional norms of older scientists or the intention of young scientists to leave academia for better rewards or prestige?

We need to understand how the skills of the entrepreneurial scientist transforms into the success of commercialization activities. As the results clearly show that, business/management and scientific self-efficacy lead to higher academic entrepreneurial intentions. However, higher collaboration self-efficacy impedes those intentions surprisingly. What does it mean for the future success of commercialization activities both at soft and hard level? Is it the result of natural born skill deficiencies of a typical scientist? We need further research on this matter.

For the purpose of this study, academic entrepreneurship has been measured by the probability of engaging in the activities in the next five years. Further studies may measure current activities already initiated by the academic entrepreneurs. Further studies may also distinguish between the types of universities according to their origins and contexts in order to see the institutional effects closer.

6 CONCLUSION

The study furtherly elaborated the discussions about the determinants of academic entrepreneurship in science and engineering in Turkey highlighting the weight of individual factors over organizational policies. Synthesising the results, it is strongly claimed that hard academic entrepreneurship intention occurs autonomously by individuals no matter how the university is supportive in terms of entrepreneurial orientation. It is suggested that further investigation is needed on this matter in order to understand the underlying reasons behind the formation of spin-offs and patents by faculty at universities. Soft academic entrepreneurial intentions are effected by departmental level routines and support which relies more on incentives, structured technology transfer processes, and guidance. Moreover, it is claimed that scientists in prestigious universities receive more credentials and are more desirable as advisors for industry, thus they enjoy more support for university-industry relations (W. Ding & Choi, 2011).

Leveraging the perspective of soft and hard level academic entrepreneurship activities, one can postulate that two different levels of engagement may comprehend different entrepreneurial scientist profiles with different motivations and objectives. Looking at different ages, younger scientists are more prone to engagement in both soft and hard level academic entrepreneurship but it is still a question of motivation in spesific Turkey context. As Vohora et al. (2004) discussed, necessity vs. opportunity entrepreneurship may create a new direction for the effect of age on entrepreneurial intentions since young scientists try to escape job insecurity and dissatisfaction by engaging in hard level academic entrepreneurship activities.

Can unintended consequences like inhibiting the tradition of science for public occur, this is another question. Krabel and Mueller (2008) found that scientists who think that research results should be freely accessible to other parties are less likely to be nascent entrepreneurs. Bringing qualitative and quantitative research methods will help to understand this paradigm better (O'Shea et al., 2004).

It is concluded that both individual and contextual level factors effect academic entrepreneurial intentions however sub-cultures at departmental level might be more influential. As discussed in previous studies (Erikson et al., 2015; Guerrero & Urbano, 2014), routines in those task environments may be supportive or hindering for academics who would engage in knowledge transfer.

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APPENDICES

APPENDIX A. Cover Letter and Questionnaire

Hoşgeldiniz

Sayın Hocam,

Türkiye çapında, Temel Bilimler ve Mühendislik alanında yapılan bu çalışmada, değerli bir akademisyen olarak görüşleriniz çok önemlidir. Çalışma sonuçları, ulusal ve bölgesel kalkınmaya akademik çalışmaları ile katkı yapacak olan bilim insanlarını teşvik için, en doğru politikaların önerilmesinde rol alacaktır.

Anket 11 bölümden ve 21 sorudan oluşmakta, yaklaşık 15 dakika sürmektedir. Soruların hepsi özenle seçilmiş ve çalışmanın en doğru sonucu verebilmesi için kapsamlı olarak hazırlanmıştır. Anketin cevaplanması istenen (1-9; 11) ve gönüllü (10) bölümleri mevcuttur, tamamını cevaplamanız bizim için çok değerlidir. Cevaplar anonimdir ve üçüncü taraflarla paylaşılmamaktadır.

Çalışmanın kapsamı ve sonuçları hakkında bilgi almak isterseniz, bana ufuk.ozgul@yeditepe.edu.tr adresimden ulaşabilirsiniz. Katılımınız ve anlayışınız için şimdiden teşekkür ederim.

Saygılarımla,

Bölüm 1

1) Lütfen bağlı bulunduğunuz üniversite/ bölümünüz hakkında aşağıda yer alan ifadelere ne kadar katıldığınızı belirtiniz. Sorularda yer alan girişimcilik kavramı; ekonomik ve sosyal değer oluşturmayı amaçlayan her türlü bilimsel aktivite olarak tanımlanmıştır.

*****

	Kesinlikle Katılmıyorum	Katılmıyorum	Ne Katılıyorum / Ne Katılmıyorum	Katılıyorum	Kesinlikle Katılıyorum
Bölümümüz, öğrencilerimizi sanayi ve toplum için önem arzeden araştırma yapmaları konusunda cesaretlendirir.	( )	( )	( )	( )	( )
Bölümümüz, öğrencilerimizin kendi araştırmalarında pratik uygulamalar gözetmelerini teşvik eder.	( )	( )	( )	( )	( )
Bölümümüzde sanayi/sektörde çalışan bilim insanları ile ortak araştırmalar yürütülmesi desteklenir.	( )	( )	( )	( )	( )
Bölümümüzde sanayi/topluma anlamlı katkı yapacak akademik araştırmalar yürütmemiz beklenir.	( )	( )	( )	( )	( )

Bölümümüzde sanayi/sektör için uygulamalı araştırma gerçekleştirmeye önem verilmez.	( )	( )	( )	( )	( )
Bölümümüz araştırma çalışmalarımıza sanayinin/sektörün dahil edilmesini destekler.	( )	( )	( )	( )	( )
Bölümümüz sanayi/sektör ve toplum çevresinde yenilikçiliği ile tanınır.	( )	( )	( )	( )	( )
Bölümümüz yüksek lisans ve doktora mezunlarımız sanayide/sektörde saygıdeğer pozisyonlarda çalışır.	( )	( )	( )	( )	( )
Bölümümüze ilgili sektör/sanayide ve toplumda saygı duyulur.	( )	( )	( )	( )	( )
Bölümümüzde, bulunduğumuz iller bölgesindeki diğer araştırmacılara kıyasla etkin araştırmacılar olarak tanınırız.	( )	( )	( )	( )	( )
Bölümümüzde sanayi işbirliğini geliştirmek için yeni fırsatları etkin olarak araştırırız.	( )	( )	( )	( )	( )
Bölümümüzde	( )	( )	( )	( )	( )

uygulamalı araştırma projelerinden kaynak yaratmakta zorlanmayız.					
Bulunduğumuz iller bölgesinde, bölüm araştırma çalışmalarımızın sanayi ve topluma katkısı anlamında saygınlığı/itibarı vardır.	( )	( )	( )	( )	( )
Üniversitemiz yeniliğe ve yeni fikirlere açıktır.	( )	( )	( )	( )	( )
Üniversite sanayi işbirliği ve araştırma politikalarımız akademisyen görüşleri alınarak şekillenmektedir.	( )	( )	( )	( )	( )
Üniversitemizde girişimcilik kültürü yaygındır.	( )	( )	( )	( )	( )
Üniversitemizde girişimcilik/yenilikçiliği ödüllendiren sistemler belirgin olarak uygulanmaktadır.	( )	( )	( )	( )	( )
Üniversitemizde akademisyenlere yönelik girişimcilik eğitimleri kapsamlı olarak verilmektedir.	( )	( )	( )	( )	( )
Üniversitemizde akademisyenlerin iş yükü anlamında, girişimcilik olarak	( )	( )	( )	( )	( )

tanımlanan aktiviteler için yeterli zaman yoktur.					
Üniversitemizin teknoloji transfer çalışmalarını gerçekleştiren birimler (teknoloji transfer ofisi vb.) başarılıdır. (Teknoloji transferi: Bilimsel araştırmaların, ekonomik ve sosyal değer yaratacak şekilde sektör/sanayiye ve topluma sunulması, bunun sonucunda fikri mülki haklar elde edilmesi, çözüm, patent, faydalı model oluşturulması)	( )	( )	( )	( )	( )
Üniversitemiz araştırma projelerinde dış kaynak bulma konusunda akademisyenlere destek olur.	( )	( )	( )	( )	( )
Üniversitemizin laboratuar vb. fiziksel altyapı kaynakları yeterlidir.	( )	( )	( )	( )	( )
Üniversitemizde akademisyenlerin sektör/sanayi işbirliği becerilerini geliştirecek işletme/yönetim eğitimleri almaları sağlanır/teşvik edilir.	( )	( )	( )	( )	( )

Üniversitemizde girişimcilik faaliyetlerini gözlemlediğim akademisyenler vardır.	( )	( )	( )	( )	( )
Girişimcilik ve yenilikçilik bulunduğum üniversitenin misyonunun bir parçasıdır.	( )	( )	( )	( )	( )
Üniversitemizde sanayi ve topluma yönelik çözüm üretmek, misyonunun bir parçasıdır.	( )	( )	( )	( )	( )
Üniversitemiz, akademisyenlerin girişimcilik faaliyeti için finansman elde etmeleri konusunda gerekli aktörlere (risk sermayesi, melek yatırımcı ağları, finans kuruluşları vb.) erişimlerini sağlar.	( )	( )	( )	( )	( )
Üniversitemizin sanayi/sektör işbirliği bağları zayıftır.	( )	( )	( )	( )	( )
Üniversitemizde fikri mülki hakların yönetimi akademisyen ve üniversitenin ortak faydasına göre uygulanmaktadır.	( )	( )	( )	( )	( )
Üniversitemizde	( )	( )	( )	( )	( )

akademik girişimciler için işten geçici süreliğine izin alma (günlük, haftalık ya da eğitim yılı/dönemi bazlı) koşulları uygundur.					
Üniversitemizde akademik girişimcilik hakkında bilgi ve tecrübe edinirim.	( )	( )	( )	( )	( )
Üniversitemizin teknoloji transfer politikaları esnek değildir ve bürokratiktir.	( )	( )	( )	( )	( )
Üniversitemizin kamu kuruluşları, sanayi/ticaret odaları, sektörel organizasyonlar ile bağlantıları gelişmiştir	( )	( )	( )	( )	( )
Üniversitemizde öğrenci girişimciliği aktif olarak teşvik edilmektedir.	( )	( )	( )	( )	( )

Bölüm 2

2) Lütfen aşağıdaki ifadelere ne kadar katıldığınızı belirtiniz.*

	Kesinli	**Katılmı**	**Ne**	**Katılıy**	**Kesinl**

	kle Katılmı yorum	**yorum**	**Katılıy orum Ne Katılmı yorum**	**orum**	**ikle Katılıy orum**
Üniversiteler , eğitim ve araştırma misyonunun yanında bölgesel ve ulusal kalkınmaya katkıda bulunmalıdır.	( )	( )	( )	( )	( )
Üniversite araştırmaları sonucunda patent, faydalı model vb. anlamda ekonomik değer yaratılmaya çalışılması bilimsel üretime zarar verir.	( )	( )	( )	( )	( )
Üniversiteler, öğretim üyelerinin performans değerlendirme/yükseltme/atama kriterlerinde girişimcilik faaliyetlerini (bilimsel çalışmalardan ekonomik ve sosyal değer yaratma) göz önüne almalıdır.	( )	( )	( )	( )	( )
Bilimsel araştırmaların sonuçlarının ticari bir amaç	( )	( )	( )	( )	( )

güdülmeden direk yayınlanması gerekir.					
Üniversiteler, bilimsel araştırmalarla ekonomik ve sosyal değer yaratılmasında aktif görev almalıdır.	( )	( )	( )	( )	( )
Sanayi/sektör, bilimsel araştırmaların yönünü belirlemede katılım göstermemelidir.	( )	( )	( )	( )	( )

Bölüm 3

3) Lütfen aşağıdaki aktiviteleri gerçekleştirip gerçekleştirmediğinizi (mevcut durumunuz dahil) evet/hayır olarak belirtiniz.*

	EVET	**HAYIR**
Üniversite çıkışlı girişim şirketi konusunda deneyimim var. • Kendi şirketimi kurma (üniversite çıkışlı girişim-	( )	( )

academic spin-off) • Akademi çıkışlı kurulacak bir şirketin kuruluşuna destek olma		
Araştırma işbirliği deneyimim var • Üniversite üzerinden sanayi ve araştırma işbirliği (ArGe işbirliği, ortak araştırma projeleri) • Üniversite üzerinden araştırma hizmetleri (sözleşmeli araştırma, danışmanlık, kalite kontrol, test, sertifikasyon, prototip ve faydalı model geliştirme)	( )	( )
Fikri-Mülkiyet deneyimim var. • Patent ve lisanslama • Akademik çalışmalarla diğer fikri mülki haklar elde etme (copyright,	( )	( )

trademark)		
Konferans, Bilimsel Toplantı, Network Toplantılarına katıldım	( )	( )
Sektör/sanayiye yönelik olan seminer ve eğitimler düzenledim/ eğitim verdim	( )	( )
Akademik kariyerim öncesi sektörde çalışma deneyimim oldu.	( )	( )
Ulusal kamu destekli projede yer aldım/yürüttüm	( )	( )
Ulusal sanayi destekli projede yer aldım/ yürüttüm	( )	( )
Uluslar arası destekli projede yer aldım/yürüttüm	( )	( )

Bölüm 4

4) Lütfen aşağıda yer alan konularda daha önce eğitim alıp almadığınızı (çift anadal, yandal, sertifika, seminer vb. dahil) evet/hayır olarak belirtiniz.*

	EVET	HAYIR
İşletme/Yönetim eğitimi aldım.	( )	( )
Girişimcilik eğitimi aldım	( )	( )
Fikri mülki haklar eğitimi aldım.	( )	( )
Pazarlama eğitimi aldım.	( )	( )

Bölüm 5

5) Lütfen sahip olduğunuz eğitim ve deneyimlerin ışığında aşağıda yer alan ifadelere ne kadar katıldığınızı belirtiniz.*

	Kesinlikle Katılmıyorum	Katılmıyorum	Ne Katılıyorum Ne Katılmıyorum	Katılıyorum	Kesinlikle Katılıyorum
Alanımdaki uygulamalı araştırma imkanlarını kolaylıkla belirlerim.	( )	( )	( )	( )	( )

Yeni ürün, hizmet ya da çözüme dönüşebilecek fikirleri rahatlıkla bulurum.	( )	( )	( )	( )	( )
İkna ve iletişim konularında becerikliyim.	( )	( )	( )	( )	( )
Takım çalışmasına yatkınım.	( )	( )	( )	( )	( )
İnsanlara liderlik edebilirim.	( )	( )	( )	( )	( )
Fikri mülki haklar konusunda bilgi sahibiyim.	( )	( )	( )	( )	( )
Pazarlama yönetimi konusunda bilgi sahibiyim.	( )	( )	( )	( )	( )
Organizasyon ve	( )	( )	( )	( )	( )

yönetim konusunda bilgi sahibiyim.					
Girişimcilik konusunda bilgi sahibiyim.	( )	( )	( )	( )	( )
Finansal yönetim konusunda bilgi sahibiyim.	( )	( )	( )	( )	( )
Gelişmiş bir bilimsel çevrem vardır.	( )	( )	( )	( )	( )
Gelişmiş bir iş dünyası ve kamu çevrem vardır.	( )	( )	( )	( )	( )
Risk almaktan çekinmem.	( )	( )	( )	( )	( )
Bilimsel alanımda kendimi donanımlı buluyorum.	( )	( )	( )	( )	( )

Bölüm 6

6) Lütfen kendiniz için tasarladığınız kariyer ışığında öngörülen beş yıllık zaman dilimi içerisinde aşağıdakilerden hangisini öncelikli olarak tercih ettiğinizi belirtiniz.*

( ) Tam zamanlı bir akademisyen olarak herhangi bir ticari faaliyet gerçekleştirmemek.

( ) Tam zamanlı bir akademisyen olarak sanayi/sektör işbirliklerinde yer almak.

( ) Üniversiteden ayrılmadan yarı zamanlı olarak sanayi/sektörde çalışmak/danışmanlık vermek/araştırma yürütmek.

( ) Üniversiteden ayrılarak sanayi/sektörde yer alan bir kuruluşta tam zamanlı ya da yarı zamanlı olarak çalışmak/ danışmanlık vermek/araştırma yürütmek.

( ) Üniversiteden ayrılmadan akademi çıkışlı bir şirket kurmak ya da kuruluşunda/yönetiminde aktif görev almak.

( ) Üniversiteden ayrılarak kendi şirketini kurmak.

( ) Diğer

Bölüm 7

7) Aşağıda sıralanmış insan etkinlikleri veya çevredeki değişimler sizin için ne kadar önemlidir?*

	Çok Önemsiz	**Önemsiz**	**Ne Önemsiz Ne Önemli**	**Önemli**	**Çok Önemli**
Genellikle kömürün yanmasından kaynaklanan sülfür oksidin neden olduğu	( )	( )	( )	( )	( )

asit yağmurlarının akarsuları ve orman alanlarını etkilemesi					
Karbondioksit ve metan gibi sera gazlarının aşırı salınımının neden olduğu küresel ısınmanın seller ve hava sıcaklığı artışı gibi olaylara yol açması.	( )	( )	( )	( )	( )
Soğutucuda kullanılan gazlar nedeniyle koruyucu ozon tabakasının incelmesinin güneş kaynaklı ultraviyolenin artmasına neden olması	( )	( )	( )	( )	( )
Denizlerde petrol çıkarmak için sondaj yapılması ve petrol ürünlerinin taşınması (boru hattı, tanker kamyonları, tanker	( )	( )	( )	( )	( )

gemiler vb.) ve bunun neden olabileceği kazalar.					
Tehlikeli atık alanları; buradaki zehirli kimyasalların akarsulara ve toprağa karışması	( )	( )	( )	( )	( )
Radyasyon; nükleer enerji üretiminden ortaya çıkan radyoaktif maddelerin (atıkların) etrafa yayılması	( )	( )	( )	( )	( )
Kalıcı yani uzun süre bozulmayan ve zehirli organik kirleticilerin (DDT, PBC, Dioksin, Benzen vb.) fabrikalardan akarsulara ve atmosfere verilmesi. (Bu maddeler bozulmadan uzun süre kalabilir ve çok uzaklara taşınabilir.)	( )	( )	( )	( )	( )
Kurşun, çinko,	( )	( )	( )	( )	( )

kadmiyum gibi ağır metallerin maden çıkarma faaliyetleri sonucu yüzey sularına karışması, kömürün yanması sonucu civanın atmosfere karışması					
Pestisitler; böcekler, kemirgenler, yabani otlar gibi zararlılarla mücadelede kullanılan kimyasalların etkisi.	( )	( )	( )	( )	( )
Ötrafikasyon; su içinde azotlu gübre ve azot oksit gibi bileşiklerin aşırı artışı sonucu alg patlaması meydana gelir. Bu durum nehir ve kıyı sularında çözünmüş oksijen miktarını azaltır.	( )	( )	( )	( )	( )
Kanalizasyon;	( )	( )	( )	( )	( )

atık suların arıtılmadan akarsulara veya denizlere verilmesi					
Genetik olarak değiştirilmiş tarım ürünlerinin olası etkileri (Örnek: Mısır)	( )	( )	( )	( )	( )
İstilacı türler; ait olmadıkları bir bölgeye insan eliyle taşındıktan sonra o bölgede hızla çoğalarak yerli türlerin varlığını tehdit etmesi	( )	( )	( )	( )	( )
Kağıt ve kereste ihtiyacı için büyük orman arazilerinde traşlama şeklinde ağaç kesimi	( )	( )	( )	( )	( )
Kentleşme ve yerleşim nedeniyle doğal alanların (habitatların) bozulması ve parçalanması	( )	( )	( )	( )	( )

Elektrik üretimi, su taşkınlarının önlenmesi, nehirlerin yönlerinin değiştirilmesi amacıyla baraj yapımı	( )	( )	( )	( )	( )
Sulak alanların endüstriyel gelişim, ticaret, tarım alanı elde etme, turizm ve yerleşim amaçlı bozulması ve yok edilmesi	( )	( )	( )	( )	( )
Denizlere ve göllere akan iç suların tarım alanlarından taşınan tarım ilacı ve gübre gibi kimyasallar ve tortular ile kirlenmesi	( )	( )	( )	( )	( )
Açık madencilik	( )	( )	( )	( )	( )
Çayır ve meralarda çok miktarda çiftlik hayvanının aşırı otlatılması	( )	( )	( )	( )	( )
Spor ve	( )	( )	( )	( )	( )

eğlence amaçlı avlanma (Bıldırcın, geyik avlama, derin su ve kıyı balıkçılığı)					
Ticari balıkçılık	( )	( )	( )	( )	( )
Dünya genelinde nüfus artışı	( )	( )	( )	( )	( )

Bölüm 8

8) Lütfen aşağıdaki ifadelerde yer alan aktiviteleri öngördüğünüz beş yıllık zaman dilimi içerisinde gerçekleştirme olasılığınızı belirtiniz.*

	Çok Düşük Olasılık	**Düşük Olasılık**	**Ne Düşük Ne Yüksek Olasılık**	**Yüksek Olasılık**	**Çok Yüksek Olasılık**
Araştırmalara dayanan fakat üniversiteden bağımsız bir şirketin kuruluşunda yer almak	( )	( )	( )	( )	( )
Araştırmalara dayanan üniversite	( )	( )	( )	( )	( )

çıkışlı bir şirketin (spin-off) kuruluşunda yer almak					
Kendi araştırmam, geliştirdiğim fikir ya da geliştirdiğim teknolojiye dayanan üniversite çıkışlı bir şirketin kurucusu olmak.	( )	( )	( )	( )	( )
Üniversitemde gerçekleştirdiğim bir araştırmanın sonuçlarından oluşan bir patent için başvuru yapmak.	( )	( )	( )	( )	( )
Geliştirdiğim bir teknolojinin, bilginin, ya da çözümün sanayide/sektörde lisanslanmasını sağlamak.	( )	( )	( )	( )	( )
Diğer fikri mülki haklar sahibi olmak. (copyright, trademark)	( )	( )	( )	( )	( )
Sanayi ile araştırma işbirliği projeleri gerçekleştirmek	( )	( )	( )	( )	( )
Sanayide danışmanlık aktiviteleri gerçekleştirmek	( )	( )	( )	( )	( )
Oluşturduğum sanayi/sektörel çözümlere, bilimsel	( )	( )	( )	( )	( )

gelişmelere yönelik kaynak yayınlamak (kitap, makale, blog yazısı)					
Öğrencim olan uygulamalı araştırmacıların sanayi/sektörde uygun işlere yerleştirilmesinde yardımcı olmak.	( )	( )	( )	( )	( )
Alanımla ilgili konferanslara/bilimsel toplantılara/ürün ve teknoloji toplantılarına katılmak	( )	( )	( )	( )	( )
Sanayi/sektöre yönelik eğitmenlik yapmak ve/veya seminer gerçekleştirmek	( )	( )	( )	( )	( )

Bölüm 9

9) Lütfen cevaplayınız.*

	EVET	**HAYIR**	**EMİN DEĞİLİM**
Küresel ısınma ve iklim değişikliği kavramının	( )	( )	( )

bilimsel geçerliliğine inanıyor musunuz?			
Küresel ısınma ve iklim değişikliği ile mücadelede bilim ve mühendisliğin en önemli çözüm noktası olduğuna inanıyor musunuz?	( )	( )	( )

Bölüm 10

Bu bölümde yer alan soruları <u>gönüllü olarak cevaplayabilirsiniz.</u> <u>Zorunlu değildir.</u>

<u>Cevaplamayanlar sayfanın altında yer alan "Next" bölümüne tıklayarak devam edebilirler.</u>

10) Aşağıda kendi kişilik özelliklerinizle ilgili olarak yer alan ifadelere ne ölçüde katıldığınızı lütfen belirtiniz.

	Kesinlikle Katılmıyorum	**Katılmıyorum**	**Ne Katılıyorum Ne Katılmıyorum**	**Katılıyorum**	**Kesinlikle Katılıyorum**
Sürekli olarak yaşamımı iyileştirecek ve kolaylaştıracak yeni yollar ararım	( )	( )	( )	( )	( )
Bulunduğum toplumda farklılık yaratma gücünü kendimde hep hissederim	( )	( )	( )	( )	( )
Bulunduğum toplumda farklılık yaratma gücünü kendimde hep hissederim	( )	( )	( )	( )	( )
Nerede olursam olayım yapıcı gelişim için hep etkili bir güce sahip olmuşumdur.	( )	( )	( )	( )	( )

Fikirlerime yönelik engellerle yüzleşmekten ve bu engellerin üstesinden gelmekten hoşlanırım	( )	( )	( )	( )	( )
Hiçbirşey ideallerimin gerçeğe dönüşmesini görmek kadar heyecan verici olamaz.	( )	( )	( )	( )	( )
Hoşlanmadığım bir şey görürsem bunu düzeltirim.	( )	( )	( )	( )	( )
İhtimali ne olursa olsun, birşeye inanıyorsam gerçekleştirmeye çalışırım.	( )	( )	( )	( )	( )
Başkalarının itirazlarına karşılık kendi fikirlerimi savunmaktan hoşlanırım.	( )	( )	( )	( )	( )
Fırsatları ortaya çıkarmak	( )	( )	( )	( )	( )

konusunda oldukça becerikliyim.					
Her zaman işleri yapacak daha iyi yollar ararım.	( )	( )	( )	( )	( )
Bir fikre inandıysam hiçbir engel beni bu fikri gerçekleştir mekten alıkoyamaz.	( )	( )	( )	( )	( )
Statükoya meydan okumayı severim.	( )	( )	( )	( )	( )
Ne zaman problemim olursa doğrudan çözmeye çalışırım.	( )	( )	( )	( )	( )
Problemleri fırsata çevirmek konusunda yetenekliyi m.	( )	( )	( )	( )	( )
İyi fırsatları başkalarında n çok daha önce görürüm.	( )	( )	( )	( )	( )
Birinin	( )	( )	( )	( )	( )

sıkıntılı olduğunu gördüğümde herhangi bir şekilde yardımcı olurum.					

11) Lütfen, çalıştığınız üniversitedeki yönetim şeklini göz önüne alarak aşağıdaki ifadelere ne kadar katıldığınızı belirtiniz.

	Kesinlikle Katılmıyorum	**Katılmıyorum**	**Ne Katılıyorum Ne Katılmıyorum**	**Katılıyorum**	**Kesinlikle Katılıyorum**
Yeni fikirlerin ortaya çıkması ve uygulaması için yöneticiler gerektiğinde kuralları esnetirler.	( )	( )	( )	( )	( )
İşimi geliştirmeye dönük yeni bir düşünceye/uygulamaya sahip olduğumda bunu yöneticilerimle kolaylıkla paylaşırım.	( )	( )	( )	( )	( )
Yönetim, yeni bir fikir/uygulama önerdiğimde onu ciddiye alır ve geliştirme	( )	( )	( )	( )	( )

yolunu arar.					
Yönetim, çalışanların sıradışı buluş ve uygulamalarını gördüğünde hemen ödüllendirme yoluna gider.	( )	( )	( )	( )	( )
Yönetim, çalışanlara özgürce düşünme ve davranmaları için uygun bir ortam hazırlar.	( )	( )	( )	( )	( )
Yönetim, çalışanların hata yapmaktan korkmamalarını ve risk almalarını teşvik eder.	( )	( )	( )	( )	( )
Yönetim yapılan hata ve yanlışları birer öğrenme aracı olarak görür ve değerlendirir.	( )	( )	( )	( )	( )
Yönetim, farklı düşünme ve davranmaya özendiren demokratik liderliği benimser.	( )	( )	( )	( )	( )

Üstün başarılara imza atan personelle gurur duyan bir yönetim vardır.	( )	( )	( )	( )	( )
Yöneticiler farklı insanların farklı düşünme biçimlerine saygı gösterirler.	( )	( )	( )	( )	( )
Yönetim, çalışanların bilgi ve becerilerini geliştirmek için sürekli biçimde eğitim hizmetleri sunar.	( )	( )	( )	( )	( )

12) Lütfen aşağıdaki ifadelere kendinizi değerlendirerek ne kadar katıldığınızı belirtiniz.

	Kesinlikle Katılmıyorum	**Katılmıyorum**	**Ne Katılıyorum Ne Katılmıyorum**	**Katılıyorum**	**Kesinlikle Katılıyorum**
Kendine güvenen biriyim.	( )	( )	( )	( )	( )
Başarısızlık benim azmimi artırır.	( )	( )	( )	( )	( )

Kolayca pes ederim.	( )	( )	( )	( )	( )
Eğer bir işi ilk denemede yapamazsam başarılı olana kadar uğraşırım	( )	( )	( )	( )	( )
Yeteneklerime her zaman çok güvenmem.	( )	( )	( )	( )	( )

13) Lütfen aşağıdaki ifadelere akademik kariyerinizin amaçları doğrultusunda ne kadar katıldığınızı belirtiniz.

	Kesinlikle Katılmıyorum	**Katılmıyorum**	**Ne Katılıyorum Ne Katılmıyorum**	**Katılıyorum**	**Kesinlikle Katılıyorum**
İnsanlığa gerçek katkılarımın olabileceği bir kariyer isterim.	( )	( )	( )	( )	( )
Toplumun refahı için hizmet edebileceğim bir	( )	( )	( )	( )	( )

kariyer isterim.					
Becerilerimi başkalarının yararına kullanabileceğim bir kariyer isterim.	( )	( )	( )	( )	( )

Bölüm 11

14) Yaşınız?*

_____

15) Cinsiyetiniz?*

( ) KADIN
( ) ERKEK

16) Akademideki pozisyonunuz?*

( ) Araştırma Görevlisi/Yüksek Lisans-Doktora Öğrencisi/
( ) Doktor Araştırma Görevlisi/ Doktor Öğretim Görevlisi
( ) Yardımcı Doçent
( ) Doçent
( ) Profesör
( ) Diğer

17) Alanınız?*

( ) Temel Bilimler

( ) Mühendislik

( ) Diğer

18) Üniversitenizde teknoloji transfer ofisi var mı?*

( ) Evet

( ) Hayır

( ) Bilmiyorum

19) Yüksek Lisans/Doktora/Doktora sonrası çalışmalarınızdan en az birini yurtdışında yaptınız mı?*

( ) EVET

( ) HAYIR

20) Bağlı bulunduğunuz üniversite?*

_____

21) Kaç senedir bu üniversitede çalışıyorsunuz?*

_____

Teşekkürler

Thank you for taking our survey. Your response is very important to us.

APPENDIX B. Respondent Feedback

-Assistant Professor of Mechanical Engineering: "üniversite-sanayi işbirliğinde en belirleyici olan kişisel ağdır. Verimlilik açısından bakıldığında sadece girdi ve çıktı ilişkisi değil; ne yapılabilirdi ve ne yapıldı soruları gündeme gelir."

-Full Professor of Biotechnology: "Temel bilimler doğası gereği ilgilendikleri teorik soruların çözümleri ile uğraşırlar; uygulama alanı ve değer yaratma özelliği ile ilgilenmezler. Mühendislik ise toplumdaki soruların çözümü için harekete geçer. Akademisyenin genetiksel ve kişilik özellikleri, değişim ve değer yaratma isteğini tetikler. Toplumsal/çevresel koşullar bunu ya baskılar ya da meydana çıkmasına yardımcı olur. Üniversite-sanayi işbirliğinde sanal iletişim değil, gerçek iletişim gereklidir. Bilim insanı ve endüstrinin güven ortamında uzun süreli çalışması gerektiği için Türkiye' ye özgü olarak gerçek iletişim bu ortamı sağlar. Devlet ve vakıf üniversiteleri çalışma şartları açısından önemli derecek farklılıklar taşır; vakıf üniversitelerinde politikalar daha esnektir. Vakıf üniversiteleri ticari amaç güttüğü için beklentiler de bu yönde şekillenmektedir. Türk bilim insanları işletme eğitimi almadan kendi kişisel özellikleri ile harekete geçmektedir, fakat işletme eğitimi çok önemlidir. Ayrıca yabancı dil imkanı yoksa, uluslararasılaşma imkansızdır. İletişim-diksiyon bile bir noktada akademisyenin değer yaratma hedefinde belirleyicidir. Bilim için bilim düşüncesini güdenler temel bilim insanlarıdır."

-**Full Professor of Electronics Engineering;** “Bölüm değil, üniversite politikaları daha baskındır. Vakıf üniversitelerinde tek gün izinden, uzun süreli izne kadar farklı uygulamalar mevcuttur. Devlet üniversitelerinde belirli akademik girişimcilik türleri ya da resmi olmayan kanallarla işbirliği yapmak halihazırda suçtur; sadece teknoloji geliştirme bölgelerinde izinlidir. Proje bazlı işbirliklerinde üniversiteden mutlaka izin alınması gereklidir. Akademisyenler bilimsel konferansların yanı sıra, ürün geliştirme bazlı marka ve teknoloji toplantılarına katılırlar…”

APPENDIX C. CORRELATIONS of CONSTRUCTS

Correlations												
		PerUni	PerDep	Rep	BSE	SSE	CSE	SoftAE	HardAE	OrgCREA	GenSE	ProPER
PerUni	Pearson Correlation	1	,650**	,624**	,304**	,210**	,151**	,203**	,124*	,756**	,072	,124*
	Sig. (2-tailed)		,000	,000	,000	,000	,002	,000	,013	,000	,207	,038
	N	404	404	404	404	404	404	404	404	291	311	279
PerDep	Pearson Correlation	,650**	1	,724**	,357**	,274**	,192**	,386**	,230**	,553**	,072	,262**
	Sig. (2-tailed)	,000		,000	,000	,000	,000	,000	,000	,000	,205	,000
	N	404	404	404	404	404	404	404	404	291	311	279
Rep	Pearson Correlation	,624**	,724**	1	,299**	,346**	,234**	,340**	,210**	,517**	,007	,246**
	Sig. (2-tailed)	,000	,000		,000	,000	,000	,000	,000	,000	,905	,000
	N	404	404	404	404	404	404	404	404	291	311	279
BSE	Pearson Correlation	,304**	,357**	,299**	1	,520**	,454**	,463**	,432**	,357**	,198**	,428**
	Sig. (2-tailed)	,000	,000	,000		,000	,000	,000	,000	,000	,000	,000
	N	404	404	404	404	404	404	404	404	291	311	279
SSE	Pearson Correlation	,210**	,274**	,346**	,520**	1	,564**	,440**	,355**	,271**	,301**	,554**
	Sig. (2-tailed)	,000	,000	,000	,000		,000	,000	,000	,000	,000	,000
	N	404	404	404	404	404	404	404	404	291	311	279
CSE	Pearson Correlation	,151**	,192**	,234**	,454**	,564**	1	,312**	,196**	,191**	,239**	,535**
	Sig. (2-tailed)	,002	,000	,000	,000	,000		,000	,000	,001	,000	,000
	N	404	404	404	404	404	404	404	404	291	311	279
SoftAE	Pearson Correlation	,203**	,386**	,340**	,463**	,440**	,312**	1	,645**	,180**	,162**	,343**
	Sig. (2-tailed)	,000	,000	,000	,000	,000	,000		,000	,002	,004	,000
	N	404	404	404	404	404	404	404	404	291	311	279
HardAE	Pearson Correlation	,124*	,230**	,210**	,432**	,355**	,196**	,645**	1	,170**	,113*	,334**
	Sig. (2-tailed)	,013	,000	,000	,000	,000	,000	,000		,004	,046	,000
	N	404	404	404	404	404	404	404	404	291	311	279
OrgCREA	Pearson Correlation	,756**	,553**	,517**	,357**	,271**	,191**	,180**	,170**	1	,167**	,121*
	Sig. (2-tailed)	,000	,000	,000	,000	,000	,001	,002	,004		,005	,048
	N	291	291	291	291	291	291	291	291	291	288	267
GenSE	Pearson Correlation	,072	,072	,007	,198**	,301**	,239**	,162**	,113*	,167**	1	,222**
	Sig. (2-tailed)	,207	,205	,905	,000	,000	,000	,004	,046	,005		,000
	N	311	311	311	311	311	311	311	311	288	311	274
ProPER	Pearson Correlation	,124*	,262**	,246**	,428**	,554**	,535**	,343**	,334**	,121*	,222**	1

	Sig. (2-tailed)	,038	,000	,000	,000	,000	,000	,000	,000	,048	,000	
	N	279	279	279	279	279	279	279	279	267	274	279
**. Correlation is significant at the 0.01 level (2-tailed).												
*. Correlation is significant at the 0.05 level (2-tailed).												