ÇANKAYA UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
BUSINESS ADMINISTRATION

MASTER THESIS

THE ROLE OF TUBITAK IN NATIONAL INNOVATION SYSTEM: A QUALITATIVE ANALYSIS

İSMAİL BİÇME

AUGUST 2019

ÇANKAYA UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
BUSINESS ADMINISTRATION

MASTER THESIS

THE ROLE OF TUBITAK IN NATIONAL INNOVATION SYSTEM: A QUALITATIVE ANALYSIS

İSMAİL BİÇME

AUGUST 2019

Title of Thesis: **The Role of TUBITAK in National Innovation System: A Qualitative Analysis**

Submitted by: **İsmail BİÇME**

Approval of the Graduate School of Social Science Studies, Çankaya University

Prof. Dr. Mehmet YAZICI
Director of Institute

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Management

Assoc. Prof. Dr. Ayşegül TAŞ
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science

Assoc. Prof. Dr. İrge ŞENER
Supervisor

Examination Date: 09.08.2019

Examining Committee Members

Prof. Dr. Nilay ALÜFTEKİN SAKARYA (Ankara YBU)

Assoc. Prof. Dr. İrge ŞENER (Çankaya University)

Ass. Prof. Dr. Arif Orçun SAKARYA (Çankaya University)

STATEMENT OF NON-PLAGIARISM

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that as required by these rules and conduct, I have fully cited and referenced all materials and results that are not original to this work.

Name Surname: İsmail BİÇME

Signature: İsmail Biçme

Date: 16/09/2019

ABSTRACT

THE ROLE OF TUBITAK IN NATIONAL INNOVATION SYSTEM: A QUALITATIVE ANALYSIS

İsmail BİÇME

Master of Business Administration (MBA)

Supervisor: Assoc. Prof. Dr. İrge ŞENER

August 2019, 120 pages

As one of the prerequisite conditions of economic development, innovation has been discussed in the literature for a long time and still keeps its popularity. In addition, since innovation activities cannot be carried out by institutions or states alone, it is necessary to carry out them within a system in order to advance in this field nationally. Since the establishment and operation of national innovation systems requires an evolutionary and organic approach rather than a mechanical approach, long-term projects and policies are needed. In this study, the role of TUBITAK, which is an important state institution in Turkey's national innovation system, within the system and its effectiveness in this area has been investigated in a qualitative framework of an analysis based on determined documents published since 2000. According to the results of the research, it is seen that while TUBITAK has important roles such as supporting the research and development (R & D) activities financially, providing scholarships and awards for the development of scientists and raising awareness of R & D in the society to contribute to the development of our country, in the national innovation system; it is evaluated that additional studies are needed in order to make the studies carried out within the innovation system more comprehensive. It is expected that the results of the research will be benefited by relevant institutions and researchers working in this field.

Key Words: TUBITAK, national innovation system of Turkey, innovation

ÖZET

ULUSAL İNOVASYON SİSTEMİNDE TÜBİTAK'IN ROLÜ: NİTEL BİR ARAŞTIRMA

İsmail BİÇME

Yüksek Lisans

İşletme Yönetimi

Danışman: Doç. Dr. İrge ŞENER

Ağustos 2019, 120 sayfa

Ekonomik kalkınmanın ön koşullarından biri olarak literatürde uzun süredir incelenmeye devam eden inovasyon, hala bir çalışma alanı olarak güncelliğini korumaktadır. Bununla birlikte, inovasyon faaliyetleri kurumların veya devletlerin tek başına icra edemeyeceği bir konu olduğu için çalışmaların bir sistem dahilinde ve ulusal olarak bu alanda ilerleyecek şekilde icra edilmesi gerekmektedir. Ancak ulusal inovasyon sistemlerinin oluşturulması ve işletilmesi mekanikten ziyade organik ve evrimsel bir yaklaşım gerektirdiği için uzun dönemli proje ve politikalara ihtiyaç bulunmaktadır. Bu çalışmada Türkiye'nin ulusal inovasyon sisteminde önemli bir aktör olan TÜBİTAK'ın, sistem içindeki etkinliği nitel bir araştırma deseni çerçevesinde, bu alanda 2000 yılından beri yayınlanan belirlenen belgelerden faydalanılarak analiz edilmiştir. Araştırma sonuçlarına göre TÜBİTAK'ın ulusal inovasyon sistemi içindeki; araştırma ve geliştirme faaliyetlerini finansal olarak destekleme, bilim adamlarının gelişimi için burs ve ödüller verme, topluma ve ülkemizin kalkınmasına katkıda bulunmak için Ar-Ge konusunda farkındalık yaratma gibi önemli rolü ortaya koyulurken inovasyon sistemi içinde icra edilen çalışmaların daha derinlemesine anlaşılabilmesi için ilave çalışmalara ihtiyaç olduğu

değerlendirilmiştir. Çalışma sonuçlarından ilgili kurumların ve bu alanda çalışma yapan araştırmacıların faydalanacağı umulmaktadır.

Anahtar Kelimeler: TÜBİTAK, Türkiye'nin ulusal inovasyon sistemi, inovasyon

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and special thanks to those who helped me to make this dissertation possible.

First and foremost, I want to thank my supervisor Assoc. Prof. Dr. İrge ŞENER. I am very grateful to her not only for taking on the challenge to supervise my thesis but also for her encouragement, guidance and knowledge.

My deepest thanks go to my beloved master thesis qualifying committee members, namely, Prof. Dr. Nilay ALÜFTEKİN SAKARYA and Ass. Prof. Dr. Arif Orçun SAKARYA for their insightful comments and feedbacks that were instrumental in completion of my dissertation. It is always a pleasure to recall the nice people at Çankaya University for their sincere guidance I received to uphold my academic as well as practical studies in Business Administration.

My very special thanks go to my parents whom I owe everything I am today, my dad and my mom Cemil and Nurhan BİÇME, and my uncle Ass. Prof. Dr. Mustafa CANBEK for giving encouragement, enthusiasm and valuable assistance to me.

Additionally, I would like to thank to my class mates and colleagues for extending their friendship towards me, sharing their ideas and knowledge with me during my master program.

Although my gratitude is extended to those who helped me to make this dissertation possible, a paper is not enough for me to express the support and guidance I received from them.

THE ROLE OF TUBITAK IN NATIONAL INNOVATION SYSTEM:
A QUALITATIVE ANALYSIS

ULUSAL İNOVASYON SİSTEMİ İÇİNDE TÜBİTAK'IN ROLÜ:
NİTEL BİR ANALİZ

TABLE OF CONTENTS

ABSTRACT……..……IV

ÖZET..... ..V

ACKNOWLEDGEMENTS..……VII

TABLE OF CONTENTS.....IX

LIST OF TABLES XII

LIST OF FIGURES XIII

LIST OF ABBREVIATIONS……...XV

CHAPTER ONE 1

INTRODUCTION 1

CHAPTER TWO 4

LITERATURE REVIEW..... 4

2.1. CONCEPT OF INNOVATION 4

2.2. INNOVATION TYPES..... 10

2.2.1. Product Innovation 10

2.2.2. Business Process Innovation 11

2.2.3. Marketing Innovation..... 12

2.2.4. Organizational Innovation..... 13

2.3. CONCEPTS RELATED TO INNOVATION 14

2.3.1. Invention……...15

2.3.2. Creativity..... 16

2.3.3. Science and Technology..... 17

2.3.4. Research and Development (R & D)..... 18

2.3.5. Diffusion and Imitation 19

2.4. INNOVATION MODELS 19

2.4.1. Linear Models of Innovation 20
2.4.1.1. Dynamic Innovation Model 21
2.4.1.2. Technology Cycle Innovation Model 23
2.4.1.3. S Curve Innovation Model 24
2.4.2. Non-Linear Models 25
2.4.2.1. Concurrent Connection Innovation Models 25
2.4.2.2. Interactive Innovation Models 26
2.4.2.3. Network-Based (Learning) Innovation Models. 26
2.5. National Innovation Systems 27
2.5.1. Systematic Approach to Innovation Concept and National Innovation System 27
2.5.2. Definitions of a National Innovation System 31
2.5.3. Important Activities that are Part of Innovation Systems 36
2.5.4. Elements of National Innovation System 37
2.5.5. Main Institutions and Organizations Constitutes National Innovation System 40
2.5.6. Knowledge and Learning in National Innovation Systems 41
2.6. Turkey's National Innovation System 43
2.6.1. Supreme Council for Science and Technology (BTYK) 47
2.6.2. The Scientific and Technological Research Council of Turkey (TUBITAK) 49
2.6.3. Other Actors of NIS of Turkey 50
2.6.4. Research on Turkey's National Innovation System 51
2.7. Regional Innovation Systems & Centers 52
CHAPTER THREE 54
RESEARCH DESIGN AND METHODOLOGY 54
3.1. Research Questions and Research Purpose 54
3.2. Research Method and Research Design 54
3.3. Data Collection 54
3.4. Descriptive Analysis of Documents 56
3.5. Content Analysis of Documents 60
3.5.1. Content Analysis of TUSIAD-Regional Innovation Center; Turkey-2008 62

3.5.2. Content Analysis of TUSIAD-National Innovation System-2008..... 65
3.5.3. Content Analysis of TUSIAD-National Innovation System-2006..... 67
3.5.4. Content Analysis of TTGV-University-Industry Cooperation-2010 ... 69
3.5.5. Content Analysis of TTGV-University-Industry Coop./Technology Transfer Interface-2010 75
3.5.6. Content Analysis of TEPAV-Innovation, Cooperation and Entrepreneurship-2007 79
3.5.7. Content Analysis of TEPAV-1st Regional Development and Governance Symposium-2006 81
3.5.8. Content Analysis of TEPAV-2nd Regional Development and Governance Symposium-2007 82
3.5.9. Content Analysis of TEPAV-7th Regional Development and Governance Symposium-2012 83
3.5.10. Content Analysis of DPT-Science and Technology Special Commission Report 2000 84
CHAPTER FOUR 91
DISCUSSION AND CONCLUSION 91
REFERENCES 95
CV: CURRICULUM VITAE……...……...…….103

LIST OF TABLES

Table 1 - Definitions of the Concept of Innovation. 5
Table 2 - European Innovation Scoreboard 2019 *(structural differences)*.....…….8
Table 3 - European Innovation Scoreboard 2019 *(relative dimension score)*.....…..9
Table 4 - Functional categories for identifying the type of business process innovations……11
Table 5 – Some Definitions of the National Innovation System..... 33
Table 6 - Analysis of Some Innovation Systems. 35
Table 7 - Public Policy Effects on Innovation..... 39
Table 8 - The Documents Analyzed in the Study.....55
Table 9 - Word Frequencies for All Documents in the Sample. 57
Table 10 - Word Frequencies for 'innovation'. 57
Table 11- Word Frequencies for TUBITAK. 58
Table 12 - Word Frequencies for TUBITAK, science, technology and innovation.. 59
Table 13 - Word Frequencies for ‘TUBITAK’ and ‘innovation’..... 60
Table 14 - Word Frequencies for ‘TUBITAK’ and ‘innovation system’……..……..60

LIST OF FIGURES

Figure 1- Innovation Models. 20
Figure 2 - Linear Innovation Model. 21
Figure 3 - Innovation Phases. 22
Figure 4 - Technology Cycle Model. 24
Figure 5 - R & D Activities and Discontinuity. 25
Figure 6 - Concurrent Connection Innovation Model. 25
Figure 7 - Interactive Model of Innovation. 26
Figure 8 - A National Innovation System Model. 30
Figure 9 - Turkish NIS 44
Figure 10 - Main actors in Turkish STI system with their systemic functions is given. 45
Figure 11-Word Tree for 'TUBITAK' and 'innovation' in the All Sample Documents. 61
Figure 12 - Word Tree for 'TUBITAK' and 'innovation' in the TUSIAD-Regional Innovation Center; Turkey 62
Figure 13 - Word Tree for 'TUBITAK' and 'innovation' in the TUSIAD-National Innovation System-2008. 65
Figure 14 - Word Tree for 'TUBITAK' and 'innovation' in the TUSIAD-National Innovation System-2006. 68
Figure 15 - Word Tree for 'TUBITAK' and 'innovation' in the TTGV-University-Industry Cooperation (2010). 70
Figure 16 - Word Tree for 'TUBITAK' and 'innovation' in the TTGV- University-Industry Coop./Technology Transfer Interface (2010). 75
Figure 17 - Word Tree for 'TUBITAK' and 'innovation' in the TEPAV-Innovation, Cooperation and Entrepreneurship (2007). 79
Figure 18 - Word Tree for 'TUBITAK' and 'innovation' in the TEPAV 2nd Regional Development and Governance Symposium (2007). 82

Figure 19 - word tree for 'TUBITAK' and 'innovation' in the DPT-Science and Technology Special Commission Report (2000)……85

LIST OF ABBREVIATIONS

ARDEB Academic Research Funding Programs Directorate

BIDEB Department of Science Fellowships and Grant Programs

BITO Society Activities Grant Programs

BTYK The Supreme Council of Science and Technology

DPT State Planning Organization

EU European Union

GDP Gross Domestic Product

HRST Human Resources in Science and Technology

IP Intellectual Property

İŞBAP Collaboration Network Platform

KOSGEB the Small and Medium Industry Development and Support Administration

MAM Marmara Research Center

MoSIT Science, Industry and Technology Ministry

NIS National Innovation System

NSI National Systems of Innovation

OECD The Organization for Economic Cooperation and Development

R & D Research and Development

RDA Regional Development Agency

R & I Research and Innovation

RSI Regional Systems of Innovation

SB Science Board

SI Systems of Innovation

SSI Sectoral Systems of Innovation

ST Science and Technology

STI Science, Technology and Innovation

TAEK Turkey Atomic Energy Agency

TEYDEB Technology and Innovation Grant Programs Directorate

TEPAV The Economic Policy Research Foundation of Turkey

TPE Turkish Patent Institute

TSE Turkish Standards Institute

TS Technological System

TSI Technological System of Innovation

TUBITAK the Scientific and Technological Research Council of Turkey

TUBA Turkey Academy of Sciences

TTA Technology Transfer Accelerators

TTGV the Technology Development Foundation of Turkey

TURKAK Turkish Accreditation Center

TURKSTAT Turkish Statistical Institute

TÜİK Turkish Statistical Institute

TÜSİAD Turkish Industry and Business Association

UME National Metrology Institute

USAM The University Industry Cooperation Centers

USAMP The University-Industry Joint Research Centers Program

YÖK Higher Education Council

CHAPTER ONE

INTRODUCTION

Although many studies have been conducted on innovation, which is an almost imperative condition for economic development, the subject is still up to date. Meaning the introduction of new methods in the social, administrative and cultural fields, innovation is both related with development in the knowledge and maintaining superiority. Since innovation has both intellectual and tangible outputs, its wide-ranging framework causes it to be considered a phenomenon. In today's economy, various definitions are made about the concept of innovation that has become one of the most important competitive tools. As a general definition, it can be called scientific, technological, financial, commercial and organizational activities that reveal technological new or improved processes or products (OECDa, 2018).

Innovation can be classified in many ways. According to the Organization for Economic Cooperation and Development (OECD), there are four types of innovation. *Product innovation* is the emergence of a good or service developed according to new or significant features or their intended uses. *Business process innovation* is the implementation of a new or substantially improved production or delivery method; these techniques include significant changes in equipment and/or software. *Marketing innovation* is opening of new markets, new positioning, easier addressing, product design or packaging according to customer needs, product placement product promotion and prices to cover important changes or new markets. *Organizational Innovation* is a method of organization that is used in business applications, workplace organization or external relations, and encompasses these relationships (OECDb, 2018).

In fact, innovation, the starting point of is invents, has been the center of attention almost 100 years ago due to the importance which was put forward by Schumpeter, but especially due to technological innovations since the 1980s. Of course, the enormous knowledge and long Research and Development (R&D) studies behind the technological products produced in recent years have led to the consensus

that innovation should be considered as a system rather than a single phenomenon. Because innovation emerges with interaction between different actors, and the mobilization and implementation of innovations is closely related to the institutional arrangements of the country or region where innovation activities are carried out. The term National Innovation System (NIS) has been on the agenda for more than 20 years and is now widely used by politicians as well as scientists who have undertaken academic studies around the world. The National Innovation System approach defines the effective networks of policies, people and institutions that extend beyond the national borders of countries and enable the flow of information in the domestic industry (Kılınç, 2011:71). Nowadays, as the information society process has started, most of the developing countries are trying to capture this system.

Effective use of technologies is required to achieve a new and destructive innovation. So, the production and effective use of technology has been one of the most important factors affecting the economic development and competitiveness of countries. Collaborations have become essential since the information required to produce technological products or services cannot be usually in a single institution. This may be one of the matters that underline the importance of national innovation systems.

Although it seems that national innovation systems seem to be relatively easy to set up, it is not simple to operate this complex structure that can provide technological development in a national way. For this reason, it will be useful to learn about the functioning of national innovation systems and to carry out studies for this purpose. In this study, taking part in the innovation system of Turkey, the role of a government agency that the Scientific and Technological Research Council of Turkey (Turkish abbreviation: TUBITAK) in the system were investigated. In fact, TUBITAK is not only a governmental organization within the national innovation system, but also it is affiliated to Supreme Council of Science and Technology (Turkish abbreviation: BTYK), a supreme body that dominates the system. At the political level, the BTYK is the most astounding positioning Science, Technology and Innovation (STI) arrangement making body (Erdil & Ertekin, 2018). BTYK decides and coordinates research and advancement approaches. Furthermore,

TUBITAK, associated to Science, Industry and Technology Ministry (MoSIT), goes about as the secretariat of the BTYK.

The role of TUBITAK, which is one of the most important actors in the national innovation system in Turkey has tried to be recognized in the scope of this research. In this context it's tried to answer, whether TUBITAK is an effective player in the national innovation system of Turkey. Furthermore, the role of TUBITAK is evaluated by some other elements in or the outside of the national innovation system.

To investigate the research questions phenomenological research design was chosen within the framework of qualitative research. In terms of research technique, document analysis method was chosen in the framework of qualitative research design. The documents collected within the scope of the research questions were examined with content analysis methods. The documents published after 2000 selected with the purposive sampling method. In this study, summarizer content analysis method was used. Because the research is aimed at examining the role of a specific institution in a system considered to have already existed rather than a new phenomenon in the documents examined.

In order to understand the role of TUBITAK in national innovation system of Turkey, this study is divided into four chapters. This first chapter is the introductory part of the research which contains the background of the study, the objectives of the study and the significance and justification of the research. The second chapter is a literature review which contains a discussion of the definition of innovation, concepts related to innovation, national innovation system, TUBITAK, other actors of national innovation of Turkey and research on Turkey's national innovation system. Chapter three includes data collection and techniques of data analyses and the results obtained from the analyses. Chapter four presents the discussion of the results and in addition recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1. Concept of Innovation

In the process of transition to the information society and knowledge economy, knowledge is increasingly replacing the classical factors of production. Therefore, both organizations and states are trying to enlarge their knowledge and knowledge base, to maintain their competitive advantages, as well as to realize their economic development and increase their welfare levels. On the other hand, the development in the knowledge base is not enough, and the need to maintain superiority arises. Preserving this superiority is possible with the concept called “innovation”. These circumstances lead to international meetings about innovation, writing books on this subject, academic studies, and the publication of magazine and newspaper news, making innovation a frequently encountered issue. Therefore, it is of great importance that the definition of innovation is well defined and meaningful (Akyos, 2008).

The word innovation is based on the Latin word “innovatio". It means the introduction of new methods in the social, administrative and cultural fields. When the structural situation of the word innovation is examined, it is composed of ‘in’ meaning inside and ‘novare’ meaning of, changing, transforming into a new structure. This word’s root depends on being ‘new’. It was used in French in the form of innovation, but it was first introduced in English before 1588 (Akalın, 2007). The dictionary meaning, and common use of the word is ‘the introduction of something new’[1]. Looking at the historical process of innovation, the concept, especially the product of the 19th century, is considered as a new discovery and invention and is perceived as a technical concept. Austrian economist and political scientist Joseph Schumpeter first used the word innovation in a book he wrote in 1911 and described it as the "driving force of development" (Koçel, 2010).

[1] Merriam Webster Online Dictionary, https://www.merriam-webster.com/dictionary/innovation

Table 1 - Definitions of the Concept of Innovation

AUTHORS	DEFINITION
Jacob Schmookler (1966)	"If a cooperation develops a new product or service for itself, or uses a new method or entry for itself, it will have a technical change. The first time a particular technical change is made, it means the firm is innovating and this action is an innovation."
Selwyn W. Becker and Thomas L. Whisler (1967)	"An idea to be applied for the first time by one of the organizations that have similar goals"
Kenneth E. Knight (1967)	"Innovation is the creation of modification for itself and its surroundings as a new change."
George W. Downs, Lawrence B.Mohr (1976)	"Different applications in organizations."
Joel Goldhar (1980)	"Innovation, covering the process from the emergence of ideas to commercialization, is an array of organizational and individual behavioral patterns that are linked to defined resource separation decision points."
Christopher Freeman (1982)	"Industrial innovation encompasses design, production, management and commercial activities for the marketing of a new (or improved/advanced) product or for the first-time commercial use of a new (or improved/advanced) process or equipment."
William L. Moore, Michael L. Tushman (1982)	"Innovation is the synthesis of a requirement in the market and the production of the product that responds to this requirement"
Everett M. Rogers (1983)	"Innovation is an idea, application, or object that is perceived as new."
Peter Drucker (1985)	"Innovation is the tool that allows entrepreneurs to make changes to a different business or service. A discipline has the ability to be shown as the ability to learn, to practice"
Rickards (1985)	"Innovation is the implementation of new ideas. The problems of the systems (requirements) are resolved with new solutions to these requirements."
Roberts (1987)	"Innovation = invent + use. Invention expresses all efforts to create new ideas and make them work. It covers usage process, commercial development, implementation and transfer; Focusing on ideas and inventions for specific objectives, evaluating these objectives, transferring research and/or development results, and using, spreading and disseminating a wide range of results based on technology."
Porter (1990)	"Companies capture competitive advantage with innovation. They approach innovation from a wide angle, covering both new technologies and new forms of business. "

Source: Elçi, 2007; Ersoy & Şengül, 2008

According to Schumpeter, who considers innovation as a starting point for economic discipline, innovation is defined as present resources as new combinations (Schumpeter, 1934). Schumpeter, who was the first to approach innovation from an economic perspective, defined this concept as ‘everything that brings profit to the entrepreneur and emerged as a result of technological advances’, and touched upon the relationship between innovation and the entrepreneur (Yavuz, Albeni, & Kaya, 2009). In the literature, different definitions of the concept of innovation have been made after Schumpeter’s studies till present; some of them are presented in Table 1.

By combining the perspective of all researchers to make a comprehensive and broad definition, innovation in terms of economic units is defined as “the process of creating new and important economic values of all kinds that provide significant increases in the functions of economic units consisting of individuals, corporations, state and global communities, and to raise their economic returns and well-being and the outputs of these processes” (Turanlı & Sarıdoğan, 2010:15).

Innovation is divided into two as ' radical ' or ' incremental ' according to the diversity, innovation and magnitude of change. Radical and incremental innovations according to Uzkurt (2008) and Turanlı and Sarıdoğan (2010) are described as follows: Innovation is radical if the result of radical ideas consists of large breakouts in which previously untested products, services or methods are developed; besides step-by-step, as a result of studies involving a series of development and improvement activities are called incremental innovation. For example, although the mobile phone itself is a radical innovation, adding features to it, such as radio, camera, connection to the internet, can be evaluated as incremental innovations. Structural innovations occur in parallel with a change in a component of the existing system and products, with changes in interactions and connections between other components forming the system.

OECD (Organization for Economic Cooperation and Development) is an important actor that aims to ensure the welfare and economic development of the world's people and seeks to understand the factors behind economic, social and environmental changes, measures global trends and productivity. OECD publishes books, databases and reports yearly in different areas such as innovation and is widely seen as an ‘authoritative source of independent data’ (Salzman, 2000). One of the documents prepared by OECD is called ‘Oslo Manual’ which contains

guideliness for collecting and using data for technological and industrial innovation. The first edition of Oslo Manual in 1992 showed that it was possible to collect and develop data on the complex and differentiating process of innovation**.** In the second edition, which was published in 1997, has been updated to include a broader spectrum of industries and concepts of definitions and methodology, screen experiences and a more advanced understanding of the innovation process. The third edition published in 2005, shows a large amount of data and experience from the rapid adoption of innovation surveys worldwide, including economies at very different levels of economic development. After Oslo Manual's third edition, 13 years later in 2018, the fourth edition was published. The fourth edition seeks to strengthen its relevance as a source of conceptual and practical guidance for the provision of data, indicators and quantitative analyses on innovation (OECD, 2005; OECDb, 2018).

In OECD Publication (Oslo Manual, 2018), innovation refers to" transforming an idea into a marketable product or service, a new or improved method of manufacturing or distribution, or a new social service". In other words, innovation is not only a concrete result, but also a phenomenon that produce socio-economic effects. In today's economy, various definitions are made about the concept of innovation that has become one of the most important competitive tools. As a general definition, it can be signified that it is both a new process and an activity. This manual provides definitions for both as follows:

> *"An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).*" (Oslo Manual, 2018: 34).
>
> *"Innovation activities include all developmental, financial and commercial activities undertaken by a firm that are intended to result in an innovation for the firm."* (Oslo Manual, 2018: 70).

Innovation, representing the development level of countries, is used to rank countries. European Commission uses the annual European Innovation Scoreboard to provide a comparative analysis of the performance of innovation in EU countries, selected third countries and regional neighbors. It assesses relative strengths and weaknesses of national innovation systems and helps countries identify areas they

need to address (European Commission, 2019:6), Turkey which is a country that has been switched to a moderate innovative country from being a modest country, has increasing innovation performance over the years (European Commission, 2019:77). Structural differences between European Union (EU) and Turkey are presented in Table-2 and relative dimension scores are presented in Table-3.

Table 2 – European Innovation Scoreboard 2019 *(structural differences)*

	TR	**EU**
Performance and structure of the economy		
GDP per capita (PPS)	21.700	29.500
Average annual GDP growth (%)	5.3	2.2
Employment share manufacturing (NACE C) (%)	18.2	15.5
of which High and medium high-tech (%)	18.0	37.5
Employment share services (NACE G-N) (%)	35.4	41.8
of which Knowledge-intensive services (%)	20.2	35.0
Turnover share SMEs (%)	n/a	37.9
Turnover share large enterprises (%)	n/a	44.4
Foreign-controlled enterprises – share of value added (%)	n/a	12.6
Business and entrepreneurship		
Enterprise births (10+ employees) (%)	5.6	1.5
Total Entrepreneurial Activity (TEA) (%)	15.2	6.7
FDI net inflows (% GDP)	1.6	4.3
Top R&D spending enterprises per 10 million population	0.7	19.6
Buyer sophistication (1 to 7 best)	3.5	3.7
Govarnance and policy framework		
Ease of starting a business (0 to 100 best)	69.0	76.8
Basic-school entrepren. education and training (1 to 5 best)	1.7	1.9
Govt. procurement of advanced tech products (1 to 7 best)	3.5	3.5
Rule of law (-2.5 to 2.5 best)	-0.2	1.2
Demography		
Population size (millions)	79.8	511.3
Average annual population growth (%)	1.3	0.2
Population density (inhabitants/km2)	103.3	117.5

Source: European Innovation Scoreboard 2019:77
(https://ec.europa.eu/docsroom/documents/35915)

Table 3 – European Innovation Scoreboard 2019 *(relative dimension score)*

Turkey	Relative to EU 2018 in		Performance relative to EU 2011 in	
	2018		2011	2018
Summary Inovation Index	59.2		55.3	64.4
Human resources	35.8		20.4	43.7
New doctorate graduates	14.7		15.4	21.3
Population with tertiary education	50.0		0.0	59.7
Lifelong learning	48.0		47.9	49.0
Attractive research systems	27.1		28.1	30.5
International scientific co-publications	5.2		1.1	7.5
Most cited publications	35.7		50.4	39.1
Foreign doctorate students	33.8		11.0	32.4
Innovation-friendly environment	78.2		97.4	123.6
Broadband penetration	100.0		155.6	200.0
Opportunity-driven entrepreneurship	55.3		57.8	71.6
Finance and support	41.8		55.8	45.7
R&D expenditure in the public sector	45.5		51.4	42.1
Venture capital expenditures	N/A		N/A	N/A
Firm investments	92.8		104.7	110.6
R&D expenditure in the business sector	39.3		27.0	45.1
Non-R&D innovation expenditures	176.1		205.6	205.6
Enterprises providing ICT training	57.9		73.3	73.3
Innovators	150.0		93.4	136.2
SMEs product/process innovations	127.8		90.5	124.0
SMEs marketing/organizational innovations	158.7		107.0	135.5
SMEs innovating in-house	165.9		82.4	149.3
Linkages	41.6		31.1	43.2
Innovative SMEs collaborating with others	86.9		49.7	92.8
Public-private co-publications	7.6		2.8	8.9
Private co-funding of public R&D exp.	22.6		29.6	21.7
Intellectual assets	8.5		6.9	8.3
PCT patent applications	18.9		14.2	17.2
Trademark applications	3.6		0.0	4.0
Design applications	2.7		5.1	2.5
Employment Impacts	10.3		0.0	10.8
Employment in knowledge-intensive activities	11.8		0.0	12.8
Employment fast-growing enterprises	N/A		N/A	N/A
Sales Impacts	55.3		77.8	56.9
Medium and high-tech product exports	55.4		55.3	59.8
Knowledge-intensive services exports	38.9		16.9	40.2
Sales of new-to-market/firm innovations	75.1		174.5	72.8

The colors show normalized performance in 2018 relative to that of the EU in 2018: dark green: above 120%; light green: between 90% and 120%; yellow: between 50% and 90%; orange: below 50%. Normalized performance uses the data after a possible imputation of missing data and transformation of the data.

Source: European Innovation Scoreboard 2019:77
(https://ec.europa.eu/docsroom/documents/35915)

2.2. Innovation Types

Innovation can be classified in many ways. Although there are many opinions in the literature, the distinction made by Austrian economist Joseph Schumpeter stands out based on his classification. According to Schumpeter, there are five different types of innovations (Schumpeter, 1934) which are,

- Creation of a new product or a qualified change to the existing products
- A new process innovation for the industry,
- The formation of a new market,
- Development of alternative resources for raw materials or other inputs,
- Changes in the industrial organization.

Innovation is beyond that; are classified according to the results, priorities and effects of it (Güleş & Bülbül, 2004). Information about the different types of innovation is provided below.

2.2.1. Product Innovation

Product innovation is the emergence of goods or services developed according to new or significant features or their intended uses differs significantly from the firm's previous goods or services and that has been introduced on the market. These important specifications; includes improvements, components and materials, anonymous software, user convenience, or other functional features (OECDb, 2018). In other words, product innovation is the technical features of a product which include important improvements in parts, materials, software, ease of use/convenience, or other functional properties (Elçi, Karataylı, & Karaata, 2008:26). Development of a different and new product; or changes to the existing product, differentiation, innovation and the introduction of these products to the market are called 'product innovation' (Elçi, 2007:3) and a simple definition can be explained to take an existing product to the next level. In another definition, product innovation is also called as studies to produce a new product and to increase the life of an existing product. So, it is a process that involves the production, development and dissemination of products to the market. The new products produced help to preserve the market share, while also helping to grow the market share in parallel. Briefly a product process; shortening of a product with higher models is forcing firms, firms that innovating products grow and develop, and even a product innovation is the

driving force behind companies, as a result the new product is the key to success in production and the milestone of the competition (Tunç, 2008:14).

2.2.2. Business Process Innovation

Business Process innovation is the implementation of a new or substantially improved production or delivery method for one or more business functions which differs significantly from firm's previous business process; these techniques include significant changes in production, distribution and logistics information and communication systems in equipment and/or software (OECDb, 2018). In another definition, the development of a different and new production method or distribution shape or method is summarized as the improvement of existing methods and making them more advanced (Elçi, 2007:9) In other words, it is to develop ways to deliver an existing product or services more efficiently and more effectively (Kırım, 2005:20). As seen below in Table 4, this type of innovation covers all processes from production of innovation to distribution. This means that if companies can produce or deliver the same product or service more than once, or if the production of a product and service is less than normal, there may be a process innovation there (Tunç, 2008:16).

Table 4 - Functional Categories for Identifying Type of Business Process Innovations

Short term	Details and subcategories
1. Production of goods or services	"Activities that transform inputs into goods or services, including engineering and related technical testing, analysis and certification activities to support production."
2. Distribution and logistics	"This function includes: a) transportation and service delivery b) warehousing c) order processing."
3. Marketing and sales	"This function includes: a) marketing methods including advertising (product promotion and placement, packaging of products), direct marketing (telemarketing), exhibitions and fairs, market research and other activities to develop new markets b) pricing strategies and methods c) sales and after-sales activities, including help desks other customer support and customer relationship activities."

Table – 4 Continued

4. Information and communication systems	"The maintenance and provision of information and communication systems, including: a) hardware and software b) data processing and database c) maintenance and repair d) web-hosting and other computer-related information activities. These functions can be provided in a separate division or in divisions responsible for other functions."
5. Administration and management	"This function includes: a) strategic and general business management (cross-functional decision-making), including organising work responsibilities b) corporate governance (legal, planning and public relations) c) accounting, bookkeeping, auditing, payments and other financial or insurance activities d) human resources management (training and education, staff recruitment, workplace organisation, provision of temporary personnel, payroll management, health and medical support) e) procurement f) managing external relationships with suppliers, alliances, etc."
6. Product and business process development	"Activities to scope, identify, develop, or adapt products or a firm's business processes. This function can be undertaken in a systematic fashion or on an ad hoc basis, and be conducted within the firm or obtained from external sources. Responsibility for these activities can lie within a separate division or in divisions responsible for other functions, e.g. production of goods or services."

Source: Oslo Manual, 2018:75

2.2.3. Marketing Innovation

Marketing innovation is opening of new markets, new positioning, easier addressing, product design or packaging according to customer needs, product placement, product promotion, sales and after sales support and prices to cover important changes or new markets (OECDb, 2018). In other words, it is all kinds of marketing techniques to increase the sales of the company by making small plays or corrections to the appearance and/or shape of the products without playing the functional features (Dinler, 2014:188). According to another definition, it is to develop different marketing methods to uncover different and new designs, or improve the ones that exist, and make them more advanced (Elçi, 2007:12). In short, marketing innovation includes the improvement of 'contact with customers' processes. The ideas here can be improved in the field of marketing communication

as well as in the field of shopping activity (Kırım, 2005:23). Here, organizational and marketing innovation goes into the class of non-technological innovation and is as important as technological innovation (Elçi, 2007:12). Marketing innovation does not only cover innovation for reaching markets, it also involves delivering or adopting innovation to new consumers (Ayhan, 1999:21). Such innovations focus on differentiating the interactions that customers will develop within the purchasing process, as well as marketing innovation can be seen, as a tool to eliminate the traditional relationship between the customer and the seller, and development of innovative method (Yavuz, 2010:147).

In this type of innovation, the development of marketing techniques or the emergence of new marketing methods can be used for both new and existing products. A new marketing, which is an important part of the concept of marketing innovation; includes significant changes in the concept and design of the current product. Of course, as mentioned above, these changes are performed without changing the functional properties of the product. It is very important to retain existing users in these changes. This is a significant factor in the change in appearance. For example, a furniture design or changes in a detergent package can be very important (Adıgüzel, 2012). In fact, when marketing innovation is called a slightly broader term, it is a brand new one that includes important changes from product design to packaging, product positioning to product promotion/promotion and pricing and marketing methods. The goal of marketing innovation is to respond more successfully to customer needs, develop new markets or position the existing product in a market differently (Göker, 2009:57).

2.2.4. Organizational Innovation

Organizational Innovation is a method of organization that is used in business applications, workplace organization or external relations, administration and management and encompasses these relationships (OECDb, 2018). Organizational innovations in the commercial application involve the use or implementation of new methods for the execution of the work. For example, many applications can be exemplary (Günay, 2007:16), such as the arrangement of information, easy access to information, and the creation of a database of lessons and other information. The development of working methods, conditions and methods of doing business or

adaptation of existing methods to the company's requirements (Elçi, 2007:10). In other words, it is the implementation of a new organizational method in the company's business applications, workplace organization or external relations (Elçi et al., 2008;27). These innovations combine material and labor resources with the most appropriate way to express new and different structures (Yavuz, 2010,:147).

In addition to these descriptions, this type of innovation may be thought to strengthen the connection within the company, increase the compliance between workers and improve business productivity, or improve company performance by lowering the costs of tools. Organizational innovation in commercial applications includes new methods for organizing routine works and procedures to sustain studies. Innovations in organizations involve the realization of new methods for the distribution of responsibilities and decision-making between employees to divide a business between firms and organizational units. For example, a firm is aimed at increasing the incentive and self-confidence for employees to provide ideas to management. For these studies to succeed, it is necessary to abandon a centralist structure or to establish working teams with fewer responsibilities as individuals, but organizational innovations are included. For example, the centralization of company activities and increased decision-making responsibility. Changes based on the organizational methods currently being applied to commercial applications, the workplace organization or external relations in a company are not organizational innovation (Adıgüzel, 2012:38-40)

Being different from other types of innovation, organizational innovation is a novelty that has not previously been used in companies and has emerged as a result of the strategic decision taken by the administration. It can occur in the form of a new internal communication system (intranet) or a new costing method (Akyos, 2005:6).

2.3. Concepts Related to Innovation

Innovation is related with the such concepts of invention, R & D, creativity and science and technology. Concepts related to innovation are described below.

2.3.1. Invention

The concept of innovation is associated with the concepts of invention and creativity. Inventing is a concept close to technology and innovation, since eliminating an existing situation and doing the same work in another way. An invention can be found at the basis of innovation. However, in order for the invention to turn into innovation, it must be commercialized and the yield increased by providing benefits (Satı, 2013:19). The invention is a concept associated with innovation and even used together. Methodological change occurs when a person or organization produces a service or product that is innovative for the first time or uses a new method or input. The inventor and his product are also called inventions for the entrepreneur who made the methodological change for the first time. The beginning and the first process of science is to make invention. The invention can be defined as the use of known information to reach a previously unknown new finding or method development. The invention describes the level of idea or concept of a new or improved product or process. The implementation of the invention or the use of invention begins to transform it (Akıncı, 2011:56).

There is a significant difference between innovation and invention. While invention is the first time to develop an idea for a new product or method of production, innovation is the first commercialization of an idea. However, invention and innovation can sometimes be closely related to each other and it is difficult to distinguish one from another. Biotechnology can be given as an example of this situation. In many cases there is a great time difference between innovation and invention. Inventions can be transported anywhere (for example, universities), innovations emerge more in firms. To transform an invention into innovation, a company normally needs to combine several different types of information, abilities, qualifications and resources. For example, the company may need product and market knowledge, skills and features, a well-functioning distribution system and adequate financial resources. Following this, the role of the innovator, an individual or organizational unit that is responsible for bringing together the necessary factors (the innovation theorist Schumpeter considers it an entrepreneur) may be very much different (Fagerberg, Mowery, & Nelson, 2005:4-5).

Although the concept of invention plays an important role in historical and sociological literature for technical change, it has undergone an environmental role in

the economic literature until recently. One of the main problems of economists is the difficulties they face in making an acceptable analytical identification, in contrast to formal-institutional descriptions made by national patent offices. Usher (1964) has solved this problem and described the invention as the emergence of new things that require a movement of understanding beyond technical or professional skills (Ruttan, 2001:65).

It is not important to invent, according to Lowe and Marriott (2006). There is a popular misconception that innovation and invention are the same, but according to the common opinion of the authors in this field, innovation does not necessarily contain an invention. Britain has a successful history of scientific and technological invention, but behind its use there is innovation and the establishment of new businesses and jobs. The concept of innovation plays a more important role than the concept of traditionally invention in the economy. This was not possible until Schumpeter set innovation as the main function of the entrepreneur and built an economic development theory in which innovator and innovation, credit and profit maximization were found. The concept of innovation has thus been a great demand. Schumpeter has separated innovation and innovator from invention and inventor. According to Schumpeter, the main difference between the two concepts as follows: innovation is also possible without the things we described as inventing, and invention does not necessarily include innovation. Schumpeter has not only rejected the idea that innovation is based on invention but also expressed that the processes that produce innovations are different from the processes that produce inventions economically and socially (Ruttan, 2001:64).

2.3.2. Creativity

The concept of creativity is one of the most confused concept with innovation. Although these two concepts seem synonymous, there are differences. While creativity is to think about new things and thinking differently, innovation is to do and apply new things (Ozan, 2009:18). Innovation starts with creativity. Because the emergence of new ideas, the application of these ideas with innovation or the change of existing ideas to bring new perspectives is to be realized through creativity. There are differences between the abilities required to create or create new ideas and to implement these ideas (Akıncı, 2011:56). If a creative idea is not implemented, it is

not possible to create value for the business, and this idea has no meaning for that business anymore. Therefore, innovation process to be created in the enterprises should include creativity and innovation together (Cengiz, 2012: 23; Durna, 2000:6).

Businesses where creativity can be improved are much less affected by uncertain environmental conditions and as a result, they are strengthened in an intensely competitive environment. In this respect, it is important for the companies to examine the relationship between creativity and innovation very well, to place creative thinking in all units of the company and to create organizational climate and culture open to innovation in order to establish positive innovation activities and establish a productive human resources structure (Satı, 2013:12).

Creativity is the new and special solutions defined as mental processes for ideas, concepts, theories and product development. Creativity can be considered as a concept that expresses the implementation of new and appropriate ideas and innovation in the organization. The basic phases of the individual creativity process are identifying the problem or task, storing the necessary information, developing new ideas and evaluating the results. Besides, the main components of individual creativity are; expertise, which is an indication of the level of education and individual experience, it is a focus on the task of having creative thinking skills and expressing the degree to which the task or problem is adopted and motivated in its solution (Uzkurt, 2008:28-29).

2.3.3. Science and Technology

Mankind has endeavored for centuries to understand nature, its environment and itself in order to live happier. This struggle of human beings to make sense of life has taken a systematic shape together with research, development, analysis and science process. With this feature, science has gained an important place in human life from past to present (Turanlı and Sarıdoğan, 2010:11). Technology is a scientific application to achieve a commercial gain. In other words, technology is all the methods people use in the production system or the techniques people use to change their environment (Satı, 2013:14). The words technology and science are used in the same sense in daily life, although there is a relationship between these two concepts, there are differences between them. Technology or technical information is a set of

information that is based on a systematic discipline of how something is produced, consumed and used (Dalkıran, 2013:173; Türkcan, 2009:21-22).

2.3.4. Research and Development (R & D)

Research and Development (R & D) is a creative systematic study/work to increase the stock of knowledge; including knowledge of humanity, culture and community and to produce new devices or products with available knowledge (OECD Frascati Manual 2015). R & D is a series of actions ranging from finding useful products that meet the needs of people, developing, testing and using production tools and finding new principles in nature (Satı, 2013:16). R & D is considered as an important resource in the discovery of "new products, new production techniques, new information and new processes". According to Frascati (1993), "R & D includes creative works that increase the information stock and use it to design new applications and discoveries". R & D is a factor that affects the productivity levels of firms. The information stock obtained as a result of R & D activities plays a leading role in the production of highly competitive products and has a significant impact on the profitability levels of the company. R & D is not only the source of new technologies; at the same time, it contributes significantly to the activities that have an important role in the formation of new technologies such as learning by doing or design in industrial economies in the modern world (Işık & Kılınç, 2010:7).

The information obtained as a result of R & D activities is used to develop a new product and production method and to reveal a new market. This information contributes to the development of companies by increasing their competitiveness. The information produced in a company contributes to the development of the region by rapidly spreading to other companies in the region. R & D expenditure is a key indicator of the efforts made by the private and public sectors to gain competitive advantage in science and technology. R & D includes creative works that increase the information stock, use this information for new applications and are based on a systematic basis (Bozkurt, 2015).

R & D covers three main activities, which are basic research, applied research and experimental development. The *basic research* involves theoretical and practical studies to obtain new information under the phenomenon and observable facts

without any application or use. *Applied research* also relates to original research carried out to obtain new information, but the research here is conducted for specific practical purposes or objectives. *Experimental development* is a systematic study and an activity in which knowledge is obtained as a result of research and practical experience. These studies are based on the production of new materials, new products or devices, the development of new production methods or systems, or the further development of these already manufactured and developed processes. The share of R & D expenditures in GDP is used in international comparisons. R & D is one of the most important activities for innovation. If the organizations carrying out R & D activities do not have entrepreneurial qualifications, value cannot be created, and R & D results cannot be transformed into innovation. Therefore, innovation activities carried out in different fields of activity include not only technological innovation, but also organizational and marketing innovation (Zerenler, Türker, & Şahin, 2007).

2.3.5. Diffusion and Imitation

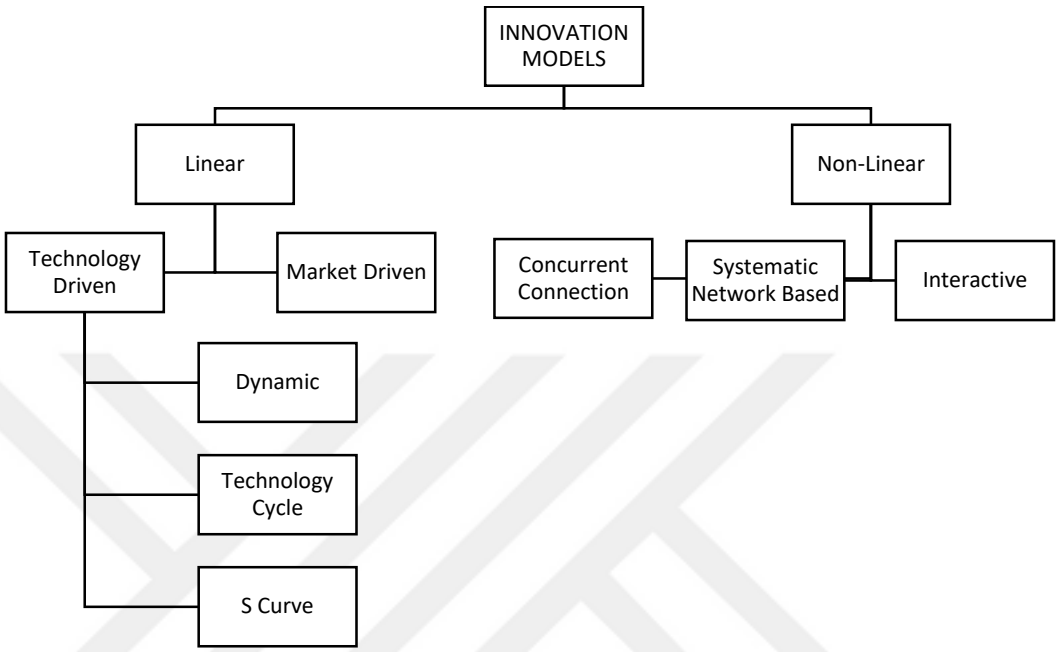
The transformation of invention into commercial utility is innovation and, the spread of innovation into markets is diffusion. As can be understood from the definition, diffusion and innovation are two closely related concepts. When an innovation occurs, it can be implemented in many ways. Advances in the form of small increases are decisive in the spread of technology and innovation. But substantial innovations have overshadowed them. Therefore, active adoption of new technologies is vital for the majority of countries and firms (Akıncı, 2011:57; Ozan, 2009:26). The word imitation can be defined as a thing intended to simulate or copy something else and it made by simulating a particular example or work. The concept of imitation is also closely related to innovation. Innovations are generally initiated by one or several individuals or firms, and other firms and individuals benefit from these studies (Demirci, 2006).

2.4. Innovation Models

Innovation Models are classified into linear models and nonlinear models as shown in Figure 1. Linear models consist of technology-centric and market-centric innovation models. Nonlinear models are divided into three types: concurrent connection models, interactive innovation models and systematic network-based

learning models. Technology-based innovation models are classified as Utterback and Abernathy's (1978) dynamic innovation model, Tushman and Rosenkopf's (1994) technology lifecycle model and Foster's S curve model (Figure 1).

Figure 1- Innovation Models



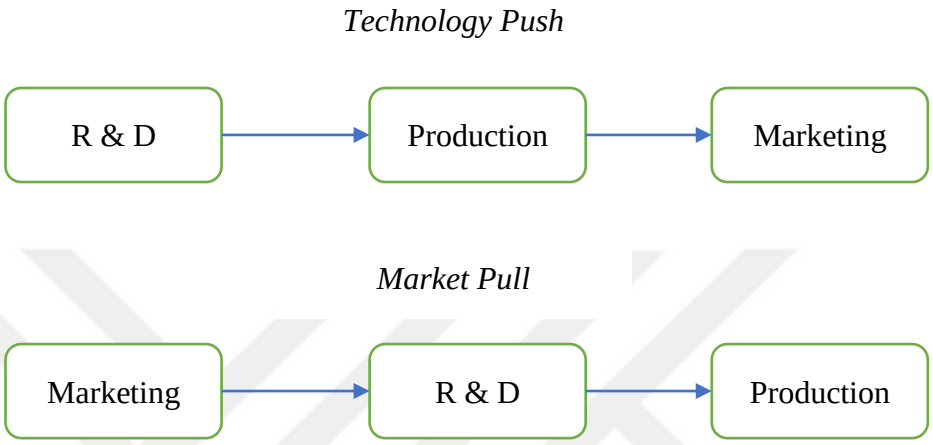
Source: (Erdal, 2008; O'Sullivan & Dooley, 2009; Trott, 2005)

2.4.1. Linear Models of Innovation

There are two main types of product innovation model. The first is a technology-driven model based on the assumption that unexpected discoveries made by scientists are translated into product ideas and engineering with the help of technology, and that these discoveries are turned into prototypes by designers for product testing. This model is often referred to as a *technology push* model. It is left to the production process to find ways to produce these products efficiently. Finally, through marketing and sales, products will reach potential consumers. The technology push model played a leading role in post-World War II industrial policies. While this model of innovation can be applied to several cases (most importantly the pharmaceutical industry), it does not apply to many other cases. Mostly, the innovation process in this model follows different routes. In the 1970s, the market played an active role in the innovation process. This led to the formation of the second linear model, i.e. the *market pull* model. The customer needs-oriented model emphasizes the role of marketing processes, leading to new ideas resulting

from close interactions with customers (Trott, 2005:23). Figure 2 shows technology and market-oriented linear innovation models. In the model that has the technology push, the marketing is the last stage, whereas in the model that has the market pull, the production takes place in the final stage.

Figure 2 - Linear Innovation Model

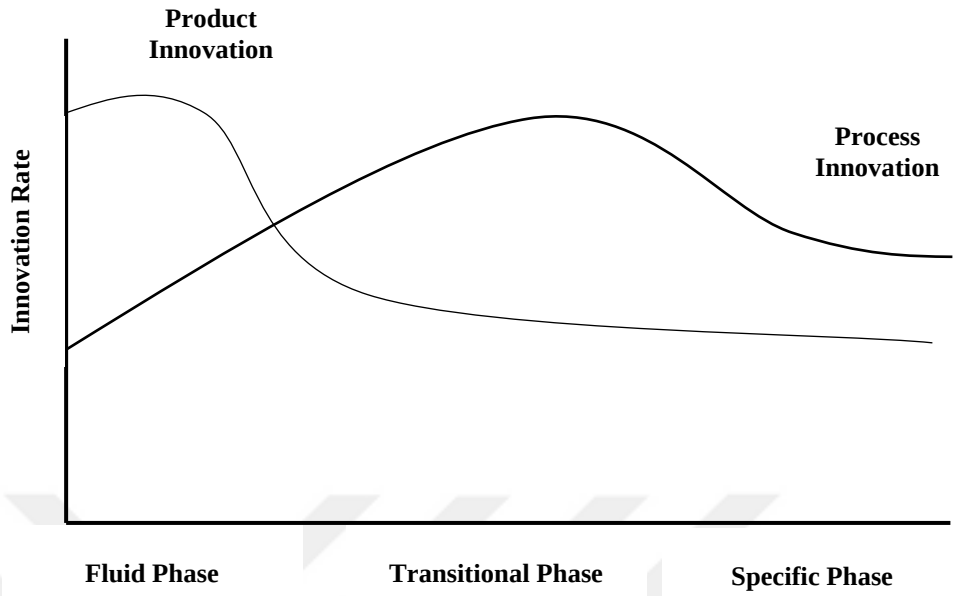


Source: Trott, 2005:23

2.4.1.1. Dynamic Innovation Model

According to Utterback (1994), Utterback & Abernathy (1978) model is an attempt to explain the dynamic processes of innovation in detail. This model describes the rate of change of product and process innovation. In the model that tries to explain the dynamic processes in an industry and companies in this industry, development stages are given. These stages are fluent, transition and specific. These stages are associated with innovation rate and are based on product, process, competition and organizational aspects. The phases involved in the innovation process according to this model are shown in Figure 3.

Figure 3 - Innovation Phases



Source: Utterback, 1994:91

The phases involved in the innovation process according to this model are explained below (Utterback, 1994):

Fluid Phase: The fluid phase is the stage where most of the changes are experienced for the first time. In the fluent phase of technology evolution, the rate of product change is expected to increase rapidly. When technology is flowing, firms cannot have an idea of the exact level of R & D expenditures. In the early stages of the flow stage, process innovation often lags product innovation.

Transition Phase: If the market grows due to new products, the industry may enter the transition phase. The acceptance of a product innovation and the emergence of dominant design are the characteristics of this stage. In the transition phase, product and process innovations become more closely linked. The properties of the materials are increased, the use of expensive and upgraded equipment in production plants increases, and administrative controls suddenly appear to be important. According to the model, the product innovation rate decreases in the transition phase, while the process innovation rate increases rapidly.

Specific Phase: At the specific stage, the cost and quality value ratio is considered as the main source of competition. At this stage, the products became

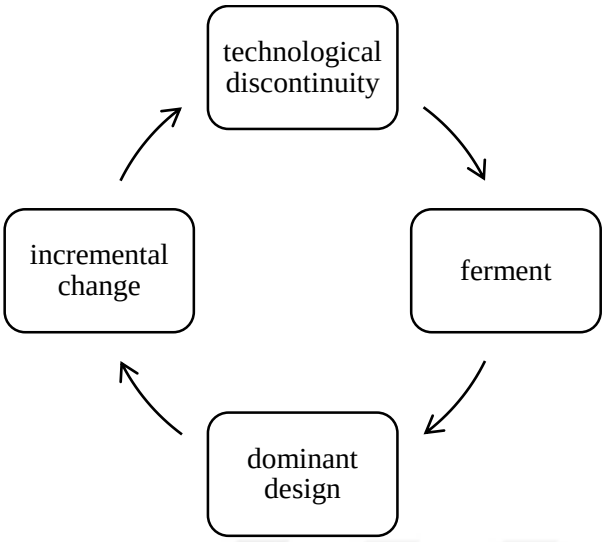
very clear and the differences between competitors' products decreased; product and process innovation rate is beginning to decrease. Product and process innovation appears in small incremental steps. Innovation contributes greatly to improving product performance. When innovation enables customers to compare and evaluate the product, it can become a leader in product performance. While product and process innovations are interdependent, product innovation rate decreases and process innovation rate increases. In process innovation, it is possible to produce more specialized products with less labor.

2.4.1.2. Technology Cycle Innovation Model

Tushman and Rosenkopf (1994) used the technology cycle model to explain technological change. In their study, they aimed to explain the technological change governed by the socio-economic evolution processes of variation, choice and protection. Using the “S” curves, the model divides the life cycle into four components: technological discontinuity, ferment, dominant design and incremental change.

Technology cycle model is depicted in Figure 4 in the period of technological discontinuity, a large product or process invention provides a source of variation, that is, an old or imitation technology or a variation. This leads to competition of different variations in a ferment region. There will also be a technological rivalry between new and old technology. At the same time, the dominant design emerges as a variation that wins the selection process. This initiates a period of discontinuous development for the dominant design and eventually leads to a new technological discontinuity. Technological discontinuity is fundamentally different from other types of environmental change. The discontinuity here represents the practice existing in the industry, and thus the dramatic abandonment of knowledge. Thus, technological changes are clearly becoming very important for the technological competencies of the companies (Schoen 2015).

Figure 4 - Technology Cycle Model

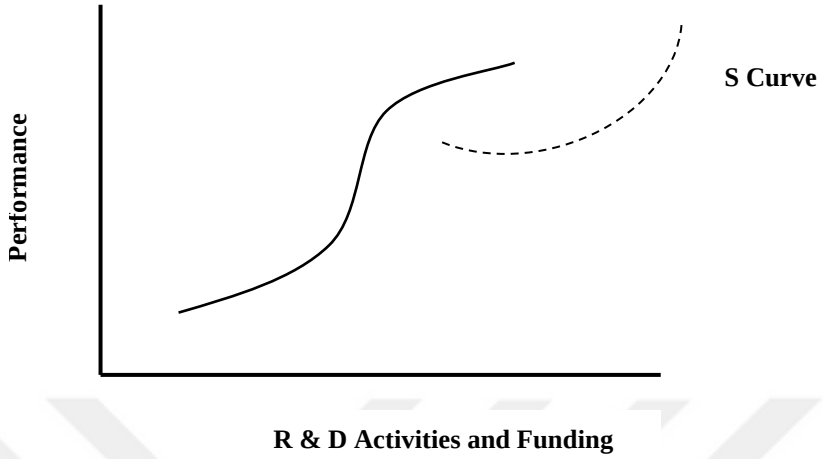


Source: Drejer, 2002:366

2.4.1.3. S Curve Innovation Model

Foster (1986) used the "S" curve for technology life cycle and this life cycle is represented in Figure 5. This illustration represents investments in customer-perceived product development and performance enhancement. The investment in product, service and process development results in a stream of small performance improvements that add value to the customer. However, when approaching the end of life at the top of the "S" curve, more R & D investment provides only a small improvement in performance. For example, when the usage time of analogue TVs is approached, even significant additional investments have not been able to provide small improvements in customer satisfaction. As digital televisions became available for purchase, demand for obsolete products dropped rapidly (Lowe and Marriott, 2006:72).

Figure 5 - R & D Activities and Discontinuity



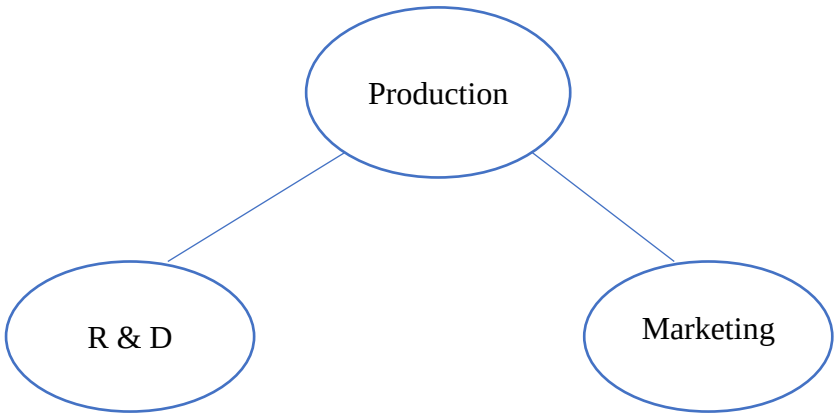
Source: Foster, 1986a

2.4.2. Non-Linear Models

2.4.2.1. Concurrent Connection Innovation Models

The concurrent link model is related to the fact that information in manufacturing, R & D and marketing functions that promote innovation is the result of concurrent (simultaneous) interconnection (Figure 6). The starting point for innovation is not known in advance (Trott, 2005:24).

Figure 6 - Concurrent Connection Innovation Model

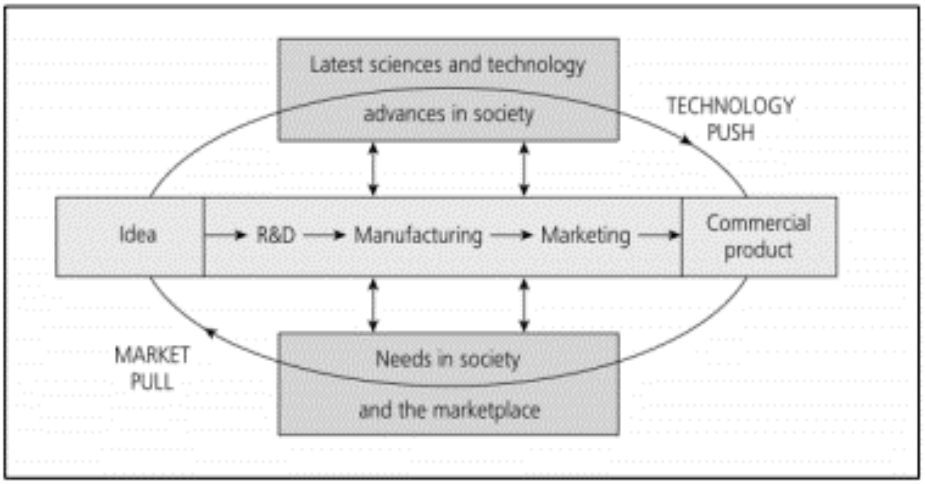


Source: Trott, 2005:24

2.4.2.2. Interactive Innovation Models

According to Trott (2005), the interactive model (Figure 7) establishes a link between technology push and market pull models. The model states that innovations occur as a result of the interaction of the market, the science base, and the capabilities of the organization. Like the matching model, the starting point is not clear. Here, the information flow is used to explain how innovations spread. The innovation process represents the capabilities of organizations and their relevance to both the market and the science base. Businesses that successfully manage this process will be successful in innovation. The center of the model is the R & D functions of organizations, engineering and design, manufacturing and marketing and sales (Trott, 2005:25).

Figure 7 - Interactive Model of Innovation.



Source: Trott, 2005:25

2.4.2.3. Network-Based (Learning) Innovation Models

Network-Based (Learning) Innovation Model is an innovation model based on learning from the internal and external dynamics that the enterprise interacts with. It is possible to classify these dynamics as internal and external learning sources. In-house learning resources include learning through R & D and development, learning through testing, learning by doing, learning from mistakes, learning from cross-project groups. Non-business learning resources, learning from or with suppliers, learning from leading users, learning through horizontal collaborations, learning

from science and technology (ST) infrastructure, learning from literature, learning from competing activities, learning from reverse (back) engineering applications, learning from company acquisitions, learning from customer-based prototype trials, learning from services, learning by taking lessons from mistakes (Erdal, 2008:7).

2.5. National Innovation Systems

This section includes: Systematic Approach to Innovation Concept and National Innovation System, Definitions of a National Innovation System, Important Activities that are Part of Innovation Systems, Elements of National Innovation System, Main Institutions and Organizations within National Innovation System and Knowledge and Learning in National Innovation Systems.

2.5.1. Systematic Approach to Innovation Concept and National Innovation System

The system can be defined as an integrated collection of complex and interactive elements that affect each other (Şengül, 2008). According to the system, the whole is more than the sum of the parts. Being systematic means seeing the whole instead of dealing with parts. In the 1960s, system dynamics between social scientist and system analysis were popular and, many researchers particularly from management, began to use this approach to study decisions and choices regarding science, technology and innovation (Godin, 2007).

The main features of the system can be listed as follows (Tuncel, 2011);

a) Consisting of certain sub-units and subsystems,
b) Consisting of pieces with certain relations between them,
c) And that the whole, has relationship between parts and environment

Innovation emerges with interaction between different actors. The success of innovation depends on how all actors work together to form a network system where they can share their knowledge (Geels, 2004). The system approach, which has an analytical feature, started with the Bertalanffy's general system theory in 1960s. The systematic approach to innovation is more integrated with economic policies. It means that the flows of information and technology among enterprises, people and institutions are the key to the innovative process. The systemic approach puts

emphasis on the role of system-specific institutional factors that encourage innovation and technological change (Lundvall, 1992; OECD, 1999; Edquist, 2001). There are two subsystems in a system, one is transformation and the other is control. Transformation is a priority process in an open system which takes inputs and converts them into outputs. The type of this transformation determines the operational capability of the technological system and the boundaries of a technological system are determined by the physical structure in which it receives and transforms the inputs into its output (Betz, 1994). In a transformational system, inputs are produced because of environmental effects on the system, while outputs are produced because of the environmental impact of the system. From this point of view, systematic behavior is more about how parts interact with others rather than what individual parts do (Tuncel, 2011:104).

R & D, technology acquisition and development, competent human resources, and the number of full-time researchers are in this context. R & D, which has become a national culture due to the developments in the fields and the size, spread and sustainability of the studies within this scope, has been the key to the development of high value-added production countries as a result of intensive, high innovation ability. The theories of innovation and the systems implemented accordingly start from the firm or entrepreneurial micro scale with increasing acceleration and complexity. Later, the meso-scale environment and business environment of these organizations, and then more extreme regulations, institutions, human resources, government programs, but also extends to macro systems (Edquist, 2001).

Nelson (1993) made a slightly different interpretation of the concept of "system" within the National Innovation System (NIS). According to his definition, the "system" aspect of the NIS is the group of institutions and companies that interact to determine innovation success. Conscious planning, consistent and smooth interaction of institutions and companies within this system significantly affects innovation success and the elements included in the concept of 'system' within the NIS are very important. Some elements of the system on a national or sectoral basis are deliberately planned by actors or politicians. Some important elements also take place automatically in the system over time. In fact, it is difficult to plan the NIS as a whole system (Edquist, 1997). Therefore, Lundvall (1992) stated that the definition of the NIS should be clear and flexible. It would be appropriate to consider the NIS

perspective as a system-wide system that attempts to explain and create actors, behaviors and flows that provide increasingly complex science and technological innovations. In the light of these explanations, the NIS aims to regulate, finance and protect the new science and technological developments arising from this interaction, whether small or large, public or private firms, universities and public institutions interact with the aim of producing science and technology, commercial, legal, social and financial framework. This system, as can be seen from the schematic representation below (Figure 8), has a very complex structure, and the success in the establishment, synchronous operation and development of this system is directly proportional to the competence status of the countries within the scope of science-technology development-innovation, in other words, the level of development (Kiper, 2010:24).

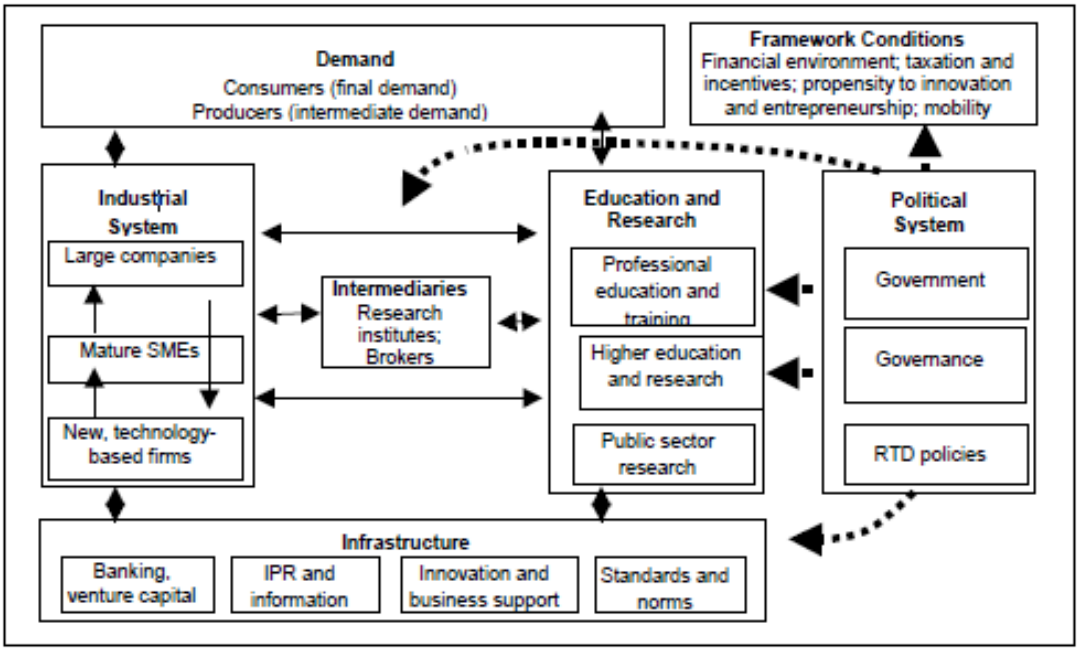
The features of the system approach have been evaluated by different academics. In addition to the three features mentioned above, when we examine the different features, the basic features of the system approach regarding innovation (Kılınç, 2011:56; Tödtling, Kaufmann, & Sedlacek, 1998) are listed below:

- Innovation has various starting points such as sales, marketing, R & D and distribution functions. Innovation systems include inter-company interdependencies and feedback cycles, as well as between companies and other organizations.
- The main feature of the innovation process is uncertainty. The biggest task for overcoming this problem is the institutions, because only these institutions can deal with these problems. Institutions carry out multiple functions in innovation processes. Their first function is to reduce uncertainties by providing communication or by using specific rules and measures. The second function is to resolve conflicts between various people and to determine the rules of joint work that can be done. The third function is to support the studies on this subject by providing rewards for innovation.
- The mobilization and implementation of innovations is closely related to the institutional arrangements of the country or region where innovation activities are carried out. All these codifications and studies are guided by the governance model including public works.

- Routines are also useful tools for dealing with uncertainty for companies. The tools that guide the innovation process and provide stability by drawing a certain technological path through the choices to be made for the research and development, communication and screening activities used by the firms are called routines.

As it can be seen in the Figure 8, national innovation systems can contain a complex structure, since it involves complex processes of producing information and producing innovative products from this information (Kuhlmann & Arnold, 2001:8). This system, as can be seen from the schematic representation below, has a very complex and composite structure, and the success in the establishment, synchronous operation and development of this system is directly proportional to the competence status of the countries within the scope of science-technology development-innovation, in other words, the level of development (Kiper, 2010).

Figure 8 - A National Innovation System Model



Source: Kuhlmann & Arnold, 2001:2

Today, where innovation plays an active role in economic growth, advances in new technologies to feed innovation and developments in systems of information generation, dissemination and use play an important role. When we look at the basic components of the national innovation field, we see the government, its affiliates and the policies they form in terms of providing the necessary regulations and resources,

financial environment, supports, venture capital and others that feed the entrepreneurial environment and, the standard and conformity assessment system elements are being developed to determine the demand situation (Kiper, 2010:26). In addition to establishing such an innovation system with all actors, it is essential that they work in close interaction and cooperation with each other. Systems are being developed in order to measure the success of the National Innovation System and to ensure that countries' systems can be compared with each other. In this context, by gathering the statistics of the countries by the organizations whose expertise is known in this field, measurable analyzes are carried out for innovation inputs and outputs. Of these, the EU-provided innovation report provides important clues about the success of the country's innovation systems (Kiper, 2010:26).

2.5.2. Definitions of a National Innovation System

The term National Innovation System (NIS) has been on the agenda for more than 20 years and is now widely used by politicians as well as scientists who have undertaken academic studies around the world. For several decades, (neoclassical) economists have been reproved for their failure to integrate institutions into their theories and econometric models (Nelson and Winter, 1977; Nelson, 1981) and, partly as a replication to this situation, researchers in the field of science, technology and innovation studies invented the concept of a National Innovation System (Godin, 2007:7) Nowadays, as the information society process has started, most of the developing countries are trying to capture this process. The most important factor to catch up this process is the technology production. The economic development and competitiveness of countries is affected by the production and effective use of technology. Technology, innovation and science policies are designed and directed by the governments under the administration of the countries and the scientific and technological products of that country are produced. In order for these policies to be carried out effectively and planned and managed, they must be implemented through a concrete systematic (Saatçioğlu, 2005).

The idea of a system approach to innovation is rooted in the National Political Economy System, which was introduced by economist Friedrich List in 1841 (Elçi et al., 2008). Then, in 1985, Lundvall's work (1985) was considered as an 'innovation system' and was described as 'national innovation system' by economist Christopher Freeman who examined the success of the Japanese economy in 1987. The concept

of innovation system is based on the fact that innovation occurs in a country through the network structure of different actors such as public institutions, private sector organizations, universities and research institutions, and the relationships and interactions between them (Elçi et al., 2008).

The importance given by the states to the policies put forward in these issues is decisive in shaping the science and technology management mechanisms. Science and technology governance mechanisms include competent institutions and systems to take part in the process of national policy making and implementation. In today's world, these systems are named with the notion of national innovation systems (Saatçioğlu, 2005:180, DPT, 2000a:186-187). The most important factor in the fact that developed countries hold power in the world economically and gain the title of "developed country" because of they manage science and technology very well. The effect of these elements is more prominent than the others. The future and success of societies is more dependent on new thinking, creativity and the realization of new knowledge (Yavuz et al., 2009; Yongxiang, 1998:174).

The main source of growth for economies is technical change. In the process of technical change, the necessity of understanding and managing the processes of innovation and technological change is put forward in economic, scientific and technological policies. Considering these requirements well, the concept of innovation provides the link between technological change and economy and is a sophisticated, effective, non-linear process (Durgut & Akyos, 2001).

To achieve economic development in today's world, to gain competitive advantage in markets around the world and to produce advanced technologies, it has become compulsory for countries to gain innovation ability. Therefore, the countries that have entered the knowledge economy and built all of their policies on this economic structure have started to be interested in National Innovation Systems, which is a set of institutional structures aimed at increasing their ability to generate innovation (Saatçioğlu, 2005; Yavuz et al., 2009).

The definitions of the national innovation system made by various authors are listed below in Table 5.

Table 5 – Some Definitions of the National Innovation System

Author	Definition
Freeman (1987)	"It is the network of organizations in the state and private sectors that creates new practitioner science, transfers it from abroad, transforms and disseminates it through its work and mutual effects."
Lundvall (1992)	"These are elements and relationships that have mutual effects and are in the boundaries of countries in the production, dissemination and use of previously unknown and economic information."
Niosi (1993)	"It is a system that emerges with the interaction between private sector and state sector companies, higher education institutions and non-governmental organizations that carry out scientific and technological studies within the borders of countries to make new scientific studies and develop technologies, to provide financing, to make and maintain regulations."
Nelson and Rosenberg (1993)	"It is a group of institutions that determine the innovation achievements of national companies through their impacts."
Edquist and Lundvall, (1993)	"It is the system of economic structures and institutions that affect the rate and direction of society's technological change."
Patel and Pavitt (1994)	"It is the system created by the institutions that determine the incentive systems and structures, technological education rates, the size and composition of the studies that create change."
Metcalfe (1995)	"It is a collection of different organizations that provide collective or individual contributions to the development and dissemination of technological innovations, produce and implement policies to influence innovation processes, and provide a framework for innovation in the form of management."
Galli and Teubal (1997)	"It is the construction of certain organizations and institutions, production of scientific and technological information, and the establishment of the necessary connections to be implemented."

The National Innovation System approach appears to be an innovation around a system. Innovations are mostly the result of the work of various organizations and the relations of these organizations. This approach states that successful innovation

works depend on long-term relationships, interactions between innovative and external organizations and institutions. In addition, the interactions of departments, colleagues, managers and workers in an innovative business are of great importance. In addition, this systemic approach to innovation implies that the institutional activities of innovation work and the relationships and interactions between innovative organizations are affected by the institutional context (Abrunhosa, 2003; Kılınç, 2011:71).

The National Innovation System approach defines the effective networks of policies, people and institutions that extend beyond the national borders of countries and enable the flow of information in the domestic industry (Kılınç, 2011:71). The National Innovation System approach seeks to view innovation studies in a wider macroeconomic framework to present development processes more realistically. The NIS approach is also closely linked to educational policies. This approach also allows policymakers to identify their strengths or weaknesses within the network in which they are involved. When we examine the national innovation approach to the economic field, this approach advocates the production and management of policies that will provide competitive advantage in the global market (Feinson, 2003:19).

In an environment open to national competition, it is impossible for a firm or country to survive and struggle if it does not have the institutional mechanisms to establish new methods, terms and practices, and does not have the ability to turn scientific and technological results into economic benefit. The NIS can project a useful image on the economy by providing a certain degree of flexibility in the selection of certain parts of the economy, which should be included in the analysis of politicians. With this feature, it is very important for policy makers to establish the relationship between innovation system and economic growth and development issues (Kılınç, 2011:72; Lundvall, 2005:22)

Innovation systems, especially technological ones, have crucially important notions for developing strong and significant links between the related actors of NIS for technological interdependence (Chang and Chen, 2004). Some innovation system analysis can be seen in Table 6.

Table 6 - Analysis of Some Innovation Systems

Author	Type of SI	Study Context	Units of Analysis	Analytical Framework
Freeman (1987)	NSI	Japan	Social-economic adaptation	MITI; company R&D for importing technology; education and training institutions; keiretsu
Saxenian (1991)	RSI	IT sectors in Silicon Valley & Rt. 128	Blurred firms in a region	Informal information exchange; human resource; inter-firm networks
Lundvall (1992)	NSI	Scandinavian countries, mainly Denmark	User–producer interactive learning	Role of public sector, education, R&D institutions, standard and training institutions; production system; marketing system; Financial sector
Nelson (1993)	NSI	15 developing and developed countries	Co-evolution between technology and organization Firm-based competence and routines	Allocation of R&D activity; sources of its funding; characteristics of the firms; important industries; roles of university; government policy
Carlsson (1995)	TS	Swedish technological system	Technological knowledge networks	Institutional infrastructure; clustering resource; economic competence, development block
Breschi &Malerba (1997)	SSI	Various sectors in OECD countries	Inter-sector knowledge interaction	Technological regimes; dynamics of innovation; knowledge and spatial boundary
Cooke (1997)	RSI	Innovative regions in Europe	Localized social and productive interdependence	Financial capacity; institutional learning, productive culture

SI: Systems of Innovation
NSI: National Systems of Innovation
TS: Technological System
SSI: Sectoral Systems of Innovation
RSI: Regional Systems of Innovation

Source: Chang & Chen, 2004

Carlsson and Stankiewicz (1991); (as cited by Chang and Chen, 2004) define technological systems as "networks of agents interacting in a specific technology area under a particular institutional infrastructure for the purpose of creating, diffusing and utilizing technology". They suggest that the main elements of technological system of innovation (TSI) are as stated below.

- **Economic competence:** "the sum of the total of a firm's abilities to generate and take advantage of business opportunities".

- **Clusters and networks:** “a successful innovation seems to require the interaction among agents with different competences. Moreover, the nature of innovation is uncertain and complex, therefore networks provide other alternatives for governing innovation”.
- **Institutional infrastructure:** “a set of institutional arrangements directly or indirectly support, stimulate, and regulate the process of innovation and the diffusion of technology”.
- **Development blocks:** “the development block is dynamic in nature and incorporates the characteristic of disequilibrium. It creates tension within the technological system that varies in strength and composition over time and generates development potential for the system”.

2.5.3. Important Activities that are Part of Innovation Systems

According to Edquist (2006) and Gömleksiz (2012) important activities that play a role in innovation systems can be listed as follows;

- Concentration of research and development studies in different types of sciences, creation of unknown knowledge and evaluation of R & D and innovation studies, provision of knowledge in the labor force and new product markets and development of education, training, formation of human wealth and personal learning activities.
- Establishment of new firms, diversification of existing firms, increase of internal entrepreneurship for the creation of organizations needed for the development of innovation in different and new fields.
- Development of consultancy services for the management of innovation processes and development of networks created through markets and other systems involving learning activities as well as interactions between different organizations involved in innovation processes (For example; Consultancy services and technology transfer for R & D with state support).
- Laws and regulations that enable the creation or modification of new institutions, which affect innovation processes and innovative works.
- Incubation and innovation activities to reach the opportunities to perform and work to get the administrative support.

- Financing innovation processes and other activities that facilitate the commercialization and compliance of information

2.5.4. Elements of National Innovation System

Companies that adopt the concept of innovation and bring an innovative structure to their companies carry out studies in this direction. For these studies to be successful, it is not enough to ensure the cooperation and interaction between the departments within the company. In addition, different sources of information should be evaluated and solid connections should be established with other companies, universities, research institutions, users and input providers and all sources should be collated (Tuncel, 2011:115). Although the national innovation system is a competitive advantage, it also increases the levels of development and prosperity of countries and brings social benefits. According to Muchie (2008) and Kılınç (2011) the main elements of NIS are as follows:

- Conceptual Framework: The establishment of a conceptual framework on the ways to be followed in the management, adoption and development of the ideas and policies constituting the innovation system. Policies that are produced in terms of identifying and evaluating new opportunities and combating problems should be examined quickly in a conceptual structure that manages the dynamic interaction of the country towards the stages of political and economic change (Kılınç, 2011:76).
- Ensuring the unity of technology, organization and knowledge: In an effective National Innovation System, there is a need for strong interactions, links and coordination that will build and develop good knowledge and technology (Muchie, 2008).
- Government grants (Incentives): To reach the aims determined by the state, it is necessary to establish the essential connections by establishing the network structure between the units which economic and noneconomic features and thus to provide incentives to ensure the dynamism that changes and develops interrelations and to create continuity in these incentives (Muchie, 2008).
- Execution / Learning / Feedback / Outputs: Strategies, policies, projects and programs implemented within a system should include feedback mechanisms (review, monitoring and feedback). These are very effective factors for

adapting innovation activities to industrial and socio-economic development stages (Kuhlman&Arnold, 2001).

- Social and Economic Changes: Results and new behaviors after learning experience; these can bring about regulatory, healing, adaptive, revolutionary, constructive, social and economic changes. Constructive change creates a positive social and economic change and a progressive transformation process occurs. When this transformation has a negative impact on the social and economic sphere; conflicts, political, social and economic tensions and the emergence of conflicts cause regressive changes (Kılınç, 2011).

Uncertainty is one of the long-term issues to be tackled in national innovation activities. Uncertainty means there will be risks involved with innovation, inappropriability means innovators may not be able to capture the full benefits of their innovations, and indivisibility means an innovation is non-rival because the quantity available does not diminish with use (Parkey, 2012:14). Government often intervenes in the market to correct market failures and also to provide public goods and protecting property rights and, government's reason for intervening in the market with respect to innovation therefore is to correct the market failures inherent in research, information, and innovation (Parkey, 2012:14). Government can act to overcome these circumstances and help to manage the risks of innovation for firms. Government can encourage innovation with policies that define and enforce rights so that benefits of innovation can be captured by firms; provide incentives to encourage R&D in firms; assist in the incubation of new innovative firms; help to modernize technology in existing production facilities; build technology centers; and increase the supply of technologists, scientists, and engineers through university programs and other related policies (Atkinson, 1993; Eisinger, 1988; Lugar, 1987; Lundvall, 1988; Nelson, 1987; Parkey, 2012:16). Table 7 notes these public policy measures and their potential effects on innovation.

Table 7 - Public Policy Effects on Innovation

POLICY	EFFECTS ON INNOVATION
R & D Funding	R & D Funding impacts scientific direction and production of scientists and engineers.
	R & D Funding supports innovation infrastructure of universities, research centers, federal labs, and industry research.
	R & D Funding supports pre-competitive collaboration, small manufacturers, and tech-based start-ups.
	Public R & D goals and administrative procedures can conflict and misalign with private sector goals, expectations, and management requirements.
Technology Transfer	Technology transfer impacts the incentive for industry-university collaboration and rate of knowledge flow to innovators.
Human Resource Policy	Federal education and training programs, education subsidies and research funds to support universities are a determinant of the supply of qualified workers needed for scientific research, development and commercialization of innovation.
Tax policy	A policy provides R & D incentive.
	Rate of depreciation affects transfer of knowledge embedded in new capital.
	A policy provides level of incentives for consumers to adopt innovation.
Standards	Standards can facilitate platform technologies, including internet, computing system, and software.
	Standards can also function as a barrier to technical change and can restrict markets.
Procurement	Government can stimulate market and standards development through large scale aggregation.
	Design specifications can restrict introduction of new technologies.
Antitrust	Antitrust can encourage industry innovation collaboration and new market entrants.
	Antitrust can delay innovation introduction
Intellectual Property (IP)	IP acts as intencive for innovators.
	IP can restrict entry of competitors.
	IP Protection can be weak globally, reducing return to innovation.
Market Access	Choice and access to foreign markets, export conditions and foreign direct investment influence market potential, risk and growth.
	Export controls can inhibit competitiveness.
Employment and manufacturing initiatives	Political pressures add to protectionist risks, constraints on global investment, domestic purchasing provisions, employment transitions costs, and higher skill standards.

Source: Parkey, 2012:15

2.5.5. Main Institutions and Organizations within National Innovation System

According to the system approach, there are many elements in the NIS that are involved in communication and cooperation with each other and these elements need to be discussed in detail. The main institutions and organizations that constitutes the national innovation system are (Özdemir, 2008):

- **Political and Supervisory Institutions:** They prepare innovation policies and control the process. In addition to establishing the legal framework, they provide the necessary infrastructure, incentives and coordination of activities and constitute the indispensable elements of innovation.
- **Science System:** These actors, especially universities, undertake the task of making inventions in interaction with the public and private sectors and raising the academicians and scientists who will make them. The greatest advantage of universities over public R & D institutions is their ability to train qualified research staff.
- **Business Sector:** Firms play an important role in implementing technological innovations and benefiting from technological changes.
- **Supporting Institutions Providing Technological Infrastructure:** Supporting organizations that aid in financial matters such as loans, tax deductions, as well as assisting in training and laboratory services.
- **Public and Private Research Institutions:** They undertake the task of producing and developing technological innovations.

Other resources of the countries within the national innovation system can be listed in detail as follows (Göker, 2009:8; Özdemir, 2008:28):

- Research and development organizations,
- All kinds of education and training organizations,
- Institutions examining the quality of education and research,
- Support units having technological facilitating effect,
- Consultancy, engineering, design and supervision services, technology attachés, technology consultants (these three elements are included in the mechanism of national innovation system through the Eighth Five-Year Development Plan of State Planning Organization of Turkey).
- Institutions competent in international business in the field of technology,

- institutions related to standardization and quality issues, national measurement system, national certification, equivalence and certification mechanisms,
- Financing institutions supporting and evaluating research, development and innovation activities, organizations and incentive mechanisms involved in managing resources,
- Mechanisms that encourage and support creative entrepreneurship (hatcheries, incubators, etc.),
- Regulatory institutions and patent offices that protect intellectual property rights,
- Techno-parks and techno-cities that bring together the potential of universities and research institutions and the creative entrepreneurship of industrial enterprises based on advanced technologies,
- Institutions associated with technology transfer, information networks and information service organizations,

2.5.6. Knowledge and Learning in National Innovation Systems

There are important arguments that influence the formation of the basis of innovation systems and the analysis of these systems. Knowledge and learning are also among these arguments. Learning emerges as an essential source of knowledge in the modern economy. Throughout the last 10 years, a knowledge-based economy has been achieved with the concept of learning economy, which has led to the creation of a more credible and satisfactory theoretical infrastructure in the field of innovation systems (Lundvall, 2005:22).

In the learning phase, previously unknown knowledge is revealed, and these inferences are used to develop innovative ideas. It is the learning economy that individuals, businesses, regions and national economies acquire and use the learning skills that are important in terms of yield power (Kılınç, 2011:132). In this respect, learning is not only about accessing information but also about acquiring new knowledge, competence and skills. Developing countries need to build learning and competence to ensure their own development and are greatly influenced by learning economies to meet their needs (Kitanovic, 2005:14).

To comprehend the effect of learning and knowledge on the economy, it is vital to make a distinction between different kinds of knowledge and to understand this

difference well. In this respect, it is more useful to divide the information by differentiating the concepts of know-how, know-who, know-what and know-why (Kılınç, 2011:76).

Know-How: Providing the organization of a job, the ability to effectively manage the resources needed to achieve that goal and achieve it. Know-How emerges through the process of learning by applying. Perceptual power, experience and intelligence are of great importance in this type of knowledge. Practical learning is about how a job is done, how it is done. Therefore, know-how experience is gained while performing the work (Keskin & Günsel 2009).

Know-Why: This type of knowledge is called an output of the labor that people have shown to understand and understand the social order and nature in which people live. It is a kind of knowledge that is learned by working and produced in this way. All kinds of experiments and simulation studies are carried out in order to understand the principles and theories of how a system, technological structure or business methods work and constitute the concept of learning and know-why by studying (Keskin & Günsel 2009).

Know-What: The type of information acquired through use. This type of information is formed by the interaction of sellers and buyers. Therefore, it emerges in the connection between these two actors instead of one of the producers or users (Akgün et al., 2009).

Know-Who: It is a kind of social information. It is the type of information that people know about what kind of information they have about a subject and also how they know what is done in that subject, where the connection of that thing can be found and certain social relations within the operation. The information can be divided into implicit and encoded information. A global transmission of the encoded information can be achieved, and a small amount of this information may be lost during this transmission. The coded information having the structured property can be described in a code having a global sharing feature. No intellectual property or patent rights can be claimed for the coded information (Akgün et al., 2009; Kılınç, 2011:76).

Know-how and know-who are based on the effects of experience, practical and social communication. The most important elements of national innovation

systems are knowledge and learning. Therefore, all transition economies aim to capture knowledge and learning. Since the learning activity associated with the production stages occurs through interaction with users, it is a fundamental factor necessary to achieve success in the realization of process and product innovation. Learning; In addition to shaping the know-how process needed to produce solutions to problems, it includes establishing an agenda for identifying, describing and finding solutions (Kılınç, 2011:76).

When a competitor, firm or organization performs a more beneficial process or produces a product that is more beneficial and highly productive, the pressures towards change occur in the market. In addition, consumers must change their consumption behavior when they meet new products. Change also brings learning and learning is a process that involves change and nurtures itself (Ernst & Lundvall, 1997:28-32). The production and information infrastructure, which varies from country to country, also has a stable feature over time. Institutions play a vital role at the center of innovation systems and perform important roles related to innovation activities by shaping interactive learning processes in the economic field (Kılınç, 2011:76).

2.6. Turkey's National Innovation System

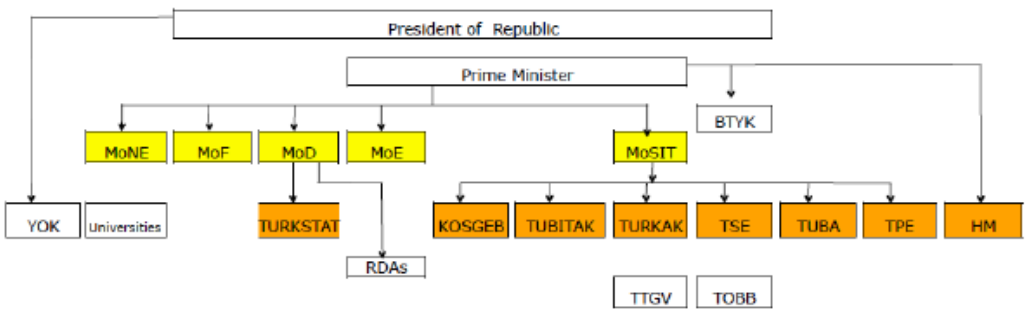
In the process of creating and implementing science, technology and innovation policies, state institutions have a more important and special position than other institutions and organizations due to their legislative and executive power. The NIS; since it is a system composed of many elements such as government agencies, private sector institutions, educational institutions and non-governmental organizations; for this system to be established on a sound basis and to operate in a healthy way, it must direct the system with the policies and laws implemented by the state. Therefore, the state is at the forefront of the NIS, especially in developing countries, because of its role in the creation of favorable conditions for innovation and in the direction of the system (Yavuz, 2010).

Turkey's history of science and technology does not show improved structure, and Turkey, remained too late in terms of the idea of establishing national innovation system (Açıkgöz, 2012: 53). The lack of continuity in the implementation of the decisions made has made it difficult to adopt the national innovation system. From

the industrial point of view, since there is no basis for industrialization, it can be said that the industrialist is not interested in science and technology, cannot have a culture such as technological learning, and cannot internalize the technology transfer. The national innovation system is built on the existence of institutions that instill continuous learning and renewal. The internal organization of the institutions constituting our national innovation system and the weakness of the inter-institutional cooperation are the points that need to be strengthened. General information about the institutions involved in the national innovation system of Turkey is given below (Açıkgöz, 2012: 53).

As can be seen in Figure 9, the Turkish Research and Innovation (R&I) system is centralized and led by the Supreme Council of Science and Technology (BTYK), the legally formalized body chaired by the prime minister, and there are also 26 Regional Development Agencies (RDAs) which are affiliated to the Ministry of Development (MoD) to encourage R&D and innovation on a regional scale (Erdil & Ertekin, 2018).

Figure 9 - Turkish NIS



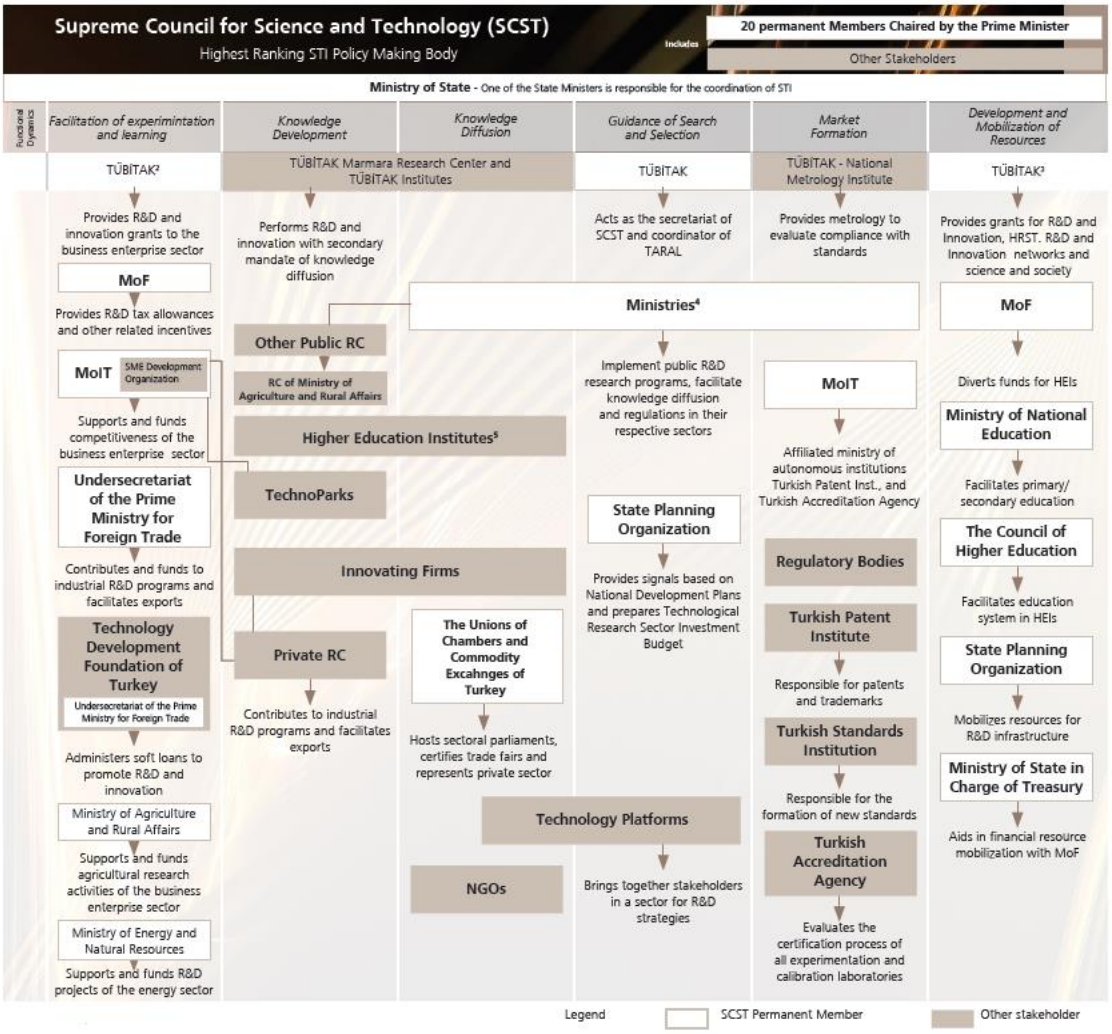
BTYK:	Supreme Council of Science and Technology
MoF:	Ministry of Finance
MoSIT:	Ministry of Science, Industry and Technology
MoNE:	Ministry of National Education
MoD:	Ministry of Development
MoE:	Ministry of Economy

TUBITAK:	Scientific and Technological Research Council of Turkey
KOSGEB:	SME Development and Support Organisation
HM:	Undersecretariat of Treasury
YOK:	Higher Education Council
TUBA:	Turkish Academy of Sciences
TSE:	Turkish Standards Institute
TURKSTAT:	Turkish Statistical Institute
RDAs:	Regional Development Agencies
TTGV:	Technology Development Foundation of Turkey
TURKAK:	Turkish Accreditation Agency
TPE:	Turkish Patent Institute
TOBB:	Union of Chambers and Commodity Exchange of Turkey

Source: Erdil & Ertekin, 2018:5

While Turkey's national innovation system wider representation is presented in Figure 10, permanent and other stakeholders can be distinguished better in this exhibition.

Figure 10 - Main actors in Turkish Science Technology and Innovation System



Source: TUBITAK, 2010:7

The Supreme Council for Science and Technology (BTYK) is the highest ranking STI policy-making body in Turkey chaired by the Prime Minister with the decision-making power for national S&T and innovation policy. This wider exhibition depicts the system (TUBITAK, 2010:7):

> *"BTYK was established and granted the role of identifying, monitoring and coordinating policies in S&T areas in accordance with national goals for economic and social development and security. Accountable directly to the Prime Minister, BTYK upholds important functions, such as to assist the government in determining long-term S&T policies (Box 1). Established in 1983, BTYK realized its first operational meeting in 1989, thus opening a new era for the STI*

policy system and started to convene with increasing intensity towards and after the turn of the new millennium. Since the mid-nineties, BTYK had also been engaged in a shift towards innovation-oriented S&T policies. Starting with the 10th meeting in 2005, this momentum was transitioned into the dynamic of meeting two times annually. The 22nd meeting was realized in December 2010."

Studies on Turkey's innovation system development, of course, has not begun recently. However, it is possible to see an acceleration since the late 1990s. This was reflected in the reports and documents published by both TUBITAK, the leading actor in the NIS and the leading representatives of the industrialists such as Turkish Industry and Business Association (TUSIAD). In one of these publications (TUSIAD, 2003), the issue of competence in innovation was addressed and inferences about how to create a more efficient innovation atmosphere were made. Turkey's production, with the level of talent that came in the early 1990s, scientists at the same date and when recalled the situation in terms of technology indicators, post-1990 science and documents located for the technology policy 'innovation in Refresher' definition said that the essence as is true. The definition that will be explained in more detail is as follows (TUSIAD, 2003):

- To be able to quickly acquire and absorb new technologies; to be able to disseminate to the economic activity areas and to use them in such a way as to obtain maximum benefit.
- To be able to develop the products we produce (goods and services we produce) and the production and distribution methods we use (production of goods and services) based on new technologies we have acquired, assimilated and learned; to design new ones.
- To be able to design and produce the necessary production tools to apply the production methods that we have developed or newly designed.
- To be able to develop, reproduce and reproduce the technologies we have acquired, and to carry out scientific research - basic research - which is the main source of technology.
- To be able to develop our organizational methods (hence the organization / management technologies [soft technologies]) that regulate the relations between the units that carry out R & D, design, production and marketing activities and after-sales technical services.

Main actors of NIS of Turkey will be explained in the below sections.

2.6.1. Supreme Council for Science and Technology (BTYK)

The institutions responsible for determining and enforcing science, technology, innovation policies and implementation tools at national scale and ensuring coordination in implementation are the components of national innovation system. One of from these organizations “The Supreme Council of Science and Technology" was established in 1983 to determine, direct and coordinate research and development policies in the field of science and technology in line with economic development, social development and national security objectives. Thanks to the effectiveness of The Supreme Council of Science and Technology (BTYK), science and technology policies have started to be handled more systematically (Apaydın, 2015). The members of the organization are, relevant ministers, the presidents of the organizations that are State Planning Organization (DPT), Higher Education Council (YOK), The Scientific and Technological Research Council of Turkey (TUBITAK) and Turkey Atomic Energy Agency (TAEK). TUBITAK acts as the secretary of the committee whose priority is to determine R & D targets and coordinates the R & D activities under the control of the relevant ministries. (Göker, 2000)

With BTYK in center, institutions associated with science and technology policies in Turkey are TUBITAK, the Small and Medium Industry Development and Support Administration (KOSGEB), the Technology Development Foundation of Turkey (TTGV), Turkey Academy of Sciences (TUBA), DPT, YOK and other supporting institutions. Especially TUBITAK-TEYDEB, TUBITAK-MAM, TTGV, KOSGEB, Turkish Patent Institute (TPE), Turkish Accreditation Center (TURKAK), Turkish Standards Institute (TSE) and National Metrology Institute (UME) are the main branches of innovation policy (Göker, 2003; Işık & Kılınç, 2012).

At the political level, BTYK is the highest-ranking STI policy making body (TUSIAD, 2003), and it includes 20 permanent members chaired by the prime minister and other stakeholders. BTYK determines, directs and co-ordinates research and innovation policies, and meetings take place twice a year with a pre-determined agenda. In total, over one hundred different actors from the governmental bodies, higher education and business enterprise sectors are represented in the meetings. BTYK reports evaluate the ended or ongoing projects and present a roadmap to

achieve predetermined targets of the BTYK or other governmental bodies, and TUBITAK, affiliated to Ministry of Science, Industry and Technology (MoSIT), acts as the secretariat of BTYK (Erdil & Ertekin, 2018).

Rapidly advancing technology and innovation activities in the world since the 21st century, enable countries to be included in the success ranking in line with their skills in this field. Nowadays, the new products, services or processes that have been developed as a result of the science and technology policies successfully implemented by developed countries which have an important role in meeting the social needs such as education, transportation, health and safety. Similarly, developing countries that pursue developed countries endeavor to capture these developments in accordance with their economic, social or cultural structures. Therefore, knowledge and technology management in each country will of course have differences. However, even with these differences, there are minimum requirements that countries must meet, such as a viable policy of science and technology. At this point, BTYK has important duties (TUBITAK, 2010).

Functions of BTYK are listed below (TUBITAK, 2010):

According to statutory decree 77, The Supreme Council for Science and Technology (BTYK) was established to fulfill the functions determined as:

a) To assist the government in the determination of long-term S&T policies,

b) To identify R&D targets related to Science and Technology (S&T) areas,

c) To identify the priority areas in R&D and prepare related plans and programs,

d) In accordance with these plans and programs, to assign tasks to public organs as well as to cooperate with the business enterprise sector as necessary to identify regulations and promotion schemes related to business enterprise sector,

e) To have bills and legislations prepared aiming to develop and increase the effectiveness of the S&T system,

f) To identify the means for development and effective utilization of R&D human resources, and assure their implementation,

g) To set the procedures for establishment of R&D centers of private institutions, and monitoring and evaluating their activities,

h) To determine in which research fields and in what proportions the R&D investment is to be made,

i) To provide coordination among sectors and institutions in programming and implementation stages.

2.6.2. The Scientific and Technological Research Council of Turkey (TUBITAK)

Being an autonomous institution and governed by the Science Board (SB) whose members are selected from prominent scholars from universities, industry and research institutions; The Scientific and Technological Research Council of Turkey (TUBITAK) was founded in 1963 as an agency responsible for promoting, developing, organizing, conducting and coordinating research and development in line with the national targets and priorities of Turkey (Gürbüz, 2018:41).

TUBITAK defines itself[2] as: TUBITAK, which adopts the vision of being an innovative, directing, participatory and sharing institution in the fields of science and technology, supports the academic and industrial research development studies and innovations, and has the functions of R & D institutes carrying out Research-Technology-Development studies in line with national priorities. In addition to this, Turkey's pinpoint Science and Technology policies and in every sector of society publishes books and magazines to increase this awareness. National and international academic activities of scientists are supported and encouraged with scholarships and awards, and the projects of universities, public institutions and industry are funded, and it is aimed to increase the competitiveness of the country.

In addition to being the secretariat of BTYK which is the highest S&T policy making body in Turkey; TUBITAK acts as an advisory agency to Turkish government on science and research issues. It supports government for S&T policy making and constitutes international S&T collaborations by representing Turkey. Besides, SCST appointed TUBITAK to specify new S&T policy of Turkey for the period until 2023, which is 100th anniversary of Turkish Republic, in December 2000. Moreover, it makes S&T researches at its R&D institutions/centers. Additional to all of these, TUBITAK encourages not only R&D, innovation and entrepreneurship activities of public and private institutions and settlement of S&T

[2] TUBITAK Institutional Web Site: http://www.tubitak.gov.tr/tr/kurumsal/hakkimizda/icerik-bizkimiz

culture but also S&T research studies and its infrastructure with the development of human resources required for S&T via several funding programs. These programs are conducted by 4 Funding/Grant Program Directorates of it: “Technology and Innovation Funding Programs” (TEYDEB), “Science Fellowship Grant Programs” (BIDEB), “Science and Society Activities Grant Programs” (BITO) and “Academic Research Funding Programs” (ARDEB) (Gürbüz, 2018:41).

At the operational level, the leading actor in the implementation system is TUBITAK and, TUBITAK takes the role in facilitating of experimentation and learning, knowledge development, knowledge diffusion, guidance of search and selection, market formation and development of mobilization of resources (Erdil & Ertekin, 2018). TUBITAK provides grants for R&D, innovation, HRST, R&D and innovation networks and science and society and, these grants aim to facilitate experiments and learning as well as development and mobilization of resources (Erdil & Ertekin, 2018).

2.6.3. Other Actors of NIS of Turkey

The Turkish Industry and Business Association (Turkish abbreviation: TÜSİAD) was established in 1971 in İstanbul and is a voluntary, independent, non-governmental organization which dedicated to promote welfare through private enterprise, leads voluntary Turkish investors representing industrial and service organizations (TÜSİAD, 2015). TÜSİAD produces about half of the added value which is created apart from the public organizations and when energy import is ignored, member of TÜSİAD institutions have been engaged in foreign trade approximately for 80% of the total foreign trade in Turkey. Tax revenues which constitute the most important element of public revenues, are covered directly or indirectly by member of TÜSİAD institutions. Moreover, considering registered employment, approximately 50% of agricultural and non-public employees work in member of TÜSİAD member organizations (TÜSİAD, 2013).

The Economic Policy Research Foundation of Turkey (Turkish abbreviation: TEPAV) is a non-partisan, non-profit think tank based in Ankara and was established by a group of bureaucrats, businessman and academicians for the purposes of conducting data-based policy analysis and policy making contributions in 2004. It develops policy proposals for the government, as well as develops projects in some

areas and makes them available to policy makers (TEPAV, 2015). The important feature which differs TEPAV from other think-tanks is that, it has a permanent team and emphasizes capacity building on a program basis in Turkey (TOBB, 2017).

Technology Development Foundation of Turkey (Turkish abbreviation: TTGV) was established as a public-private partnership in 1991 with a mission to promote and support technology development and innovation activities by the private companies and has an autonomous structure on the basis of public and private sector partnership (Akarsoy 2008; TTGV 2009). TTGV designs, develops and implements activities to provide reference and build capacity for value added operations, processes and products to support the vision of "Technology Developing Turkey" (TTGV, 2009).

State Planning Organization (DPT), was established in 1960 to accelerate the economic and social development of Turkey. It advises to the government in determining the economic, social and cultural goals of the state and prepares development plans and annual plans to achieve the goals set by the government. The organization was reorganized in 2011 as the Ministry of Development (Fedai, 2016; Yıldırım, 2015).

2.6.4. Research on Turkey's National Innovation System

There are some studies in Turkey that examines the national innovation system. In his study Özdinç (2018) aims to develop a model to define socio-cultural dimensions of the innovation systems, which have been neglected to date according to him. This model enables researchers to systematically define the innovation - whether it is a process, or a whole system-, to analyze all aspects, and to enable policy developers to see the whole picture without ignoring any dimension. Another study from Çalık (2015) aims to make a research on the roles of the universities within the national innovation system and to search whether German Universities may be models for Turkish universities in this regard. In his research İpek (2015) found that the structure of the economy is based on innovation, national innovation system and regional innovation strategies. On another study, Alptekin (2006) tries to study Turkey's science and technology policies from foundation of the republic of Turkey to today and, looks for the importance and the effects of the national innovation system to social and economic development.

2.7. Regional Innovation Systems & Centers

The regional innovation system comes to life through cooperation between the actors that make up it (businesses in the region, public institutions, funding providers, universities, non-governmental organizations, research institutions and other related organizations). The effectiveness of a regional innovation system depends on the quality and intensity of the relationships between these actors. It underlines that the comparative advantage that triggers innovation and investment is a national as well as regional feature (Elçi, 2008). In order to compete in the global market, regions must benefit from their own assets, skills and ideas and develop their unused potential (OECD, 2003).

On the other hand, the ability of the national innovation system to serve the goal of economic and social development requires regional innovation systems to become operational. Eliminating regional imbalances and achieving regional development is possible through the development of innovation systems, management forms, policies and policy implementation tools tailored to the characteristics and needs of the regions (Elçi, 2008). Similarly, sectoral characteristics and sector-specific threats or opportunities require the implementation of different innovation strategies for different sectors, so the sectoral dimension should be taken into account in the innovation system and policies (Elçi, 2007). According to Doloreux (2002) intensive cooperation between the three main actors, the public, the private sector and the university is essential for the successful functioning of regional and sectoral innovation systems and for the effective identification and implementation of policies, as in the national innovation system. In this cooperative approach, called the *triple helix*, universities train manpower in line with the needs of businesses in the region; conducts R & D activities in cooperation with enterprises in the region; commercialize the results of the research by making use of different mechanisms in the region (transferring to companies, establishing new companies in incubation centers, etc.).

Regional innovation strategies developed and implemented since the mid-1990s are based on the fact that national innovation systems in the European Union cannot produce a level of innovation that can compete with the United States (Porter, 1998).

According to Cooke (2008) the environment and support services and mechanisms related to innovation in a region play an important role in determining the competitiveness of the enterprises in the region and, regional innovation centers are the leading structures that have proven their effectiveness in creating the necessary environment and providing services. When we look at the practices in the world, although they are not directly referred to as “regional innovation centers”, such specialized intermediary institutions emerge as structures that create and strengthen the networks necessary for innovation, and which lead the relevant organizations to act together for common interests.

As with the services that will increase regional competitiveness, the structures developed to provide these services have different names (“technology support centers”, “business and innovation centers”, “innovation poles”). The administrative and legal structure of the organization that will provide innovation support services depends on the different factors, from the legal legislation of the country where it is located, to the nature of the institutions providing financing (public or non-governmental organization). When we look at the practices in the world, it is observed that the administrative structures (such as technology transfer offices established within universities), which are established to meet the needs of certain actors, are not sufficient in terms of competitiveness of enterprises, and the importance given to the structures including all actors of the regional innovation system (such as innovation centers) is increasing (D'Allura, Galvagno and Destri, 2012). As in the Silicon Valley, in some regions these services are provided by private sector companies to a large extent, while, as in South Korea, centers are fully established and developed by the government. While the centers that provide innovation support services are structured as non-profit organizations in the other country, they can operate only by incorporating them due to the fact that the legislation does not allow, as in the case of University Industry Cooperation Centers (ÜSAM) in order to benefit from public support in our country (Elçi, 2008).

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1. Research Questions and Research Purpose

As technological developments continue day-to-day, changes from these developments are forcing local actors to build national innovation systems. Therefore, besides the establishment of national innovation systems, the roles of important actors within the system come to the forefront. Consequently, the role of TUBITAK, which is one of the important actors in the national innovation system in Turkey has tried to be recognized in the scope of this research. In this context, the two research questions are as follows:

Research Question 1: Besides being an important actor in the national innovation system, is TUBITAK an effective player?

Research Question 2: How the role of TUBITAK evaluated by some other actors in the national innovation system?

3.2. Research Method and Research Design

In this study, phenomenological research design was chosen within the framework of qualitative research. In this research method, it is aimed to reveal the unique meanings of persons regarding the phenomena belonging to himself/herself and the outside world (social situation / event) (Sığrı, 2018:76). In terms of research technique, document analysis method was chosen in the framework of qualitative research design. The documents collected within the scope of the research question were examined with content analysis methods. Nvivo 12 software was used for the analysis.

3.3. Data Collection

In this study, some documents prepared by the actors that named Turkish Industry and Business Association (TÜSİAD), the Technology Development

Foundation of Turkey (TTGV), The Economic Policy Research Foundation of Turkey (TEPAV) and State Planning Organization (DPT) in the Turkish national innovation system were examined. Because as stated in the previous part, these actors are big organizations and have important roles in the National Innovation System of Turkey. Especially, the documents published after 2000 were selected with the purposive sampling method. The documents analyzed in this study can be seen in Table 8. Total 49 of documents of which 23 by TUSIAD, 2 by TTGV, 13 by TUSIAD, 10 by TEPAV and 1 document by DPT are in the list.

Table 8 - The Documents Analyzed for the Study

ORG.	PUBLICATION NAME/DATE	ORG.	PUBLICATION NAME/DATE
TUSIAD*	National Innovation Initiative Eva.2006-2013	TUBITAK	Strategic Plan 2018-2022
	Regional Innovation Center; Turkey-2008		Performance Program 2018
	National Innovation System-2003		Activity Report 2009
	National Innovation System-2006		Activity Report 2010
	National Innovation System-2008		Activity Report 2011
	Open Innovation Ecosystem-2013		Activity Report 2012
	Opinion Magazine-No-61-2010/04		Activity Report 2013
	Opinion Magazine-No-62-2010/06		Activity Report 2014
	Opinion Magazine-No-63-2010/08		Activity Report 2015
	Opinion Magazine-No-64-2010/10		Activity Report 2016
	Opinion Magazine-No-65-2010/12		Activity Report 2017
	Opinion Magazine-No-66-2011/02		Activity Report 2018
	Opinion Magazine-No-67-2011/05		STI in Turkey 2010
	Opinion Magazine-No-68-2011/06	TEPAV	Innovation, Cooperation and Entrepreneurship-2007
	Opinion Magazine-No-69-2011/08		Ind.Policy Framework for Competition Power of Turkey-2006
	Opinion Magazine-No-70-2011/10		1st Regional Development and Governance Sym.-2006
	Opinion Magazine-No-71-2011/12		2nd Regional Development and Governance Sym.-2007
	Opinion Magazine-No-72-2012/02		3rd Regional Development and Governance Sym.-2008
	Opinion Magazine-No-73-2012/06		4th Regional Development and Governance Sym.-2009
	Opinion Magazine-No-74-2012/10		5th Regional Development and Governance Sym.-2011/01
	Opinion Magazine-No-76-2012/12		6th Regional Development and Governance Sym.-2011/12
	Opinion Magazine-No-87-2014/12		7th Regional Development and Governance Sym.-2012
	Opinion Magazine-No-88-2015/02		8th Regional Development and Governance Sym.-2013
TTGV	University-Industry Cooperation-2010	DPT	Science and Technology Special Commission Report 2000
	Uni.-Ind. Coop./Tech. Transfer Interface-2010		

* *TUSIAD Opinion Reports numbered 77, 86 and 89 are excluded from this study because of not text encoded.*

3.4. Descriptive Analysis of Documents

Content analysis is a social scientific method that requires researchers to use it to create a strong situation for the validity and reliability of data, and in qualitative research, content analysis is used to interpret the meaning of the content of the text and to understand the phenomenon under the texts being studied (Sığrı, 2018:293). Researchers use content analysis in studies that analyze the types of articles in a specific content in a journal or textbook (Krippendorff, 2006). There are different approaches to content analysis. Generally accepted approaches are conventional, directed and summative approaches for data analysis (Sığrı, 2018:294). All these three approaches are used to interpret the meaning of the content of text data and therefore to comply with the naturalist paradigm. In traditional content analysis, encoding categories are derived directly from the text data. The guided approach begins with a theory or related research findings as the guidance of the initial codes. Summative content analysis usually involves counting, comparing the keywords or content, and then interpreting the underlying content. In this study, summative content analysis method was used. Because the research is aimed at examining the role of a specific institution in a system considered to have already existed rather than a new phenomenon in the documents examined.

While Storey (2007) states that qualitative research aims to reveal people's perspectives on events, Dey (1993) states that in contrast to quantitative research based on statistical data analysis, qualitative research seeks answers to the question of how people characterize events. Thus, in qualitative research, numerical data are less, and more qualitative data are used. However, in many studies, preliminary information about the data can be obtained by methods such as word frequencies or word cloud. Word frequency results produced from all documents in the sample and adjectives, pronouns and conjunctions excluded can be seen in Table 9. In this analysis, instead of using all the words, words repeated more than 900 and which are important for the innovation system are included.

Table 10 shows the frequency of word ‘TUBITAK’ for all documents. Only 14 documents mention TUBITAK. This means the sample of the study can be reduced to 14. Table 11 shows the frequency of word ‘innovation’ for all documents. As can be seen only 26 documents from 36 (76%) mention the innovation.

Table 9 - Word Frequencies for All Documents in the Sample

Word	F	Word	F	Word	F	Word	F
TUBITAK	6673	scientific	2288	country	1376	board	1146
project	5742	strategic	2272	world	1372	application	1132
support	5178	policy	2258	planning	1368	energy	1129
local	5118	governance	2224	spherical	1364	systematic	1117
science	4954	plan	2065	available	1357	activities	1116
research	4844	technological	1955	application	1346	supporting	1107
technology	4422	system	1917	performance	1325	projects	1089
development	4256	area	1793	human	1292	growth	1076
national	4240	target	1786	society	1286	woman	1061
innovation	3904	activity	1718	given	1280	report	1059
program	3406	competition	1682	levels	1255	provide	1054
economic	3389	university	1578	financial	1240	preferential	1050
industry	3204	evaluation	1557	corporate	1227	appropriate	1049
information	3053	development	1556	center	1206	studies	1023
international	3008	state	1546	staff	1197	investment	992
local	2905	production	1402	income	1195	rural	988
institution	2598	expenses	1384	sector	1187	political	970
cooperation	2463	programs	1383	source	1185	social	951
educated	2338	projects	1382	subject	1170	encouragement	940

Table 10 - Word Frequencies for TUBITAK

Document Name	F	Coverage
TTGV-University-Industry Cooperation-2010	86	0,07%
DPT-Science and Technology Special Commission Report 2000	46	0,09%
TÜSİAD-Regional Innovation Center; Turkey-2008	18	0,02%
TÜSİAD-National Innovation System-2006	16	0,03%
TTGV-Uni.-Ind. Coop.-Tech. Transfer Interface-2010	14	0,02%
TEPAV-Innovation, Cooperation and Entrepreneurship-2007	12	0,02%
TÜSİAD-National Innovation System-2008	7	0,02%
TEPAV-2nd Regional Development and Governance Sym.-2007	3	0,01%
TEPAV-7th Regional Development and Governance Sym.-2012	2	0,01%
TEPAV-1st Regional Development and Governance Sym.-2006	1	0,01%
TUSIAD-Opinion Magazine-No-63-2010-08	1	0,01%
TUSIAD-Opinion Magazine-No-67-2011-05	1	0,01%
TUSIAD-Opinion Magazine-No-73-2012-06	1	0,01%
TUSIAD-Opinion Magazine-No-88-2015-02	1	0,01%
Total	**209**	**0,34%**

Table 11 - Word Frequencies for 'innovation'

Document Name	F	Coverage
TÜSİAD-Regional Innovation Center; Turkey-2008	654	0,84%
TÜSİAD-National Innovation System-2003	475	0,40%
TEPAV-Innovation, Cooperation and Entrepreneurship-2007	336	0,57%
TÜSİAD-National Innovation System-2006	303	0,64%
TÜSİAD-National Innovation System-2008	236	0,98%
TTGV-University-Industry Cooperation-2010	188	0,20%
DPT-Science and Technology Special Commission Report 2000	165	0,39%
TTGV-Uni.-Ind. Coop.-Tech. Transfer Interface-2010	77	0,12%
TEPAV-2nd Regional Development and Governance Sym.-2007	67	0,03%
TEPAV-5th Regional Development and Governance Sym.-2011-01	59	0,03%
TEPAV-1st Regional Development and Governance Sym.-2006	54	0,02%
TEPAV-3rd Regional Development and Governance Sym.-2008	14	0,01%
TUSIAD-Opinion Magazine-No-61-2010-04	11	0,02%
TEPAV-6th Regional Development and Governance Sym.-2011-12	9	0,01%
TUSIAD-Opinion Magazine-No-68-2011-06	7	0,01%
TEPAV-4th Regional Development and Governance Sym.-2009	6	0,01%
TUSIAD-Opinion Magazine-No-87-2014-12	4	0,01%
TUSIAD-Opinion Magazine-No-65-2010-12	3	0,01%
TUSIAD-Opinion Magazine-No-66-2011-02	3	0,01%
TUSIAD-Opinion Magazine-No-73-2012-06	3	0,01%
TUSIAD-Opinion Magazine-No-74-2012-10	3	0,01%
TUSIAD-Opinion Magazine-No-76-2012-12	2	0,01%
TEPAV-7th Regional Development and Governance Sym.-2012	1	0,01%
TUSIAD-Opinion Magazine-No-70-2011-10	1	0,01%
TUSIAD-Opinion Magazine-No-71-2011-12	1	0,01%
TUSIAD-Opinion Magazine-No-72-2012-02	1	0,01%
Total	**2683**	**4,38%**

Before proceeding with content analysis related to the innovation system, ‘TUBITAK’, ‘science’, ‘technology’ and ‘innovation’ word frequencies used together in the documents were examined in order to give an idea to understand the role of TUBITAK in the innovation system. These words are very common in innovation systems and frequently used. In this analysis TUBITAK documents (13) excluded because of having objectivity and obtaining reliability. So, 36 documents analyzed and, as can be seen in Table 12, the most common word is innovation by 2.083 counts. Technology follows it by 1.392 counts. From 36 documents only 10 documents have the related words. It is not surprising that the word of TUBITAK has

less placed in the documents as a corporate name than the other words, but it is interesting to note that only 10 documents have all words at the same time.

Table 12 - Word Frequencies for TUBITAK, science, technology and innovation

DOCUMENT NAME/DATE	F	%	TUBITAK	science	technology	innovation
Science and Technology Special Commission Report 2000	909	1,77%	46	351	347	165
2nd Regional Development and Governance Sym.-2007	123	0,05%	3	15	38	67
1st Regional Development and Governance Sym.-2006	104	0,04%	1	13	36	54
Innovation, Cooperation and Entrepreneurship-2007	418	0,73%	12	4	66	336
University-Industry Cooperation-2010	453	0,70%	14	25	337	77
Uni.-Ind. Coop./Tech. Transfer Interface-2010	710	0,71%	86	98	338	188
Opinion Magazine-No-73-2012/06	30	0,05%	1	1	25	3
National Innovation System-2006	299	1,22%	7	13	43	236
National Innovation System-2008	412	0,84%	16	25	68	303
Regional Innovation Center; Turkey-2008	781	0,99%	18	15	94	654
Total	**4239**	**7,10%**	**204**	**560**	**1392**	**2083**

In order to narrow the search a little more, this time only the documents where the words "TUBITAK" and "innovation" mentioned together are examined. Table 13 shows the word frequencies and as can be seen there is no much change between Table 11 and Table 12. This time only 11 documents have the words TUBITAK and innovation at the same time. This means, these 11 documents can be analyzed thoroughly to understand the role of TUBITAK in the national innovation system.

When the research scope is further narrowed and only the word 'TUBITAK' and 'innovation system' are searched, only two documents are left as can be seen in Table 14. However, in the analysis, 14 documents listed in Table 10 with the abbreviation 'TUBITAK' in, will be examined in terms of content.

Table 13 - Word Frequencies for 'TUBITAK' and 'innovation'

DOCUMENT NAME/DATE	F	%	TUBITAK	innovation
DPT-Science and Technology Special Commission Report 2000	211	0,48%	46	165
TEPAV-1st Regional Development and Governance Sym.-2006	55	0,02%	1	54
TEPAV-2nd Regional Development and Governance Sym.-2007	70	0,03%	3	67
TEPAV-7th Regional Development and Governance Sym.-2012	3	0,01%	2	1
TEPAV-Innovation, Cooperation and Entrepreneurship-2007	348	0,58%	12	336
TTGV-Uni.-Ind. Coop.-Tech. Transfer Interface-2010	91	0,14%	14	77
TTGV-University-Industry Cooperation-2010	274	0,28%	86	188
TUSIAD-Opinion Magazine-No-73-2012-06	4	0,01%	1	3
TÜSİAD-National Innovation System-2006	319	0,66%	16	303
TÜSİAD-National Innovation System-2008	243	1,01%	7	236
TÜSİAD-Regional Innovation Center; Turkey-2008	672	0,85%	18	654
Total	**2290**	**4,07%**	**206**	**2084**

Table 14 - Word Frequencies for 'TUBITAK' and 'innovation system'

Document Name	F	Coverage
TTGV-University-Industry Cooperation-2010	88	0,08%
TÜSİAD-Regional Innovation Center; Turkey-2008	19	0,02%
Total	**107**	**0,10%**

3.5. Content Analysis of Documents

In the content analysis, the documents included in the sample were examined in terms of context. For this purpose, the words in the documents where 'TUBITAK' and innovation words are included separately or together are evaluated in terms of meaning. At this point, contextual analyzes were made by creating word trees via the research software. In this way, the keywords in the documents can be evaluated in a more holistic context.

Figure 11-Word Tree for 'TUBITAK' and 'innovation' in the All Sample Documents

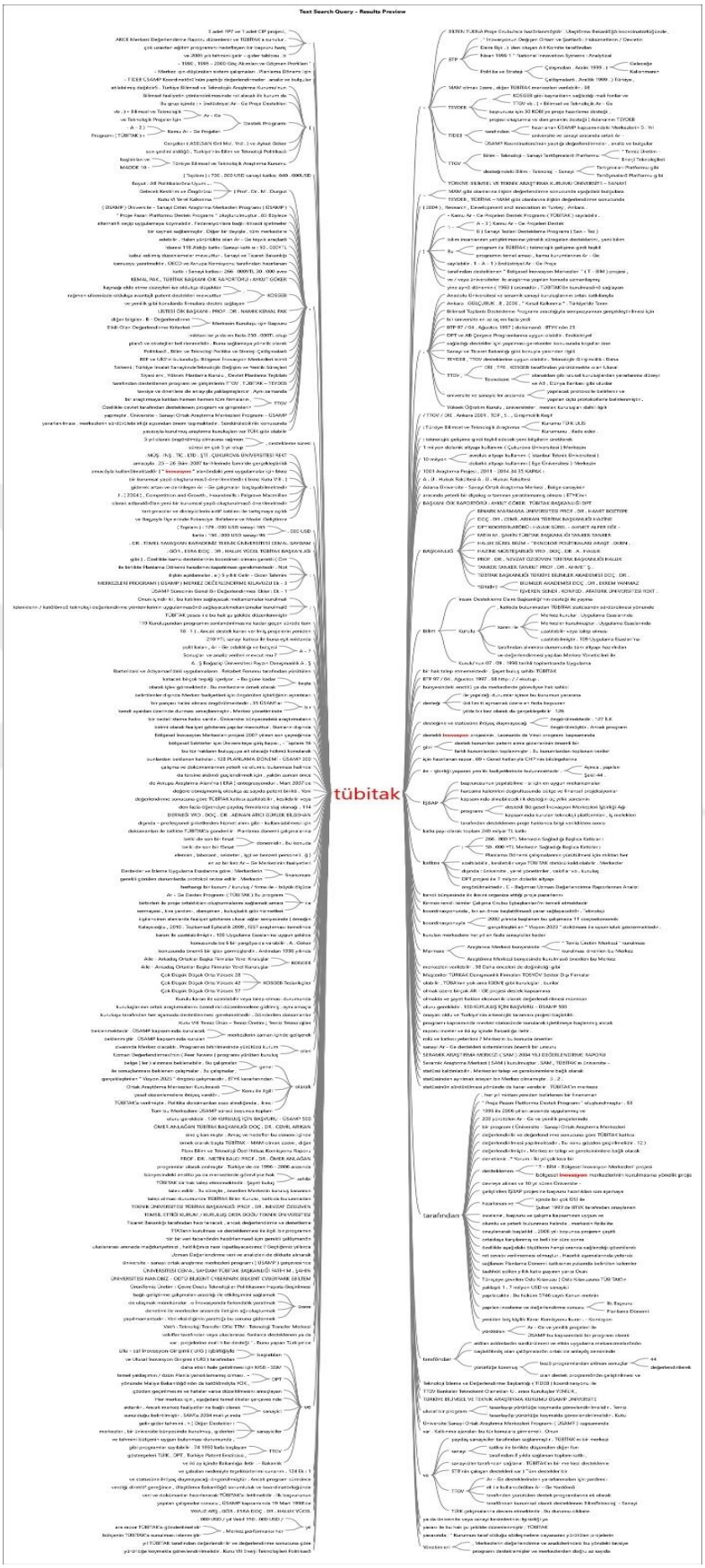
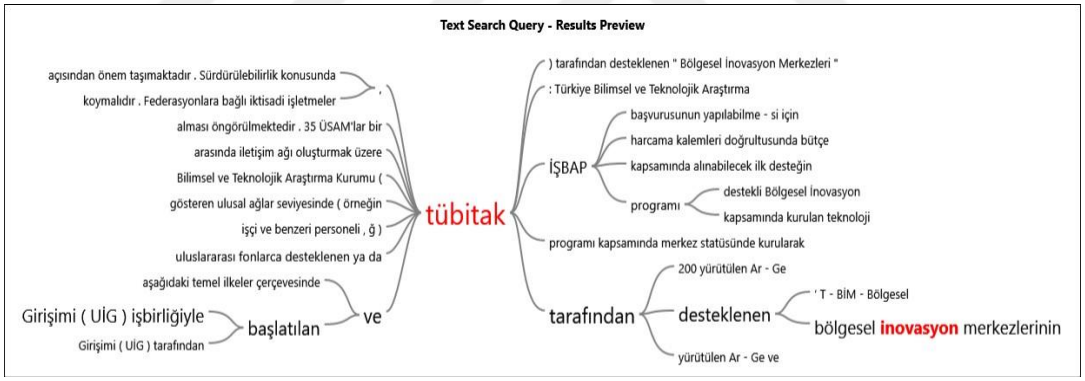


Figure 11 shows the word tree for the words ‘TUBITAK’ and ‘innovation’. Although it is not very easy to see the whole contexts in a single page it can give an idea in the software screen where to look for. Word trees that include the key words for all documents are very long and difficult to report in a page, it can be useful to create them for single document.

3.5.1. Content Analysis of TUSIAD-Regional Innovation Center; Turkey-(2008) Report

In Figure 12, word tree for 'TUBITAK' and 'innovation' in the TUSIAD-Regional Innovation Center; Turkey (2008) report can be seen. As seen, TUBITAK supports many technological and innovation programs. One of them ISBAP (Initiative Projects to Establish Cooperation Networks and Platforms) is very common in also other documents.

Figure 12 - Word Tree for 'TUBITAK' and 'innovation' in the TUSIAD-Regional Innovation Center; Turkey (2008) Report



Another topic is regional innovation centers emphasized in the documents. Related text from the document below numbered in paragraphs, show the supportive and administrative role of TUBITAK. In this supportive role TUBITAK has some actions to support the regional innovation centers in Turkey (1). Again, with ISBAP support programs, it can be understood that TUBITAK is backing regional innovation centers to set cooperation networks (2). With these ISBAP support programs, TUBITAK also supports the settlement of technology platforms (3). Another issue is that TUBITAK ISBAP support programs have been designed for a period of 3 years, but after the expiry of the period, they are taken into consideration when they apply for re-use if desired (4). It is understood that the government

supports R & D and innovation projects and that TUBITAK has projects in both areas (5). In the innovation system approach, it is emphasized that the innovation performance of the enterprises depends on the interaction between different organizations and most of the innovative activities are realized with the participation of more than one actor (6).

> ***1)*** *"TÜSİAD, TÜRKONFED, TÜSİAD-Sabancı Üniversitesi Rekabet Forumu (REF) ve Ulusal İnovasyon Girişimi (UİG) işbirliğiyle başlatılan ve* ***TÜBİTAK tarafından desteklenen bölgesel inovasyon merkezlerinin*** *kurulmasına yönelik proje kapsamında seçilen bölgelerde odaklanılacak sektörlerin belirlenmesine yönelik ikinci çalıştay, MAKSİFED'in organizasyonuyla Demirtaş Organize Sanayi Bölgesi Sanayici ve İşadamları Derneği (DOSABSİAD) 'nin evsahipliğinde 23 Kasım 2007 tarihinde Bursa'da gerçekleştirilmiştir.(p.2)"*
>
> ---
>
> *"The second workshop for the determination of sectors to be focused on selected regions within the scope of the project for the establishment of regional innovation centers initiated by TUSIAD, TURKONFED, TUSIAD-Sabanci University Competition Forum (REF) and National Innovation Initiative (UIG) and* ***supported by TUBITAK ...****(p.2)"*

> ***2)*** *"Bölgesel İnovasyon Merkezlerinin hangi sektör ve alanlarda oluşturulacağının belirlenmesi, merkezlerin kurulması, koordinasyonu ve denetimi ile merkezler arasında iletişim ağı oluşturmak üzere* ***TÜBİTAK İŞBAP programı destekli*** *Bölgesel İnovasyon Merkezleri İşbirliği Ağı oluşturulmuştur.(p.2)"*
>
> ---
>
> *"Regional Innovation Centers Cooperation Network* ***supported by TÜBİTAK İŞBAP program*** *was established to determine the sectors and areas in which Regional Innovation Centers will be established, to establish, coordinate and supervise the centers and to establish a communication network between the centers.(p.2)"*

> ***3)*** *"Sektörleri ilgilendiren alanlarda faaliyet gösteren ulusal ağlar seviyesinde (örneğin TÜBİTAK İŞBAP programı kapsamında kurulan teknoloji platformları, iş melekleri ağları, vb.) (p.115)"*

"At the level of national networks operating in sectors of interest (eg technology platforms, business angels' networks, etc. established under the TÜBİTAK İŞBAP program) (p.115)"

4) *"Sürdürülebilirlik konusunda, TÜBİTAK İŞBAP kapsamında alınabilecek ilk desteğin üç yıllık süresinin sona ermesinin ardından aynı destekten tekrar yararlanmak üzere gerekli başvurunun yapılması diğer bir önerilen noktadır. (p.118)"*

"In terms of sustainability, after the expiration of the three-year period of the first support that can be obtained within the scope of TÜBİTAK İŞBAP, it is another recommended point to apply for the same support again. (p.118)"

5) *"Gelir vergisi stopajı teşviki: Kamu personeli hariç olmak üzere teknoloji merkezi işletmelerinde, Ar-Ge merkezlerinde, kamu kurum ve kuruluşları ile kanunla kurulan vakıflar tarafından veya uluslararası fonlarca desteklenen ya da TÜBİTAK tarafından yürütülen Ar-Ge ve yenilik projelerinde…(p.201)"*

"Income tax withholding incentive: In technology center enterprises, R & D centers except public personnel, public institutions and organizations, foundations established by law, or R & D and innovation projects supported by international funds or carried out by TUBITAK. (p.201)"

6) *"İnovasyon sistemi yaklaşımının özünde yatan işbirliği ağları, işletmelerin inovasyon performanslarında belirleyici rol oynar. İşletmelerin izole bir ortamda inovasyon yapmadıklarını; inovasyonun başarıyla gerçekleşmesinin farklı kuruluşlar arasındaki etkileşime bağlı olduğunu kanıtlayan çok sayıda çalışma bulunmaktadır. OECD, inovasyon ağlarının varlığının istisnadan ziyade kural (gereklilik) olduğunu ve inovatif faaliyetlerin çoğunun, birden fazla aktörün katılımını gerektirdiğini vurgulamaktadır. Bölgesel inovasyon ağları, inovasyonda işbirliği hedefiyle kurulur. Bu işbirliği, kaynak, enformasyon ve bilgi alışverişiyle şekillenir. (p.53)"*

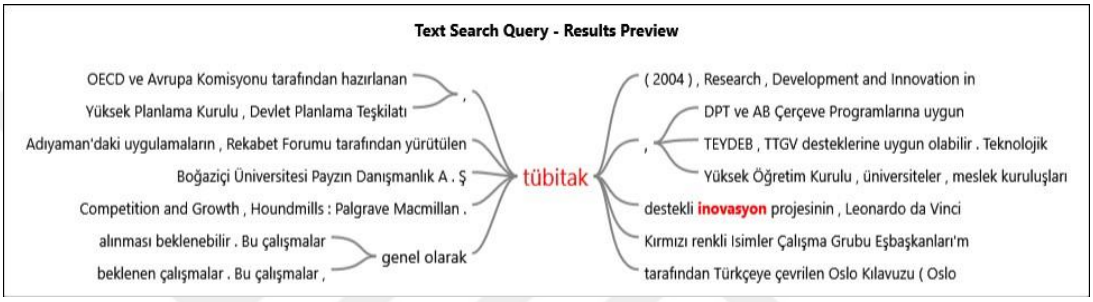
"Collaborative networks at the core of the innovation system approach play a decisive role in the innovation performance of enterprises. Businesses do not innovate in an isolated environment; There are many studies that prove that the success of innovation depends on the interaction between different organizations. The OECD stresses that the existence of innovation networks is a

rule rather than an exception, and that most of the innovative activities require the participation of more than one actor. Regional innovation networks are established with the goal of cooperation in innovation. This cooperation is shaped by the exchange of resources, information and information. (p.53)"

3.5.2. Content Analysis of TUSIAD-National Innovation System (2008) Report

In Figure 13, word tree for 'TUBITAK' and 'innovation' in the TUSIAD-National Innovation System (2008) report can be seen.

Figure 13 - Word Tree for 'TUBITAK' and 'innovation' in the TUSIAD-National Innovation System (2008) Report



In the following passages from the text based on the word tree, the role of TUBITAK and its effect on the innovation system are tried to be understood in this document. One of the important issues to be solved in innovation activities is the measurement of innovation performance. It is an enigma how to better develop non-measurable activities. It is understood that TUBITAK supports the innovation activities financially as well as providing the necessary information for the measurement of the performance of the innovation system (1). When the evaluation results of the programs supported by institutions such as TUBITAK are considered, it can be understood that the enterprises that benefit from these programs have high competitive power, awareness of technological innovation within the industry is necessary and financial support is still needed to reach the level to obtain commercial income as a result of R & D studies (2). TUBITAK also provides support directly and indirectly to the innovation system in line with the scientist training projects (3). It is also understood that R & D projects are included in the scope of support and their quality is evaluated by various committees, timely completed projects are considered successful but real success should be accepted and demanded in national or international markets (4).

1) *"Avrupa İnovasyon Karnesi 2007 raporu sonuçlarına göre Türkiye, çok sayıda gösterge bazında düşük performans gösteren ülkeler arasındadır. Bu sonucun ortaya çıkmasında özellikle dikkate alınması gereken gerçek, Türkiye'nin İnovasyon Karnesinin oluşumunda gereken verilerin tümünü sunamamasıdır. Karnenin oluşumunda girdi-input ve çıktı-output olmak üzere çok sayıda değişken kullanılmakta, bu değişkenlerin olmaması durumunda performans analizi sağlıklı bir biçimde yapılmamaktadır. Veri eksikliğinin yarattığı bu sorunu gidermek üzere TÜBİTAK ve TÜİK çalışmalarına devam etmektedir. (p.20)"*

"According to the European Innovation Scoreboard 2007 report as a result Turkey, based on several indicators are among the countries that are underperforming. These results should be considered especially true in the emergence of the failure to provide all the data required for the formation of Turkey's Innovation Scoreboard. In the formation of the scorecard, many variables, input and output, are used, and in the absence of these variables, performance analysis is not performed properly. TÜBİTAK and TURKSTAT continue to work on this problem caused by lack of data. (p.20)"

2) *"Özellikle devlet tarafından desteklenen program ve girişimlerin TTGV, TÜBİTAK – TEYDEB, TÜBİTAK – MAM gibi olanlarına ilişkin değerlendirme sonucunda aşağıdaki bulgulara ulaşılmıştır:*

• Söz konusu programlardan yararlanan işletmelerin daha yüksek oranda rekabet güçleri mevcuttur.

• Sanayi içinde teknolojik yenilik konusunda farkındalığa duyulan ihtiyaç yüksek düzeydedir.

• Makroekonomik çevre koşulları ve bunun yanında eğitim ve istihdam gibi alanlardaki düzenlemeler yenilik sürecini destekleyecek özellikler barındırmamaktadır.

• Ar-Ge çalışmalarının sonuçlarının ticari getiri sağlayacak kıvama gelmesinde ihtiyaç duyulan finansal mekanizma yetersizdir ve büyük bir sorun oluşturmaktadır. (p.21)"

"As a result of the evaluation of the programs and initiatives supported by the state, such as TTGV, TUBITAK - TEYDEB, TUBITAK - MAM, the following findings were obtained:

• Enterprises that benefit from these programs have a higher degree of competitiveness.

• The need for awareness of technological innovation within the industry is high.
• Macroeconomic environmental conditions, as well as regulations in areas such as education and employment, do not have features to support the innovation process.
• The financial mechanism needed to bring the results of R & D activities to a level that will provide commercial returns is insufficient and poses a big problem.(p.21)"

3) *"Türkiye Bilimsel ve Teknolojik Araştırma Kurumu'nun (TÜBİTAK) bilim insanlarının yetiştirilmesine yönelik süregelen desteklerini, yeni bilim ve teknoloji stratejileri doğrultusunda özellikle 2005 yılından itibaren çeşitlendirmesi ve artırmasıyla bu açığın kapatılması yönünde çalışmalar başlatılmıştır. (p.52)"*

"In order to close this gap, TÜBİTAK diversified and increased its ongoing support for the training of scientists in line with new science and technology strategies, especially since 2005. (p.52)"

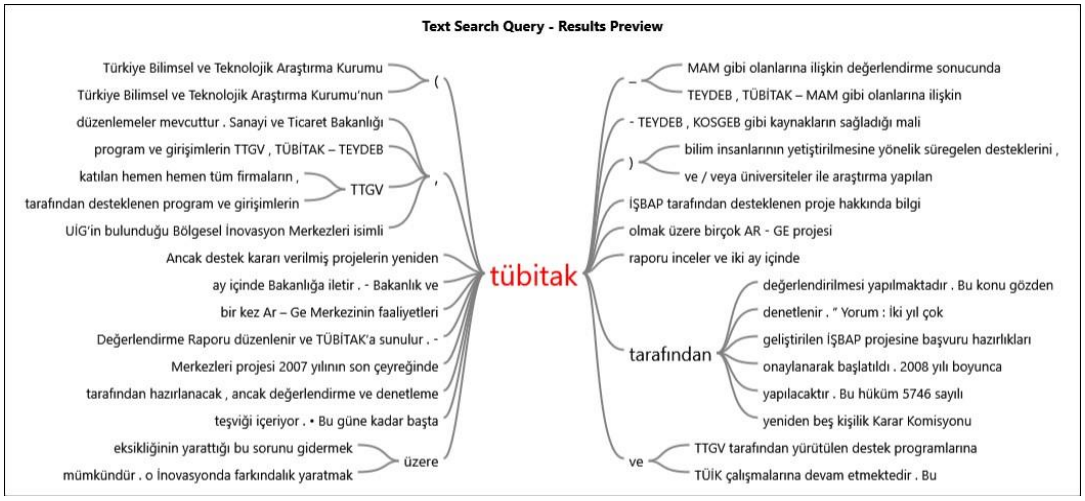
4) *"Bugüne kadar başta TÜBİTAK olmak üzere birçok AR-GE projesi destek kapsamına alındı. Bu projelerin AR-GE niteliği çeşitli kurullar tarafından değerlendirildi ve projelerin tasarlanan süreç dahilinde uygulanması ise başarı olarak nitelendirildi. Aslında gerçek başarı AR-GE projesinin çıktılarının ulusal veya uluslararası pazarlarda kabul ve talep görmesi değil midir? (p.55)"*

"To date, many R & D projects, especially by TUBITAK, have been included in the scope of support. The R & D quality of these projects was evaluated by various committees and the implementation of the projects within the designed process was described as success. In fact, isn't the real success that the outputs of the R & D project are accepted and demanded in national or international markets? (p.55)"

3.5.3. Content Analysis of TUSIAD-National Innovation System (2006) Report

In Figure 14, word tree for 'TUBITAK' and 'innovation' in the TUSIAD-National Innovation System (2006) report can be seen.

Figure 14 - Word Tree for 'TUBITAK' and 'innovation' in the TUSIAD-National Innovation System (2006) Report



As the documents reviewed frequently include the role of TUBITAK in supporting innovation and technology projects, they are not included in the ongoing analysis to avoid duplication. However, the fact that the projects supported by TUBITAK are among the clusters or networks of innovation be an effort to mature the innovation system over time (1). Though, it can be concluded that the projects supported by TUBITAK are in the field of industrial innovation as well as scientific and technological innovation and all these activities have abstract and concrete results (2).

> ***1)*** *"Gerek ağyapılar, gerekse de kümeler alanında Türkiye'de çeşitli çalışmaların yukarıda saydığımız ihtiyaçlara yanıt verecek özellikler barındırdığı görülmektedir: 2007 yılında başlayacağını tahmin ettiğimiz AB tarafından desteklenen bir projenin, KOSGEB tarafından desteklenen Bartın'daki ve Adıyaman'daki uygulamaların, Rekabet Forumu tarafından yürütülen TÜBİTAK destekli inovasyon projesinin, Leonardo da Vinci programı kapsamında yine Rekabet Forumu tarafından yürütülen SMEexcel adlı projenin, kümeler ve ağlarla ilgili örnekler arasında sayılması mümkündür.(p.49)"*

> *"Both the networks, as well as clusters in the various activities in Turkey seems to have features that respond to the needs mentioned above: by the EU, which we estimate will start in 2007 supported a project in KOSGEB supported Bartin and practices in Adiyaman, conducted by the Competitiveness Forum TÜBİTAK funded The innovation project, SMEexcel, also run by the Competitiveness Forum under the Leonardo da Vinci program, can be counted as examples of clusters and networks.(p.49)"*

2) "*Bilimsel-Teknolojik İnovasyon: Daha çok bilimsel araştırmalar ile ulaşılabilen teknoloji platformu gibi evrensel inovasyon içeren çalışmalar. Genel olarak bilimsel makale ve patent ile sonuçlanması beklenen çalışmalar. Bu çalışmalar, genel olarak TÜBİTAK, DPT ve AB Çerçeve Programlarına uygun olabilir."*

"Endüstriyel inovasyon: Daha çok tasarım, ürün geliştirme, süreç geliştirme tipi işletme içi faaliyetler. Bu çalışmaların sonunda, faydalı model, patent ve ilgili olabilecek diğer fikri mülkiyet haklarını koruyucu belge(ler) alınması beklenebilir. Bu çalışmalar genel olarak TÜBİTAK, TEYDEB, TTGV desteklerine uygun olabilir. (p.71)"

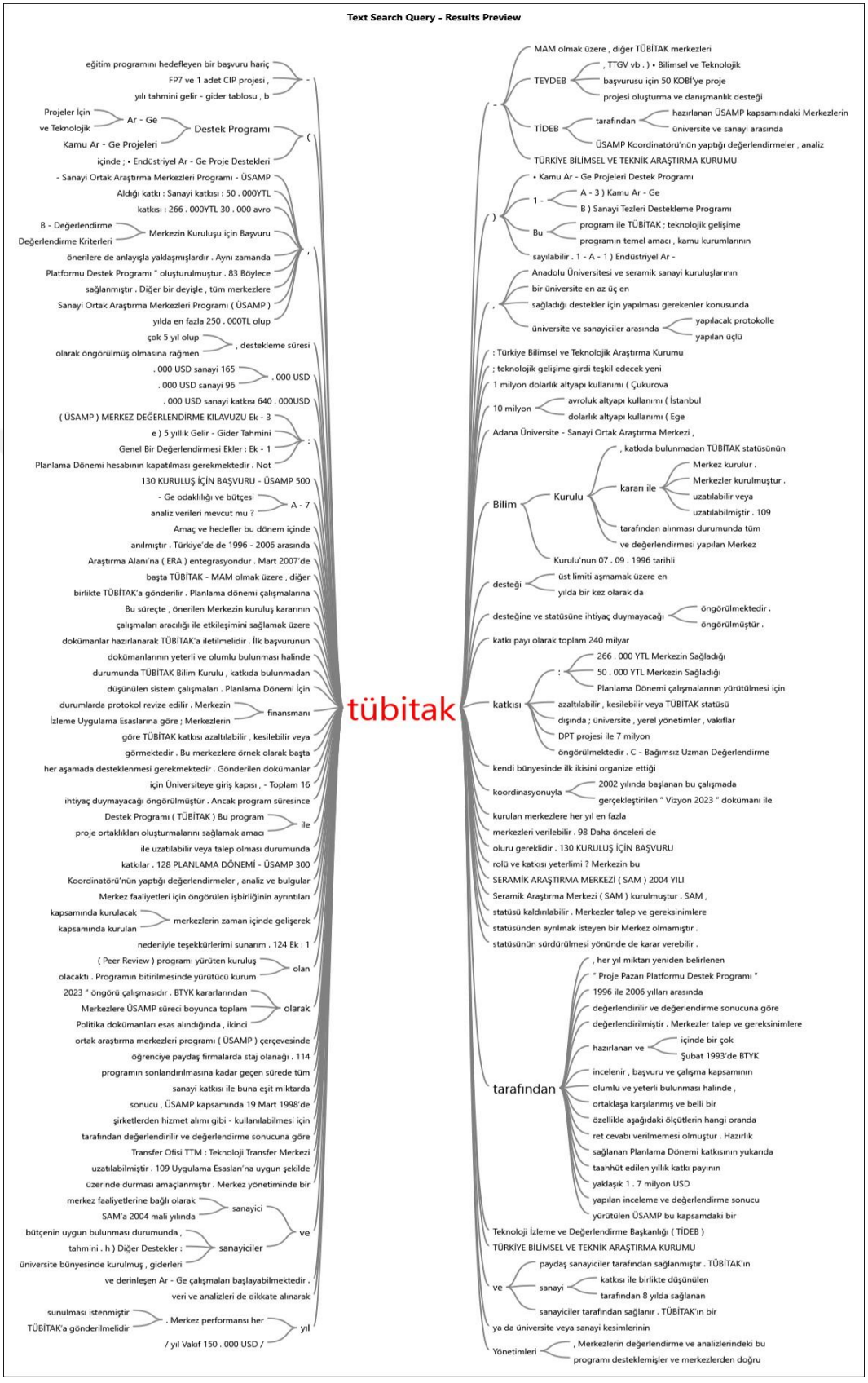
"Scientific-Technological Innovation: Studies involving universal innovation, such as the technology platform that can be reached through scientific research. Generally expected to result in scientific articles and patents. These studies may generally be in line with TÜBİTAK, SPO and EU Framework Programs."

"Industrial innovation: More design, product development, process development type in-house activities. At the end of these studies, it may be expected to obtain a document (s) that protects the utility model, patent and other relevant intellectual property rights. These studies may be in accordance with the support of TUBITAK, TEYDEB and TTGV in general. (p.71)"

3.5.4. Content Analysis of TTGV-University-Industry Cooperation (2010) Report

In Figure 15, word tree for 'TUBITAK' and 'innovation' in the TTGV-University-Industry Cooperation (2010) report can be seen.

Figure 15 - Word Tree for 'TUBITAK' and 'innovation' in the TTGV-University-Industry Cooperation (2010) Report



University-industry cooperation, which is one of the important structures of national innovation system, is summarized within the framework of this document. Within the scope of these collaborations and studies, it is understood that the 'Vision 2023' document concerning the country in general has been prepared under the coordination of TUBITAK (1). In addition to this, it is understood that BTYK has been conducting studies since the early 1990s and TUBITAK has prepared documents for policy determination in this regard (2). It is also seen that TUBITAK has prepared strategy documents for university-industry cooperation and these have been approved by BTYK (3). It is also understood that TUBITAK has been an important financial supporting actor covering industrial R & D activities since the 1990s (4). TUBITAK has also been assigned a role for the development of national infrastructure in terms of innovation system (5). TUBITAK also encourages universities to organize project markets (6). In addition, TUBITAK took roles between 1996 and 2006 in order to create the necessary environment for the joint R & D activities in terms of university-industry cooperation (7). Another point that stands out for TUBITAK in terms of R & D projects is that the projects proposed by The University-Industry Joint Research Centers Program (USAMP) have been accepted by TUBITAK unless there is an obvious problem (8). At this point, it is understood that TUBITAK freed the relevant institutions in terms of decision-making and did not stand in the way of development with a centralized management style (9). It is understood that TUBITAK, which is authorized to terminate programs such as USAMP, does not benefit from the indifference to the program, but also acts to benefit other projects (10). On the other hand, it is stated that national innovation systems require complex structuring and success depends on using these systems effectively (11). In addition to being complex, these systems operate in an ecosystem-like manner, in other words, follow an evolutionary process and change and progress are gradual and slow (12).

> ***1)*** *"Amaç ve hedefler bu dönem içinde TÜBİTAK koordinasyonuyla gerçekleştirilen "Vizyon 2023"dokümanı ile uyumluluk göstermektedir. (p.78)"*

> *"The objectives and targets are consistent with the Vision 2023" document, which was realized in coordination with TUBITAK during this period. (p.20)"*

2) *"Politika dokümanları esas alındığında, ikinci olarak TÜBİTAK tarafından hazırlanan ve Şubat 1993'de BTYK tarafından onaylanan "Türkiye Bilim ve Teknoloji Politikası:1993-2003" önemli görülmektedir. (p.79)"*

"When taken as essential policy documents prepared secondly by TUBITAK and approved by the BTYK in February 1993 "Turkey Science and Technology Policy: 1993-2003" is considered very important. (p.79)"

3) *"Mart 2007'de TÜBİTAK tarafından hazırlanan ve içinde bir çok ÜSİ ile ilgili konunun da bulunduğu "2008-2010 Ulusal İnovasyon Strateji" dokümanı BTYK tarafından onaylanmıştır. (p.81)"*

"In March 2007, "2008-2010 National Innovation Strategy" document which was prepared by TUBITAK and including many issues related to USI was approved by BTYK."

4) *"TTGV'nin ardından 1995 yılında TUBİTAK- TİDEB'in kurulması ile sanayi Ar-Ge faaliyetlerine yönelik verilen finansal desteklerin miktarı ve çeşitliliği çok artmıştır. Bu birimin 2006 yılında ismi Teknoloji ve Yenilik Programları Destekleme Başkanlığı (TEYDEB) olarak değiştirilmiştir. (p.82)"*

"With the establishment of TUBİTAK-TİDEB in 1995 following the TTGV, the amount and diversity of financial support provided for industrial R & D activities increased considerably. In 2006, the name of this unit was changed to the Presidency of Technology and Innovation Programs Support (TEYDEB). (p.82)"

5) *"Bilimsel ve Teknolojik Projeler İçin Ar-Ge Destek Programı (TÜBİTAK) Bu program ile TÜBİTAK; teknolojik gelişime girdi teşkil edecek yeni bilgilerin üretilerek ileri düzey projelerin ortaya çıkmasını ve yüksek teknoloji tabanının gelişimini hedeflemektedir. Böylece öncelikli alanlarda ulusal altyapıyı geliştirmek ve dünya pazarlarında rekabetçi olmak hedeflenmektedir. Bu programa üniversiteler ile kamu ve özel konsorsiyumlar başvurabilmektedir. (p.82)"*

"R & D Support Program for Scientific and Technological Projects (TÜBİTAK): With this program, TÜBİTAK aims to produce new information that will constitute an input to technological development and to develop advanced

projects and to develop a high technology base. Thus, it is aimed to develop national infrastructure in priority areas and to be competitive in world markets. Universities and public and private consortia can apply for this program. (p.82)"

6) *"Böylece, TÜBİTAK kendi bünyesinde ilk ikisini organize ettiği proje pazarlarını yaygınlaştırmak ve özellikle üniversiteleri proje pazarları düzenlemeye teşvik etmeyi hedeflemektedir. 2008 yılı itibari ile bu programca desteklenen farklı sektörlere yönelik olarak 18 ayrı proje pazarı organize edilmiş ve bu pazarlarda çok sayıda proje işbirliği yaratılmıştır. (p.84)"*

"Thus, TÜBİTAK aims to expand the project markets in which it organizes the first two and encourage universities to organize project markets. As of 2008, 18 different project markets have been organized for different sectors supported by this program and many projects have been created in these markets. (p.84)"

7) *"Üniversite- Sanayi Ortak Araştırma Merkezleri Programı (ÜSAMP), TÜBİTAK-TİDEB tarafından üniversite ve sanayi arasında ortak Ar-Ge faaliyetlerinin yürütülmesi için gerekli ortamın yaratılması amacıyla 1996 ve 2006 yılları arasında sürdürülmüştür. (p.86)"*

"The University-Industry Joint Research Centers Program (ÜSAMP) was carried out by TÜBİTAK-TİDEB between 1996 and 2006 in order to create the necessary environment for the conduct of joint R & D activities between university and industry. (p.86)"

8) *"ÜSAMP'ın program yürütücüleri açısından sevindirici ve başarılı diğer bir yönü de başvuruların hiçbirine- işbirliğinden çok uzaktan eğitim programını hedefleyen bir başvuru hariç- TÜBİTAK tarafından ret cevabı verilmemesi olmuştur. (p.112)"*

"Another pleasing and successful aspect of ÜSAMP for the program executives was that none of the applications - except an application aimed at the distance education program rather than cooperation - were rejected by TUBITAK."

---

9) *"Aynı zamanda, TÜBİTAK, sağladığı destekler için yapılması gerekenler konusunda koşullar öne sürmeme basiretini tüm program boyunca sürdürmüş, bu da Merkez yönetimlerinin kendi kararlarını alma ve Merkez gelişimi için daha yoğun inisiyatif kullanma isteklerine ve Merkezlerin özgüveninin gelişimine destek olmuştur. (p.120)"*

"At the same time, TÜBİTAK has continued its prudence not to put forward any conditions for the support it provides, and this has supported the desire of the Central administrations to make their own decisions and use more intense initiatives for the development of the Center and the development of self-confidence of the Centers. (p.120)"

10) *"ÜSAMP'ın sonlandırılmasında programın başarısızlığı ya da yetersizliği söz konusu değildir. Tersine sadece programın akıbetini bekleyen hazırlık aşamasındaki birçok ön girişim düşünüldüğünde, ÜSAMP devam etseydi muhtemelen bugün 14 civarında Merkez olacaktı. Programın bitirilmesinde yürütücü kurum olan TÜBİTAK ya da üniversite veya sanayi kesimlerinin ilgisizliği ya da sahiplenmemesi de söz konusu değildir. (p.121)"*

"There is no failure or inadequacy of the program in the termination of USAMP. On the contrary, given the many preliminary initiatives in the preparatory phase that only awaited the fate of the program, it would probably have been around 14 centers today if the USAMP had continued. There is no indifference or non-ownership of TUBITAK, the university or the industrial sector, as the executing institution for the completion of the program. (p.121)"

11) *"En geniş çerçevede Ulusal İnovasyon Sistemi (ULİS) olarak adlandırılan bir yaklaşım ve yapılanma ile ülkeler, yukarıda açıklanan kavramsal süreçleri hayata geçirecek karmaşık sistemler tasarlamakta ve bu sistemleri uygulamada gösterdikleri başarıyla doğru orantılı olarak da ileri ülkeler arasında sayılmaktadırlar. (p.18)"*

"With an approach and structure called National Innovation System (NIS) in the broadest framework, countries design complex systems to implement the conceptual processes described above, and they are counted among the advanced countries in direct proportion to their success in implementing these systems. (p.18)"

---

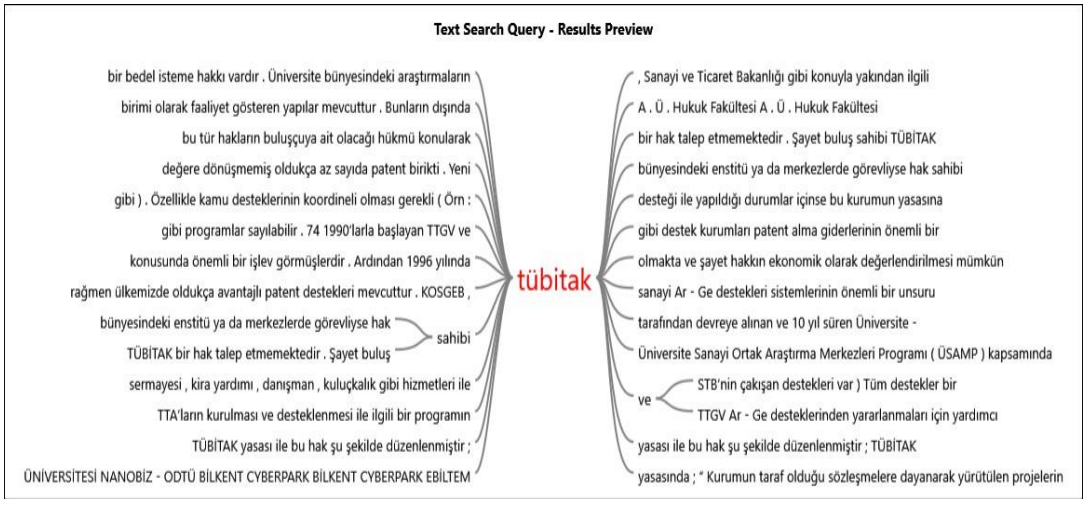
12) "*Son olarak; üniversite-sanayi işbirliğinin de parçası olduğu en geniş sistem olan Ulusal İnovasyon Sistemi için de ekosistemin önemini vurgulamak yararlı olacaktır. Başarılı bir sistem için gerekli olan unsurlar sosyal ve kültürel olgulardan çok etkilenirler ve evrimsel özellikler gösterirler. Yani, değişimlerin biçimlendirilebilmeleri çok uzun zaman alır. Bu nedenle, devlet desteklerinin başarı için yeterli bir unsur olarak değil, destekleyici bir unsur olarak görülmesi ve buna bağlı olarak politika ve uygulamaların değişen hükümetlerce sil baştan yapılmaması, uzun soluklu ve sürekli olması büyük önem taşımaktadır. (p.70)"*

"Finally; It will be useful to emphasize the importance of ecosystem for the National Innovation System, which is the largest system which is a part of university-industry cooperation. The elements necessary for a successful system are highly influenced by social and cultural phenomena and exhibit evolutionary characteristics. That is, it takes a long time for changes to take shape. For this reason, it is of great importance that the state supports are seen as a supportive factor rather than a sufficient element for success, and that policies and practices are not carried out by the changing governments and that they are long-term and continuous. (p.70)"

3.5.5. Content Analysis of TTGV-University-Industry Cooperation/Technology Transfer Interface (2010) Report

In Figure 16, word tree for 'TUBITAK' and 'innovation' in the TTGV-University-Industry Cooperation/Technology Transfer Interface (2010) report can be seen.

Figure 16 - Word Tree for 'TUBITAK' and 'innovation' in the TTGV- University-Industry Cooperation/Technology Transfer Interface (2010) Report



The establishment of complex structures such as national innovation systems, as well as the operation of them, requires effort and attention. In this context, it is stated that there is an indirect progress in these activities with the efforts of academicians who have been included in the system since the 1990s (1). Following this, it was understood that the 10-year university-industry joint research center program (USAMP), which was conducted by TUBITAK in 1996, gained significant experience (2). Measures have been taken to protect the knowledge and innovative products produced within this program in terms of human capital (3). In addition, TUBITAK also provided support for obtaining patents and patent protection, which is an important application for the protection of intellectual capital (4). Another subject is the establishment and support of Technology Transfer Accelerators (TTA), which play an important role in the transfer of advanced technologies to the country (5). The ever-increasing competition has required a non-linear innovation system since the 1980s and in this context, science, technology and industrial policies have been shaped (6). In the national innovation system, where university and industry are the main actors, we understand that many different institutions have been included in the system in recent years to maximize the value arising from the interaction of these two actors (7).

> ***1)*** *"1990'larla başlayan TTGV ve TÜBİTAK sanayi Ar-Ge destekleri sistemlerinin önemli bir unsuru olan değerlendirme ve izleme faaliyetlerinde yer alan akademisyenlerle dolaylı da olsa ÜSİ faaliyetlerinde bir ilerleme olduğu görülmüştür. (p.75)"*
>
> ---
>
> *"There has been an improvement in USI activities, albeit indirectly, with the academicians involved in evaluation and monitoring activities, which are an important element of TTGV and TUBITAK industrial R & D support systems that started in the 1990s. (p.75)"*

> ***2)*** *"Ardından 1996 yılında TÜBİTAK tarafından devreye alınan ve 10 yıl süren Üniversite-Sanayi Ortak Araştırma Merkezleri Programı (ÜSAMP) önemli bir deneyim olmuştur. (p75)"*
>
> ---
>
> *"Subsequently, the University-Industry Joint Research Centers Program (ÜSAMP), which was commissioned by TUBITAK in 1996 and lasted for 10 years, was an important experience. (p.75)"*

3) *"Şayet buluş sahibi TÜBİTAK bünyesindeki enstitü ya da merkezlerde görevliyse hak sahibi TÜBİTAK olmakta ve şayet hakkın ekonomik olarak değerlendirilmesi mümkün olur ve bir gelir elde edilirse, gelirin en fazla yarısı fikir ürün sahibine verilebilmektedir. (p.82)"*

"If the inventor is employed in institutes or centers within the body of TUBITAK, the entitlement is TUBITAK and if the right can be assessed economically and an income is obtained, at most half of the income can be given to the idea owner. (p.82)"

4) *"Buna rağmen ülkemizde oldukça avantajlı patent destekleri mevcuttur. KOSGEB, TÜBİTAK gibi destek kurumları patent alma giderlerinin önemli bir bölümü için destekler sunmaktadırlar. Bunlara ek olarak, araştırmacılara patent giderleri yanında patent koruma giderleri gibi desteklerin de sağlanması üniversitelerden sanayiye doğru teknoloji transferi sürecini kolaylaştıracak unsurlar olarak yararlı olacaktır. (p.86)"*

"However, there are quite advantageous patent supports in our country. Support institutions such as KOSGEB and TUBITAK provide support for a significant portion of the patent expenses. In addition to these, providing patent support expenses as well as patent protection expenses to researchers will be useful as elements to facilitate the process of transferring technology from universities to industry. (p.86)"

5) *"Diğer bir deyişle, TTA'ların kurulması ve desteklenmesi ile ilgili bir programın TÜBİTAK, Sanayi ve Ticaret Bakanlığı gibi konuyla yakından ilgili ve destek süreçlerinde uzman bir kuruluşça desteklenmesi, hem finansman ve hem de yukarıda değinildiği gibi özendirici ve rehberlik etkisi, benzer yapılarla etkileşim ve işbirliği gibi unsurlarda çok yararlı ve hızlı gelişmeyi sağlayabilecektir. (p.91)"*

"In other words, supporting a program related to the establishment and support of TTAs by an organization that is closely related and specialized in the support processes such as TUBITAK, Ministry of Industry and Trade, both financing and encouraging and guidance effect as mentioned above, interaction and cooperation with similar structures. will provide a very useful and rapid development in such elements. (p.91)"

---

6) *"Temel araştırmalardan başlayıp, pazara kadar uzanan değer zincirinde, 1970'lerin sonuna kadar hakim olan ve disiplinler yaklaşımların ağırlıkta olduğu doğrusal (lineer) inovasyon sistemi, özellikle 1980'lerden itibaren - Bilim-Teknoloji ve Sanayi politikaları ile de paralellik gösterecek şekilde- disiplinler arası hatta disiplinler üstü yaklaşımların temel alındığı doğrusal olmayan ya da evrimsel modellere doğru dönüşmeye başlamıştır. (p.11)"*

"The linear innovation system, dominated by the end of the 1970s and dominated by disciplinary approaches, has been based on interdisciplinary and even transdisciplinary approaches in parallel with Science, Technology and Industrial policies since 1980s. has begun to evolve into nonlinear or evolutionary models. (p.11)"

7) *"Bu yöndeki ivmelenmeyi güdeleyen pek çok faktör vardır. Bu faktörler arasında öne çıkanlar olarak; geçmişteki lineer inovasyon sistemi yerine artık geçerli olan evrimsel inovasyon süreçlerinin ilişkileri biçimlendirici ruhu ve buna bağlı olarak üniversite araştırmalarının toplumsal ve ekonomik yarara, inovasyon süreçlerine dönüşmesi yönünde toplumsal baskı, devletin doğrudan üniversite araştırmalarına ayırdığı kaynaklarda gözlenen azalma, küresel rekabette teknolojik gelişmişliğin önemli bir rol oynaması sayılabilir."*

"Özetlemek gerekirse, üniversite ve sanayinin ana aktörler olarak yer aldığı ya da üniversite-sanayi etkileşiminden doğan değeri maksimize etmek üzere devlet, diğer fon sağlayıcılar, danışmanlık kuruluşları, hukuksal koruma sistemleri vb. pek çok aktörün yer aldığı, değişik form ve özellikler gösteren kurumsal mekanizmalar son dönemlerde hızla öne çıkmakta ve gelişmektedir. (p.16-17)"

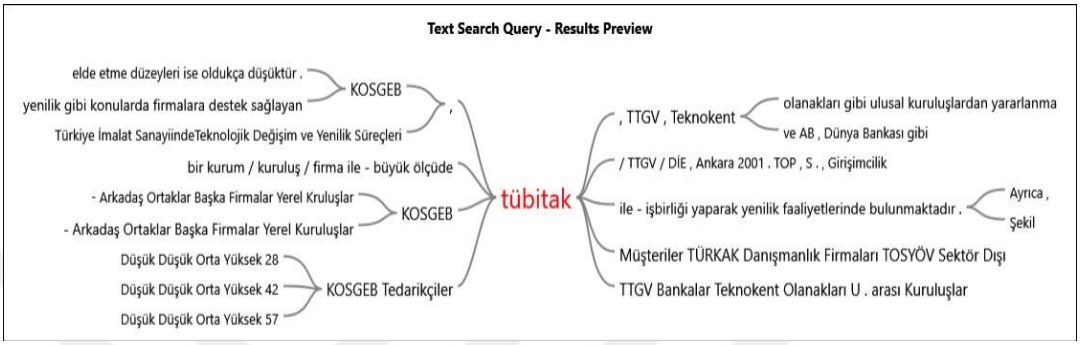
"There are many factors driving this acceleration. Among these factors; instead of the previous linear innovation system, the evolutionary innovation processes, which are now valid, form the relationship-forming spirit, and consequently, the social pressure to transform university research into social and economic benefit, innovation processes, the decrease in the resources allocated by the state directly to university research, and technological development play an important role in global competition.."

"To summarize, there are government, other fund providers, consultancy organizations, legal protection systems, etc., where the university and industry are the main actors or to maximize the value arising from the university-industry interaction. Institutional mechanisms, in which many actors take place, showing different forms and features, are rapidly developing. (p.16-17)"

3.5.6. Content Analysis of TEPAV-Innovation, Cooperation and Entrepreneurship (2007) Report

In Figure 17, word tree for 'TUBITAK' and 'innovation' in the TEPAV-Innovation, Cooperation and Entrepreneurship (2007) report can be seen.

Figure 17 - Word Tree for 'TUBITAK' and 'innovation' in the TEPAV-Innovation, Cooperation and Entrepreneurship (2007) Report



Collaboration in entrepreneurship and innovation is another factor examined. Although some support is provided by institutions such as TUBITAK, which endeavors to transfer the funding from the state channel to the innovation system, some reports seem to some areas or sectors have benefited at a very low level (1,3). In addition to financial support, in some reports, it is stated that the innovations realized by the companies are implemented without the support of any organization (2). It can be said from the statements in the reports that 1/4 of the companies that cooperate with any institution such as TUBITAK in innovation activities (4). The role of governments in the formation and effective implementation of the innovation system was re-emphasized and the necessity of governments' effects in the system was expressed (5).

> ***1)*** *"Firmaların tamamına yakını yenilik ve AR-GE çalışmalarında kendi finansman kaynaklarını kullanmaktadır. Yerel kuruluşlardan ve diğer firmalardan finansman kaynağı elde etme düzeyleri ise oldukça düşüktür. KOSGEB, TÜBİTAK, TTGV, Teknokent ve AB, Dünya Bankası gibi uluslararası kuruluşlardan yenilik çalışmalarının finansmanına yönelik kaynak kullanılması ise yok denecek kadar azdır. (p.33)"*

> *"Almost all the companies use their own financial resources in innovation and R & D studies. The level of obtaining funding from local institutions and other companies is quite low. The use of resources to finance innovation studies from*

international institutions such as KOSGEB, TUBITAK, TTGV, Teknokent and the EU and the World Bank is almost non-existent. (p.33)"

2) *"Yapılan yeniliklerin büyük bir çoğunluğu ise herhangi bir kurum/kuruluş/firma ile işbirliği olmaksızın yapılmaktadır (Bkz: Şekil 44). 68 yenilikçi firmanın 51'i (%75) yenilik faaliyetlerini tek başına yürütmektedir. Buna karşın; 17 firma (%25) herhangi bir kurum/kuruluş/firma ile -büyük ölçüde TÜBİTAK ile- işbirliği yaparak yenilik faaliyetlerinde bulunmaktadır. (p.45)"*

"Most of the innovations are made without cooperation with any institution / organization / company (See Figure 44). Of the 68 innovative firms, 51 (75%) are engaged in innovation activities alone. However; 17 companies (25%) are engaged in innovation activities in cooperation with any institution / organization / firm - largely with TUBITAK. (p.45)"

3) *"Benzer şekilde; AR-GE ve yenilik gibi konularda firmalara destek sağlayan KOSGEB, TÜBİTAK, TTGV, Teknokent olanakları gibi ulusal kuruluşlardan yararlanma düzeyi de oldukça düşüktür. (p.47)"*

"Similarly; The level of benefiting from national institutions such as KOSGEB, TUBITAK, TTGV and Teknokent facilities, which provide support to companies in areas such as R & D and innovation, is also very low. (p.47)"

4) *"Buna karşın; 5 firma (%26,3) herhangi bir kurum/kuruluş/firma ile -büyük ölçüde TÜBİTAK ile- işbirliği yaparak yenilik faaliyetlerinde bulunmaktadır. (p.60)"*

"However; 5 companies (26.3%) cooperate with any institution / organization / company - largely with TUBITAK - to carry out innovation activities. (p.60)"

5) *"İnovasyon sisteminin etkinliğinin ve ulusal yenilikçi performansın arttırılmasında hükümetler de etkin bir rol oynamaktadır. Çünkü hükümetlerin uygulayacağı bilim ve teknoloji politikaları teknik ilerlemenin yönünü ve hızını belirlemektedir. Bu bağlamda, hükümetler teknoloji ve inovasyon politikalarını genel ekonomik politikaları içerisinde değerlendirmeli, bilgi üretmede ve yönetmede birleştirici bir rol oynamalıdırlar. Yani hükümetler inovasyon kültürü*

oluşmasını sağlamalı, teknolojinin yayılmasını genişletmeli ve kolaylaştırmalı, ağları ve kümelenmeleri desteklemeli araştırma ve geliştirmeyi hızlandırıp artırmalı ve globalleşmenin gerektirdiği diğer ihtiyaçları sağlamalıdırlar (OECD, 1999). *(p.12)"*

"Governments also play an active role in improving the efficiency of the innovation system and the national innovative performance. Because science and technology policies to be implemented by governments determine the direction and speed of technical progress. In this context, governments should consider technology and innovation policies within their general economic policies and play a unifying role in generating and managing information. In other words, governments should ensure the creation of a culture of innovation, expand and facilitate the diffusion of technology, support networks and clusters, accelerate and increase research and development, and provide the other needs of globalization (OECD, 1999). *(p.12)"*

3.5.7. Content Analysis of TEPAV-1st Regional Development and Governance Symposium (2006) Report

In this document TUBITAK is mentioned just only one place. In fact, in this report summarized as the outputs of the regional development and management symposium, it is stated that TUBITAK should be considered as an actor because it has the research and / or data required for the system.

"Yine yerel olan ve olmayan bilgi üretim birimleri var, bölgesel planı etkileyebilecek aktörler arasında, bunlar tabii ki yerel üniversiteler geliyor başta ama sadece bundan ibaret değil. Yerel üniversitelerden ve yüksek okullardan başka araştırma kuruluşları var. Bu araştırma kuruluşlarının bağımsız olanı ya da özel sektöre ait olanına ben henüz hiç rastlamadım belki İstanbul tarafında vardır. Ama bunlar devletin kendi özel yasasıyla kurulmuş araştırma kuruluşları var TÜİK gibi olabilir, TÜBİTAK olabilir, TÜBA'nın yok ama İGEME gibi kuruluşlar, bunlar özel bir alana özgü araştırmaları yapan kuruluşlar. Bu araştırmaların sağlayacağı verilere dayanmak için onları birer aktör olarak mutlaka düşünmemiz gerekir. Burada belki üniversiteyi de bir kamu kuruluşu olarak düşünebilirsiniz ama bundan sonra bahsedeceklerim özel sektör ya da girişimciler diyebileceğimiz grup ile sivil toplumun kendisiyle ilgili aktörler olacak. (p341)"

"Again, there are local and non-local information production units, among the actors that can influence the regional plan, these are of course local universities, but not only that. There are other research institutions from local

universities and colleges. I have not yet come across any independent or private sector of these research organizations. Maybe there are some on the Istanbul side. But these are research institutions established by the state's own private law may be like TUIK, TUBITAK may be, but TUBA does not. Organizations such as IGEME, those that conduct research specific to a field. In order to rely on the data provided by these researches, we must consider them as actors. Here, you may think of the university as a public institution, but I will talk about the private sector or entrepreneurs and the actors related to the civil society itself. (p341)"

3.5.8. Content Analysis of TEPAV-2nd Regional Development and Governance Symposium (2007) Report

In Figure 18, word tree for 'TUBITAK' and 'innovation' in the TEPAV-2nd Regional Development and Governance Symposium (2007) report can be seen.

Figure 18 - Word Tree for 'TUBITAK' and 'innovation' in the TEPAV 2nd Regional Development and Governance Symposium (2007) Report

In this report, which conveys the results of the second study organized as a continuation of the previous symposium, it is stated that TUBITAK provided financial support (1). In addition, financial support of TUBITAK is emphasized in R & D and technology projects (2). It is understood that institutions such as TUBITAK are also used to meet the data requirement which is a useful requirement in the maintenance of innovation systems (3).

1) *"2. Bölgesel Kalkınma ve Yönetişim Sempozyumu, TEPAV, Ege Üniversitesi, Ege Bölgesi Sanayi Odası iş birliğinde kalkınma ajanslarının gelecek vizyonlarına ışık tutmak ve Türkiye'deki bölgesel kalkınma tartışmalarına katkı sağlamak amacıyla, 25–26 Ekim 2007 tarihlerinde İzmir'de gerçekleştirildi. TÜBİTAK, Bilimsel Toplantı Destekleme Programı aracılığıyla sempozyumun gerçekleştirilmesi için kısmi mali destek sağladı. (önsöz)"*

"Second Regional Development and Governance Symposium TEPAV, Ege University, Aegean Region Chamber of Industry in cooperation, to shed light on the development agencies vision of the future and to contribute to regional

development debate in Turkey, was held in Izmir on 25-26 October 2007. TÜBİTAK provided partial financial support for the realization of the symposium through the Scientific Meeting Support Program. (preface)"

2) *"Sanayinin verim, kapasite, ARGE, yüksek katma değerli ürüne geçiş projelerine mali hibe desteği". Bunu yapan Türkiye'de TÜBİTAK var. (p.321)"*

"Financial grants support to industry's efficiency, capacity, R & D, transition to high value-added products. Who's does this is TUBITAK in Turkey. (p.321)"

3) *"Bölgedeki yerleşimlerin rekabet gücünde önemli olan faktörleri ortaya çıkarmak ve politika ağlarının rolünü tanımlamak üzere 3 aşamalı bir çalışma tasarlanmıştır. Araştırmanın ilk aşamasında İzmir Bölgesindeki yerleşimlere ilişkin rekabet göstergeleri TÜİK, DPT, Türkiye Patent Enstitüsü, TTGV ve TÜBİTAK gibi farklı kurumlardan toplanmıştır. Bu kurumlardan toplanan veriler yerleşimlerin sosyo-ekonomik dönüşümü ve rekabet gücü düzeylerinin ortaya çıkarılması için kullanılmıştır. (p.428)"*

"A 3-stage study was designed to identify the factors that are important to the competitiveness of the settlements in the region and to define the role of policy networks. In the first phase of the research, Izmir indicators for placements in the Regional competition has been collected from different institutions such as TSI, SPO, Turkey Patent Institute TTGV and TUBITAK. The data collected from these institutions were used to reveal the socio-economic transformation and competitiveness levels of the settlements. (p.428)"

3.5.9. Content Analysis of TEPAV-7th Regional Development and Governance Symposium (2012) Report

In this document TUBITAK is mentioned just only one place. Although institutions such as TTGV and TEPAV carry out studies that are closely related to technology and economic development, they rarely mention important actors such as TUBITAK in their reports. In this study, the role of TUBITAK is limited in the form of financial support.

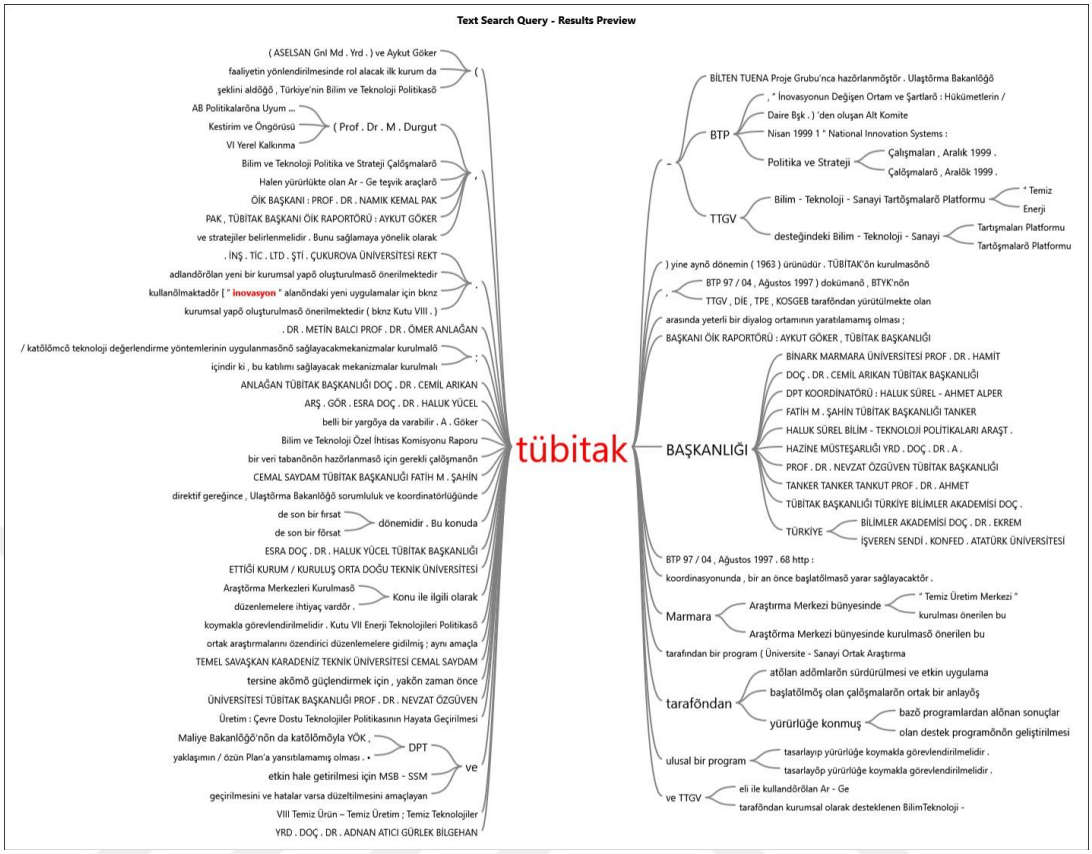
"Bu bağlamda TEPAV her yıl düzenlediği Bölgesel Kalkınma ve Yönetişim Sempozyumu'nun yedincisini Ankara Üniversitesi Kalkınma Çalışmaları Uygulama ve Araştırma Merkezi-AKÇAM'ın katkılarıyla ve "Kırsal Kalkınma ve Yönetişim" teması ile 13-14 Aralık 2012 tarihlerinde düzenledi. Konunun kuramsal, uygulamaya ve politika geliştirmeye yönelik boyutları ulusal ve uluslararası konuşmacılar, tartışmacılar ve dinleyicilerin aktif katılımı ile tartışmaya açıldı. TÜBİTAK Bilim İnsanı Destekleme Daire Başkanlığı'nın desteği ile yayına hazırlanan elinizdeki kitap, sempozyumda sunulan bildiriler, konuşma metinleri ve tartışma bölümlerinden oluşmaktadır. (önsöz)"

"In this context, TEPAV organized the seventh Regional Development and Governance Symposium organized annually on 13-14 December 2012 with the contributions of Ankara University Development Studies Application and Research Center-AKÇAM and the theme of Rural Development and Governance. The theoretical, practical and policy-oriented dimensions of the issue were opened to discussion with the active participation of national and international speakers, debators and listeners. The book, which is prepared with the support of TÜBİTAK Department of Supporting Scientists, consists of the proceedings presented in the symposium, speech texts and discussion sections. (preface)"

3.5.10. Content Analysis of DPT-Science and Technology Special Commission Report (2000) Report

In Figure 19, word tree for 'TUBITAK' and 'innovation' in the DPT-Science and Technology Special Commission (2000) report can be seen.

Figure 19 - Word tree for 'TUBITAK' and 'innovation' in the DPT-Science and Technology Special Commission (2000) Report



Technology, innovation efforts and efforts to establish a national innovation system in the 1990s gained momentum since the 2000s. In fact, this report, dealt with by a special commission of the DPT in 2000, focused mainly on both the national innovation system and TUBITAK. One of the main subjects highlighted in this program is that there is a need for a national system in the implementation of technological and economic development and that TUBITAK is tasked with preparing it (1). In this respect, it was requested that the necessary research centers be established as soon as possible, representatives of related institutions to be included in this network and necessary financial support will be provided (2). On the other hand, it is emphasized that the demand for technology for a better life is gradually increasing, and the importance of policy formation by highlighting the economic and social consequences of technology is emphasized and the importance of establishing the necessary mechanisms is underlined (3). As a result of these developments, it is learned that TUBITAK's university-industry joint research centers support program has been put into effect (4). It is also understood that the communication required to establish and maintain the national innovation system in

these years has not been provided properly (5). The need for a national innovation system is emphasized the importance of making the relevant innovation activities within the country and becoming competent in order to achieve lasting technology performance (6). Furthermore, it was emphasized that the establishment of a national innovation system is not only a technical issue, but more efforts should be made to operate the system and the complexity of the system and the system should be planned as a wholistic nature (6). It was emphasized that BTYK should be used as an effective body for the establishment and operation of this system (6). Here, it is emphasized that the national innovation system should focus more on outputs than institutional mechanisms and the information produced from this system should be shaped to produce economic and social benefits (7). The importance of financial support, which has been emphasized in many studies and mostly provided through TUBITAK, has been emphasized again and the necessity of sustainability of this has been expressed (8).

> ***1)*** *"Sürdürülebilir temiz enerji kaynaklarından yararlanmaya ve temiz enerji üretimine yönelik teknolojiler yeni bir AR-GE ve inovasyon, dolayısıyla da yeni bir iddia alanıdır. Türkiye'nin bu yeni alana girme şansı vardır ve VIII. Beş Yıllık Plan Dönemi bu şansı kullanabilmek için belki de son bir fırsat dönemidir. Bu konuda TÜBİTAK ulusal bir program tasarlayıp yürürlüğe koymakla görevlendirilmelidir. (p.45)"*
>
> ---
>
> *"Technologies for exploiting sustainable clean energy sources and producing clean energy are a new area of R & D and innovation, and therefore a new area of claim. Turkey has the chance to enter this new field and VIII. The Five-Year Plan Period is perhaps the last opportunity to exploit this chance. TUBITAK should be charged with designing and implementing a national program. (p.45)"*

> ***2)*** *"TÜBİTAK Marmara Araştırma Merkezi bünyesinde kurulması önerilen bu Merkez bir an önce kurulmalı, bağımsız bir yapıya sahip olmalı, kamu ve sanayi sektörünün yanı sıra sivil toplum örgütleri, meslek örgütleri ve yerel yönetimler de bu yapıda temsil edilmelidir. Ayrıca, 'mevcut tesislerin, yasa ve/veya yönetmeliklerle getirilen ve sonuçta, firmalar için daha büyük mali yük ve*

sınırlamalara yol açan yeni çevre şartlarına uyumunun sağlanabilmesi için'gerekli yardım fonlarının tesisine de bir an önce başlanılmalıdır. (p.46)"

"Proposed to be established within the TUBITAK Marmara Research Center, this Center should be established as soon as possible, should have an independent structure, as well as public and industrial sector, non-governmental organizations, professional organizations and local governments should be represented in this structure. In addition, the establishment of the necessary funds should be started as soon as possible to ensure that the existing facilities comply with the new environmental conditions introduced by laws and / or regulations which ultimately lead to greater financial burdens and restrictions for firms. (p.46)"

3) *"Toplumun teknoloji talebi 'daha iyi bir hayat' arzusuna dayanır. Politika tasarımcıları için bu tespit, teknolojiyi ele alışta temel hareket noktalarından biri olmalıdır. Ama, toplum katmanlarının, teknoloji ile ilgili düzenlemelerin gerçekten kendi taleplerinin de bir karşılığı olduğunun farkına varabilmeleri, buna inanabilmeleri ve daha sonra da bu düzenlemelere sahip çıkarak destek sağlamaları, 'teknolojinin ekonomik ve toplumsal sonuçlarını değerlendirme' ve 'politika oluşturma' süreçlerine katılmalarıyla mümkündür. Onun içindir ki, bu katılımı sağlayacak mekanizmalar kurulmalı; TÜBİTAK-TTGV desteğindeki Bilim-Teknoloji-Sanayi Tartışmaları Platformu gibi mevcut ama mütevazı örnekler geliştirilmeli ve AB'de örnekleri görülen 'Yurttaş Forumları' Türkiye'de de düzenlenmelidir. (p.47)"*

"Society's demand for technology is based on the desire for a "better life". For policy designers, this determination should be one of the main starting points in the handling of technology. However, it is possible for the layers of society to realize that technology-related regulations are indeed a response to their own demands, to believe in this and then to support these regulations and to support them by participating in "evaluating the economic and social consequences of technology" and "policy-making". Its for that this contribution should be established mechanisms which will ensure TÜBİTAK-TTGV available as Science-Technology-Industry Discussion Platform in support, but modest examples should be developed and the EU examples shown "Citizens Forum" to be held in Turkey. (p.47)"

---

4) *"BTYK'nın buradaki öngörülerle ilgili kararlarının hayata geçirilmesi yönünde adımlar atılmış; örneğin, 'Teknoloji Geliştirme Bölgeleri Yasa Tasarısı' hazırlanmış; AR-GE'ye Devlet Yardımı Kararı kapsamında, üniversitelerle özel sektör sanayi kuruluşlarının ortak araştırmalarını özendirici düzenlemelere gidilmiş; aynı amaçla TÜBİTAK tarafından bir program (Üniversite-Sanayi Ortak Araştırma Merkezleri Destek Programı) yürürlüğe konmuştur. (p.55)"*

"Steps have been taken to implement the decisions of BTYK regarding the projections here; for example, "Technology Development Zones Draft Law" was prepared; Within the scope of the State Aid Decision for R & D, arrangements have been made to encourage the joint research of universities and private sector industrial organizations; for the same purpose, a program (University-Industry Joint Research Centers Support Program) has been implemented by TÜBİTAK. (p.55)"

5) *"DPT ve TÜBİTAK arasında yeterli bir diyalog ortamının yaratılamamış olması; BTYK'nın da, genellikle, 'Bilim ve teknoloji alanındaki araştırma ve geliştirme politikalarının ekonomik kalkınma, sosyal gelişme ve milli güvenlik hedefleri doğrultusunda tespit edilmesi ve koordinasyonun sağlanmasından' sorumlu ve bu konuda karar almaya yetkili bir organ olarak görülmemesi ya da BTYK'nın kuruluşuna ilişkin 77 sayılı KHK'nin devlet sistemimizde 'yetki ihlali'ne neden olan bir düzenleme olarak görülmesi. (p.65)"*

"Lack of adequate dialogue between the DPT and TUBITAK, and BTYK is generally not seen as a responsible and responsible body for determining and coordinating research and development policies in the field of science and technology in line with the objectives of economic development, social development and national security, or the Decree No. 77 on the establishment of BTYK seen as a regulation that causes a violation of authority in our state system. (p.65)"

6) *"Asla unutulmamalıdır ki, kalıcı bir teknoloji performansı kazanılmasında, ithal teknoloji, hiçbir biçimde, ülkenin kendisinin, sağlam bir bilim temeli ile belirli bir inovasyon kapasitesine sahip bulunmasının yerini tutamaz. .... Ülkenin kendisinin, sağlam bir bilim temeli ile belirli bir inovasyon kapasitesine*

sahip olması ise Ulusal İnovasyon Sistemini kurmasına bağlıdır Ulusal İnovasyon Sisteminin kurulması yalnızca teknik bir mesele değildir. Sistemin kurulabilmesi için alınması gereken önlemler, öngörülen yasal ve kurumsal düzenlemeler, başta bilim, teknoloji, sanayi, eğitim, ekonomi, istihdam ve para politikaları olmak üzere pek çok politika alanını yakından ilgilendirmektedir. ... Başarı buradaki sistemik bütünlüğü yakalayabilmektedir. Bu sistemik bütünlüğü sağlamak açısından, Ulusal İnovasyon Sisteminin kurulmasında Bilim ve Teknoloji Yüksek Kurulundan (BTYK) etkin bir organ olarak yararlanmak mümkündür. (p.7)"

"It should never be forgotten that in achieving lasting technology performance, imported technology can in no way replace the country's own capacity for innovation with a solid scientific foundation. .... The fact that the country itself has a certain innovation capacity with a solid scientific foundation depends on the establishment of the National Innovation System. The establishment of the National Innovation System is not only a technical matter. The measures to be taken in order to establish the system, legal and institutional arrangements envisaged, are closely related to many policy areas, especially science, technology, industry, education, economy, employment and monetary policies. ... Success can achieve systemic integrity here. In order to ensure this systemic integrity, it is possible to utilize the High Council of Science and Technology (BTYK) as an effective body in the establishment of the National Innovation System. (p.7)"

7) *"Ulusal inovasyon sistemi bilim ve teknoloji üretmeye yönelik kurumsal mekanizmaların ötesinde, bilimsel ve teknolojik bulgulara ekonomik ve toplumsal faydaya dönüştürebilmenin kurumsal mekanizmaları da içerir ve önemi de buradan gelir. Zira, bilimsel ve teknolojik bulguları ekonomik ve toplumsal faydaya dönüştürme yeteneğine sahip bulunmayan herhangi bir ülke, sektör ya da işletmenin geleneksel korumacılığın kalktığı, uluslararası rekabete açık bir dünyada varlığını sürdürmesi mümkün değildir. (p.9)"*

"Beyond the institutional mechanisms to produce science and technology, the national innovation system includes, and comes from, the institutional mechanisms of transforming scientific and technological findings into economic and social benefit. Because, any country, sector or enterprise that does not have the ability to turn scientific and technological findings into economic and social benefit cannot survive in a world open to international competition where traditional protectionism is abolished. (p.9)"

8) *"Asıl önemli olan nokta, Ulusal İnovasyon Sistemimizin olmazsa olmaz koşulu olan AR-GE.ye devlet yardımı uygulamasında sürekliliği -ödemelerde kesintisizliği- sağlayacak bir fon tesisidir. (p.25)"*

"The most important point is a fund facility that will provide continuity and uninterrupted payments to the R & D, which is indispensable to our National Innovation System. (p.25)"

CHAPTER FOUR

DISCUSSION AND CONCLUSION

The insistence of international organizations such as OECD on the importance of innovation in economic development, as well as technological innovations in the last 30 years, has made it possible for some companies to reach billions of dollar revenues worldwide, this sometimes force or sometimes motivate governments of developing countries to establish and operate a national innovation system. In this study, Turkey's national innovation system which is TUBITAK situated as an important state institution, its role within the system and its effectiveness in this area has been investigated in a qualitative framework of an analysis based on the documents about NIS published since 2000. Initially, descriptive statistics related to the key words in the documents were included and then content analysis was conducted through the context of the research.

In some of the documents reviewed, TUBITAK is almost non-existent, while in others it has been placed a standardized role as a ‘financial support’ organization. In some documents, it is seen that the importance of national innovation system and the role of TUBITAK, which is a valuable institution in this system, are reported well. TUBITAK's involved as a secretariat for BTYK, the main actor in Turkey's national innovation system, although there is a lot of responsibility for operating the system properly, documents generally mentioned administrative role of TUBITAK, such as cooperation for financial support.

While the issues mentioned most prominently for financial support which was provided by TUBITAK, it is understood that TUBITAK provide support for regional innovation centers in Turkey, through some programs. Thus, although understood that TUBITAK have valuable and important position for Turkey's national innovation system, further studies are needed to examine how the institution is perceived for different regional innovation centers. Also, it seems to be the role of TUBITAK to ensure synchronization of the organs within the system because of output of the information production that leads to innovation as a result of activities

arising from the interaction of the organs within the national innovation system. In addition, TUBITAK stands out in information management such as providing or protecting the necessary data for the system. Indeed, one of the most problematic issues in innovation activities is the evaluation and measurement of outputs.

If the information obtained from R & D activities in innovation systems is transformed into a market product that will gain competitive advantage, the intention of participation by other companies may be high. In other words, there is a need to raise awareness about technological innovation within the system. It is assumed that TUBITAK can only provide this with its competent structure as a trusted state institution. Another subject is the support of TUBITAK to train the human resources necessary for the innovation system. Not only financial support is enough for the training of the necessary human resources, but also TUBITAK stands out as an actor that can evaluate and decide the system as a whole. However, it is understood that there is a need for qualitative approaches rather than quantity in terms of both raising human resources and measuring the outputs of the innovation system.

Since the establishment and operation of national innovation systems requires an evolutionary and organic approach rather than a mechanical approach, long-term projects and policies are needed. Meanwhile some of the outputs obtained over time will be abstract and others will be concrete, it is understood that different approaches are needed in their evaluation. At this point, it is understood that in some reports, more prominent evaluation approaches are expected from TUBITAK.

For the last 30 years, TUBITAK, together with BTYK, has made significant progress and made many steps for the national innovation system. However, the activities carried out are never enough in the face of dizzying technological advances. Therefore, it is considered that there is no national innovation system that can be defined as fully competent in the world. However, it may still need to endeavor to make innovation permanent by tackling issues such as the slowing effect of the bureaucracy, which is one of the main problems facing public institutions. This subject comes to the forefront in order to ensure the dynamism among the institutions necessary for the establishment and proper functioning of the national innovation system. In the documents reviewed, it is understood that TUBITAK is active in this field and encourages universities to prepare projects for markets. As a matter of fact,

it can be said that TUBITAK took roles within the framework of university-industry cooperation and acted to prepare the necessary environment for R & D activities. For example, in the projects prepared by USAMP or referred to as intermediary institutions within this framework, unless there is an important problem, it did not interfere and played a facilitating role. This may have encouraged institutions within the system to act more freely. The role of TUBITAK here stands out not only to leave the system completely uncontrolled, but also to free it in an ecosystem freedom.

University-industry cooperation, which is one of the most important elements for the sustainability of national innovation systems, has been achieved by TUBITAK, especially through programs such as USAMP. It is understood that TUBITAK provides the necessary support for the patents to be provided to the products arising from these collaborations. The ongoing competition in the production and introduction of advanced technology products will encourage the relevant institutions and TUBITAK to stay thriving in the innovation system.

Although it has been stated in many documents that TUBITAK assists in the financial support necessary for innovation activities, some reports emphasize the lack of this condition. This situation is thought to belong to a regional or a specific period. In these reports, it was stated that some of these supports were deprived and the necessary role of the state in supporting the innovation system was emphasized again.

Another topic that stands out in the reports is the need to establish and operate the knowledge infrastructure required for the national innovation system and to provide the data arising from this system as feedback when necessary. It is believed that TUBITAK can provide its long-standing experience of storing and managing information on R & D and technology activities in a way to support the national innovation system.

It is noteworthy that TUBITAK has been mentioned limited in some of the documents examined on the role of TUBITAK for the national innovation system. For example, the rare occurrence of TUBITAK in regional development symposia organized by TEPAV in a series can be given as an example. Likewise, the fact that

both the subject of innovation and TUBITAK are almost not included in TUSIAD opinion journals can be given as a second example.

As a result, the role of TUBITAK in supporting, regulating and in some respects evaluating the national innovation system comes to the forefront. However, it is interesting to note that TUBITAK is not adequately included in the documents examined in the scope of the research, and that some of them do not appear at all. Perhaps the coordination of TUBITAK representatives has not been made or such coordination is not needed in the preparation of these reports. More data is needed to determine if this is the case or if it is caused by any deficiencies.

Although in the scope of this research, the documents published related with Turkey's national innovation system taken to investigation, to analyze the system with a holistic approach, there is a need for more primary data. For example, the authorities of the relevant bodies in the system can be interviewed. Therefore, it may be a limitation that this study was conducted with the available data. In the future studies, as well as Turkey's national innovation system, the differences or similarities with regional innovation systems in adjacent areas or cultures can be examined. It is wished that the results of the research will be benefited by relevant institutions and researchers working in this field.

REFERENCES

Abernathy, W. J., & Utterback, J. M. (1978). Pattarns of Industrial Innovation. *Technology Review, 7*(80), 40–47.

Abrunhosa, A. (2003). The National Innovation Systems Approach and the Innovation Matrix. In *In DRUID Summer Conference* (pp. 12–14).

Açıkgöz, A., (2012*), Bilgi- Tekonoloji Ve Yenilik Üretim Stratejisi (Ulusal Yenilik Sistemleri),* İstanbul, Literatür Yayınları.

Adıgüzel, B. (2012). *İnovasyon ve İnovasyon Yönetimi.* Gazi Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi.

Akalın, Ş. H. (2007). Innovation, İnovasyon: Yenileşim. Retrieved May 3, 2019, from http://turkoloji.cu.edu.tr/DIL SORUNLARI/sukru_haluk_akalin_inovasyon_yenilesim.pdf

Akarsoy Altay, T. (2008), TTGV (Türkiye Teknoloji Geliştirme Vakfı) otomotiv kümeleri için kapasite geliştirme projesi, Ankara.

Akgün, A. E., Keskin, H., & Günsel, A. (2009). *Bilgi Yönetimi ve Öğrenen Örgütler.* Eflatun Yayınevi.

Akıncı, A. (2011). *Sürdürülebilir Rekabet Üstünlüğünün Sağlanmasında İnovasyonun Üretim Maliyetlerine Etkisi ve Ampirik Bir Uygulama.* Dumlupınar Üniversitesi, Yüksek Lisans Tezi.

Akyos, M. (2005), Sürekli Yenilikçilik (İnovasyon) için Teknolojik Yetenek Değerlendirmesi,from http://www.inovasyon.org/getfile.asp?file=MA.TYD.pdf.

Akyos, M. (2008). Firma Düzeyinde Yenilikçilik (Yenilik) ve Bilgi Yönetimi. Retrieved March 4, 2019, from http://www.sistems.org/know_info_ozet.htm

Alptekin, Ş. (2006). *Cumhuriyet'ten günümüze Türkiye'nin bilim ve teknoloji politikaları:Ekonomik kalkınma ve toplumsal gelişme açısından ulusal inovasyon sisteminin önemi ve etkileri.* İstanbul Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi.

Apaydın, Çiğdem (2015). *Bilim ve Teknoloji Yüksek Kurulu'nun (BTYK) 1989- 2014 Yılları Arasındaki Almış Olduğu Kararların Uygunluk Analizi ile İncelenmesi*

Ayhan, A. (1999). *Yenilik* (Yayın No:5). Gebze İleri Teknoloji Enstistüsü Rektörlüğü.

Betz, Frederick (1994. Strategic Technology Management, McGraw Hill, Singapore, 1994

Bozkurt, C. (2015). R&D Expenditures and Economic Growth Relationship in Turkey

Breschi, S., & Malerba, F. (1997). Sectoral innovation systems: technological regimes, Schumpeterian dynamics, and spatial boundaries. In C. Edquist (Ed.), *Systems of innovation: technologies, organizations, and institutions.* (pp. 56–130). London: Pinter.

Çalık, A. (2015). *Ulusal inovasyon sisteminde üniversitelerde inovasyon yönetim yapısı: Almanya'nın model olabilirliği üzerine bir araştırma.* Dumlupınar Üniversitesi, Sosyal Bilimler Enstitüsü, Doktora Tezi.

Carlsson, B. (1995). *Technological system and economic performance: a case of factory automation.* Dordrecht: Kluwer Academic.

Carlsson, B., & Stankiewicz, R. (1991). On the nature, function and composition of technological systems. *Journal of Evolutionary Economics*, *1*(2), 93–118.

Chang, Y.-C., & Chen, M.-H. (2004). Comparing approaches to systems of innovation: the knowledge perspective. *Technology in Society*, *26*, 17–37. https://doi.org/10.1016/j.techsoc.2003.10.002

Cooke, P. (2008). Regional Innovation Systems: origin of the species. Int. J. Technological Learning, Innovation and Development, 1(3), 393-409.

Cooke, P., Uranga, M., & Etexbarria, G. (1997). Regional innovation systems: institutional and organizational dimension. *Res Policy*, (26).

D'Allura, M.G., Galvagno, M., & Destri, A.M. (2012). Regional Innovation Systems: A Literature Review. https://www.researchgate.net/publication/255724535_Regional_Innovation_Systems_A_Literature_Review.

Dalkıran, Ö. (2013). Teknolojinin Kütüphanelere Etkisi: Bilgi Kaynakları Açısından Bir Yaklaşım.

Demirci, A. E. (2006). *İşletmelerin yenilik faaliyetlerinde şirket içi girişimciliğin temel faktör olarak incelenmesi: Türkiye ve Polonya'da Faaliyet gösteren Büyük Ölçekli Kimya İlaç Sektörü İşletmelerinde Karşılaştırmalı Durum Değerlendirmesi.* Anadolu Üniversitesi, Sosyal Bilimler Enstitüsü, Doktora Tezi.

Dey, I. (1993). *Qualitative Data Analysis: A user friendly guide for social scientists.* London and New York.

Dinler, Z. (2014). *İktisada Giriş*. Bursa: Ekin Kitabevi.

Doloreux, D. (2002). What We Should Know About Regional Systems of Innovation. *Technology in Society, 24(3), 243-263.*

DPT (2000). "*Sekizinci Beş Yıllık Kalkınma Planı*", Bölgesel Gelişme Özel İhtisas Komisyonu Raporu, http://www.kalkinma.gov.tr/Lists/Kalknma%20Planlar/Attachments/2/plan8.pdf. Erişim Tarihi:03.04.2015.

Drejer, A. (2002). *Towards a Model for Contingency of Management of Technology, Technovation.*

Durgut, M., & Akyos, M. (2001). Bölgesel İnovasyon Sistemleri ve Teknoloji Öngörüsü. In *Teknoloji Öngörüsü ve Stratejik Planlama Kongresi* (pp. 24–26).

Durna, U. (2000). *Yenilik Yönetimi ve yenilik yönetiminde etkin olan örgütsel yapı ve faktörler ve bir araştırma.* İstanbul Üniversitesi, Doktora Tezi.

Edquist, Charles (1997). Systems of Innovation: Technologies, Institutions and Organizations

Edquist, Charles. (2006). Systems of Innovation. In *The Oxford Handbook of Innovation.*

Edquist, Charles, & Lundvall, B.-Â. (1993). Comparing the Danish and Swedish Systems of Innovation. In *National Innovation Systems: A Comparative Analysis.* (pp. 265–298).

Edquist, Charles, (2001). Innovation policy: A systemic approach. In D. Archibugi & B-Å. Lundvall (Eds.), *The globalizing learning economy: Major socio-economic trends and European innovation policy* (pp. 219-238). New York, NY: Oxford University Press.

Elçi, Ş. (2007). *İnovasyon: Kalkınmanın ve Rekabetin Anahtarı.* (2nd ed.).

Elçi, Ş., Karataylı, İ., & Karaata, S. (2008). *Bölgesel İnovasyon Merkezleri: Türkiye İçin Bir Model Önerisi.*

Erdal, M. (2008). İşletme Yenilik Süreçlerinin Tarihsel Gelişimi ve Yaratıcı Örgüt Yapısı. Retrieved from http://www.tedarikzinciri.org/UserFiles/File/Teknoloji Yonetimi/YenilikYonetimi.doc

Erdil, E., & Ertekin, Ş. (2018). *Industry 4.0 and Turkish National Innovation System: Challanges and Prospects.* (No. STPS-WP-18/01). Ankara.

Ernst, D., & Lundvall, B. Â. (1997). Information technology in the learning economy-challenges for developing countries. In Erik S. Reinert (Ed.), *Globalization, Economic Development and Inequality: An Alternative Perspective*.

Ersoy, B. A., & Şengül, C. M. (2008). Yenilikçiliğe Yönelik Devlet Uygulamaları ve AB Karşılaştırması. *Yönetim ve Ekonomi*, *15*(1), 59–74.

European Commission (2019). European Innovation Scoreboard 2019 - main report (https://ec.europa.eu/docsroom/documents/35915)

Fagerberg, J., Mowery, D. C., & Nelson, R. R. (2005). *The Oxford handbook of innovation.* Boston: Oxford University Press.

Fedai, Recep (2016). Sosyal Bilimler Dergisi / The Journal of Social Science / Yıl: 3, Sayı:9, Aralık 2016, s. 410-422

Feinson, S. (2003). National Innovation Systems Overview and Country Cases. In *Knowledge Flows, Innovation, and Learning in Developing Countries* (pp. 13–38).

Foster, R. N. (1986a) Innovation: The Attacker's Advantage. Summit Books, New York.

Freeman, C. (1987). Technical Innovation, Diffusion, and Long Cycles of Economic Development. In *The long-wave debate* (pp. 298–309). Berlin: Springer.

Galli, R., & Teubal, M. (1997). Paradigmatic Shifts in National Innovation Systems. In *Systems of innovation: Technologies, institutions and organizations* (pp. 342–370).

Geels, F. W. (2004). From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research Policy*, *33*(6–7), 897–920. https://doi.org/10.1016/J.RESPOL.2004.01.015

Godin, B. (2007). *National Innovation System: The System Approach in Historical Perspective*. (36).

Göker, Aykut (2000). Tarihinin Altıncı Toplantısında Bilim ve Teknoloji Yüksek Kurulu, *Politik Bilim, CBT, 2 Aralık 2000*

Göker, Aykut (2003). Ulusal İnovasyon Sistemi, Türkiye Ulusal İnovasyon Sistemini Kurabildi mi? *'Ulusal İnovasyon Sistemi: Kavramsal Çerçeve, Türkiye İncelemesi ve Ülke Örnekleri, Hazırlayanlar: Doç. Dr. Cemil Arıkan'ın Koordinatörlüğünde Müfit Akyos, Prof. Dr. Metin Durgut ve Aykut Göker; yayın No. TÜSİAD -T/2003/10/362, Ekim, 2003.' İçinde yer almıştır; s.19-122.*

Göker, Ş. (2009). *Şirketlerde İnovasyon Stratejisinin Önemi ve Türkiye'nin İnovasyon Kapasitesinin Analizi.* Dumlupınar Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi.

Gömleksiz, M. (2012). *Bölgesel İnovasyon Sistemleri ve Türkiye: istatistiki bölge birimleri sınıflandırması düzey 2 bölgeleri inovasyon indeksi.* Selçuk Üniversitesi, Yüksek Lisans Tezi.

Güleş, H. K., & Bülbül, H. (2004). *Yenilikçilik: İşletmeler İçin Stratejik Rekabet Aracı.* Ankara: Nobel Yayınları.

Günay, Ö. (2007). *Yenilik Engellerin Belirlenmesine Yönelik Bir Araştırma.* İstanbul Üniversitesi İşletme Anabilim Dalı, Yüksek Lisans Tezi.

Gürbüz, M. K. (2018). *AN EFFECTIVE AND EFFICIENT R&D FUNDING MECHANISM: AN EVALUATION STUDY ON PRIORITIZED R&D GRANT PROGRAM (1003) OF TUBITAK*. MIDDLE EAST TECHNICAL UNIVERSITY, THE DEGREE OF MASTER OF SCIENCE IN THE DEPARTMENT OF ECONOMICS.

İpek, H. B. (2015). *İnovasyon temelli ekonomi yapısında ulusal inovasyon sistemi ve bölgesel inovasyon stratejileri.* Afyon Kocatepe Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi.

Işık, N., & Kılınç, E. C. (2010). Bölgesel Kalkınma'da Ar-Ge ve Yeniliğin Önemi Karşılaştırmalı Bir Analiz. *Eskişehir Osmangazi Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*.

Işık, N., & Kılınç, E. C. (2012). İNOVASYON SİSTEMİ YAKLAŞIMI VE İNOVASYON'UN COĞRAFYASI: TÜRKİYE ÖRNEĞİ , *Bilgi Ekonomisi ve Yönetimi Dergisi / 2012 Cilt: VII Sayı: I*

Kiper, M. (2010). *Dünyada ve Türkiye'de Üniversite-Sanayi İşbirliği ve Bu Kapsamda Üniversite-Sanayi Ortak Araştırma Merkezleri Programı (ÜSAMP)* (1st ed.). Türkiye Teknoloji Geliştirme Vakfı (TTGV).

Kitanovic, J. (2005). Dynamics of Industry and Innovation: Organizations, Networks and Systems. In *DRUID Tenth Anniversary Summer Conference*. Copenhagen, Denmark. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.549.4766&rep=rep1&type=pdf

Kılınç, E. C. (2011). *İnovasyon ve Ulusal Kalkınma: AB Ülkeleri ve Türkiye Üzerine Bir inceleme.* Karamanoğlu Mehmetbey Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi.

Kırım, A. (2005). *Karlı Reçetenin Büyümesi İnnovasyon.* (1st ed.). İstanbul: Fed Yayınları.

Krippendorff, K. (2006). *Relability in content analysis some common misconceptions and recomendations.* University of Pennsylvania Press.

Kuhlmann, S., & Arnold, E. (2001). *RCN in the Norwegian Research and Innovation System.*

Lowe, R., & Marriott, S. (2006). *Innovation Management: Entreprise, Entrepreneurship and Innovation, Concepts, Contexts and Commercialization.* Elsevier Ltd.

Lundvall, (2005). Dynamics Of Industry And Innovation: Organizations, Networks And Systems. In *DRUID Tenth Anniversary Summer Conference*.

Lundvall, B. (1992). *National systems of innovation: towards a theorem of innovation and interactive learning.* London: Pinter.

Lundvall, B. Â. (1985). Product innovation and user-producer interaction, industrial development.

Metcalfe, S. (1995). *The Economic Foundations of Technology Policy : Equilibrium and Evolutionary Perspectives. Handbook of the Economics of Innovation and Technological Change.*

Muchie, M. (2008). Evolutionary Economic Theory and the National Innovation System Perspective for an Integrated African National Structural Transformation. In *Confronting the Challenge of Technology for Development: Experiences from the BRICS*. Oxford University Conference.

Nelson, R. (1993). *National innovation systems: a comparative analysis.* New York: Oxford University Press.

Nelson, R.R. (1981). Research on Productivity Growth and Productivity Differences: Dead Ends and New Departures. *Journal of Economic Literature*.

Nelson, R.R., & Winter, S. G. (1977). In Search of a Useful Theory of Innovation. *Research Policy*.

Nelson, Richard R., & Rosenberg, N. (1993). Technical Innovation and National Systems. In *National Innovation Systems: A Comparative Analysis.*

Niosi, J., Saviotti, P., Bellon, B., & Crow, M. (1993). National systems of innovation: in search of a workable concept. *Technology in Society*, *15*, 207–227.

O'Sullivan, D., & Dooley, L. (2009). *Applying Innovation.* Sage Publications.

OECD. (1999). Managing Naional Innovation Systems.

OECD. (2003). Conclusions of the Chair, High level Meeting.

OECD. (2005). Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data. https://www.oecd-ilibrary.org/docserver/9789264013100-en.pdf?expires=1567862483&id=id&accname=guest&checksum=F25DBCD752AB5217E650BECC6A7AC317

OECD. (2015). Frascati Manual.

OECD. (2018a). OECD Science, Technology and Innovation Outlook 2018. Adapting to Technological and Societal Disruption. https://doi.org/https://doi.org/10.1787/sti_in_outlook-2018-en

OECD. (2018b). Oslo Manual: Guidelines for collecting and reporting and using data on innovation. Committee for Scientific and Technological Policy.

Ozan, Ö. (2009). *İşletmelerde Yenilik Yapma ve Yönetme.* Sakarya Üniversitesi, Yüksek Lisans Tezi.

Özdemir, Aslıhan. (2008). *Ulusal inovasyon sistemi, Türkiye örneği.* Marmara Üniversitesi, Sosyal Bilimler Enstitüsü, Yüksek Lisans Tezi.

Özdinç, Ö. (2018). *Ulusal inovasyon sisteminin sosyo-kültürel kaynakları.* İstanbul Üniversitesi, Sosyal Bilimler Enstitüsü, Doktora Tezi.

Parkey, M. (2012). *Assessing the National Innovation System in a Developing Country Context: A Framework and Evidence from Thailand.* PhD Thesis, Clemson University.

Patel, P., & Pavitt, K. (1994). National innovation systems: why they are important, and how they might be measured and compared. *Economics of Innovation and New Technology, 3*(1), 77–95.

Porter, M. (1998). *The Competitive Advantage of Nations.*

Richard, R. Nelson (1993), National Innovation Systems: A Comparative Analysis. Contributors: Richard R. Nelson - Editor. Publisher: Oxford University Press. Place of publication: New York. Publication year: 1993.

Rosenkopf, L., & Tushman, M. L. (1994). *Technology and Organization. Evolutionary dynamics of organizations.*

Ruttan, W. V. (2001). *Technology, Growth and Development: An Induced Innovation Perspective.* New York: Oxford University Press.

Salzman, James (2000) 'Labour Rights, Globalization and Institutions: The Role andInfluence of the Organization for Economic Cooperation and Development', Michigan Journal of International Law, 21: 769-848.

Saatçioğlu, C. (2005). Ulusal Yenilik Sistemi Çerçevesinde Uygulanan Bilim ve Teknoloji Politikaları: İsrail, AB ve Türkiye Örneği. *Anadolu Üniversitesi Sosyal Bilimler Dergisi, 5*(1).

Satı, Z. E. (2013). *İnovasyonu yönetmede kesitler-Bilgi Yönetimi/Ar-Ge/ Marka*

Yönetimi/ Stratejik Yönetimi. İstanbul: Nobel Yayıncılık.

Saxenian, A. (1991). The origins and dynamics of production networks in Silicon Valley. *Res Policy, 20.*

Schoen, J. (2015). The Innovation Cycle: A New Model and Case Study for the Invention to Innovation Process

Schumpeter, J. A. (1934). The creative response in economic history. Essays on Entrepreneurs, Innovations, Business Cycles, and the Evolution of Capitalism.

Schumpeter, J. (1934), *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest and the Business Cycle*, Harvard University Press, Cambridge, MA.

Sığrı, Ü. (2018). *Nitel Araştırma Yöntemleri* (1st ed.). İstanbul: Beta Basım A.Ş.

Storey, L. (2007). Analysing Qualitative Data in Psychology. In E. Lyons & A. Coyle (Eds.), *Doing Interpretative Phenomenological Analysis. Published:2007* (pp. 54–64).

Tamer Koçel, İşletme Yöneticiliği, 12.baskı, İstanbul, Beta Yayınları, 2010

Tepav (2015). "Barika-i hakikat müsademe-i efkardan çıkar". tepav.org.tr. 26 Aralık 2015 tarihinde kaynağından arşivlendi.

TOBB (2017). TOBB in Brief. https://tobb.org.tr/ozetleTOBB/ozetletobb-en.pdf

Tödtling, F., Kaufmann, A., & Sedlacek, S. (1998). The state of a regional innovation system in Styria. Conclusions and policy proposals. EU-TSER-REGIS Project" Regional Innovation Systems".

Trott, P. (2005). *Innovation Management and New Product Development.* Pearson Education Limited.

TTGV (2009). Türkiye Ulusal Teknoloji ve Yenileşim Kapasitesinin Geliştirilmesi için Modeller Mayıs 2009.

TUBITAK. (2010). Science, Technology and Innovation in Turkey, 2010.

Tunç, H. (2008). *Bir Yenilik Göstergesi Olarak Patenet Ve Türkiye Patenet Performansı.* Süleyman Demirel Üniversitesi, Yüksek Lisans Tezi.

Tuncel, C. O. (2011). *İnovasyon Sistemleri ve Ekonomik Gelişme: Bursa Bölgesi İmalat Sanayinde İnovasyon Süreçleri Üzerine Bir Alan Araştırması.* Uludağ Üniversitesi, Doktora Tezi.

Turanlı, R., & Sarıdoğan, E. (2010). Bilim-teknoloji-inovasyon temelli ekonomi ve toplum. İstanbul Ticaret Odası Yayınları.

Türkcan, E. (2009). Dünya'da ve Türkiye'de Bilim, Teknoloji ve Politika. *İstanbul Bilgi Üniversitesi Yayınları*

TUSIAD. (2003). *Ulusal İnovasyon Sistemi: Kavramsal Çerçeve, Türkiye İncelemesi ve Ülke Örnekleri.* İstanbul: Lebib Yalkın Yayımları ve Basım İşleri.

TÜSİAD. (2013). "TÜSİAD'ın Türkiye Ekonomisine Katkısı", TÜSİAD, 2013, Yıllık Rapor. Son erişim tarihi: 12 Eylül 2013

TÜSİAD. (2015). Kapalı Ekonominin Krizleri ve TÜSİAD'ın Kuruluşu. tusiad.org.tr. 2 Nisan 2015 tarihinde kaynağından arşivlendi. Erişim tarihi: 30 Mart 2015

Usher, D. (1964). The welfare economics of invention. *Economica*, *31*(123), 279–287.

Utterback, M. J. (1994). *Mastering the Dynamics of Innovation.* Boston: Harvard Business School Press.

Uzkurt, C. (2008). *Yenilik Yönetimi ve Yenilikçi Örgüt Kültürü.* İstanbul: Beta Yayınları.

Yavuz, A., Albeni, M., & Kaya, D. G. (2009). Ulusal İnovasyon Politikaları ve Kamu Harcamaları: Çeşitli Ülkeler Üzerine Bir Karşılaştırma. *Süleyman Demirel Üniversitesi Iktisadi ve İdari Bilimler Fakültesi Dergisi*, *14*(3), 65–90.

Yavuz, Ç. (2010). İşletmelerde İnovasyon-Performans İlişkisinin İncelenmesine Dönük Bir Çalışma. *Çanakkale Onsekiz Mart Üniversitesi, Biga, İ.İ.B.F, İşletme Bölümü Girişimcilik Ve Kalkınma Dergisi (5:2), ss. 143-173.*

Yıldırım, Selime (2015). KMÜ Sosyal ve Ekonomik Araştırmalar Dergisi 17 (29): 23-32, 2015

Yongxiang, L. (1998). Striving to Build a National Innovation System for the Era of Knowledge. *Asia Pacific Biotech News (APBN)*, *2*(10).

Zerenler, M., Türker, N., & Şahin, E. (2007). Küresel Teknoloji, Araştırma-Geliştirme (Ar-Ge) ve Yenilik İlişkisi. *Selçuk Üniversitesi, Sosyal Bilimler Enstitüsü Dergisi*. 17, 653-667.

CV: CURRICULUM VITAE

PERSONAL INFORMATION

Nationality: Turkish (TC)

Date and Place of Birth: 02.06.1988 , Samsun / TURKEY

Marital Status: Single

Phone: 0532 654 55 83

Email: ismailbicme@gmail.com

EDUCATION

Degree	Institution	Year of Graduation
MS	Çankaya University	2019
BS	Girne American University	2012
High School	Çarşamba Anatolian High School	2006

WORK EXPERIENCE

Year	Place	Enrollment
2019 - Present	The Scientific and Technological Research Council of Turkey (TUBITAK) - Ankara	Directorate of Science Fellowships and Grant Programmes (BİDEB)
2013 - 2019	The Scientific and Technological Research Council of Turkey (TUBITAK) - Ankara	Department of Strategy Development (SGDB)
2012 - 2013	İsmail Biçme Export&Import – Samsun	Sole Proprietorship – İsmail Biçme Export&Import

FOREIGN LANGUAGES

Turkish, English and elementary Russian

HOBBIES

Travelling, imagining and reading whodunits