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INNOVATION IN THE COOPERATION OF UNIVERSITY – INDUSTRY

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ABSTRACT

Innovation became an important element in acquiring knowledge, in increasing the sustainable and a potent economic growth, global competitive power, and social welfare. The developed countries largely give importance the cooperation of university- industry – government, in order to be able to produce the high value added technologies, and to transfer the studies conducted in university and the practical knowledge in industry to university. Cooperation of university - industry expresses a process, in which the university and industry with the innovative studies they carried out, increasing the employment opportunities, provided the economic advantages, and thus supported to each other. The increase in the global competition makes unavoidable the development of university –industry cooperation and fortification of the entrepreneurship activities in the developing regions. The successes in cooperation become very effective in the developedness of nations: Therefore, among the issues most discussed by the academic, administrative, and political circles, university –industry cooperation is the leading one. From now on, on the point arrived, by adding the research activities to the educational activity, main mission of universities, making a contribution to the social development, moves the concept of entrepreneur university to the agenda and one mentions about giving an active role to the universities in the national innovation system.

1. INTRODUCTION

In today's technology, while the foreign dependency is tried to be impeded, developing the research, technology developing, and innovation culture, a transition process to the information society is focused. This cooperation consists of the interdependences of University, as an institute producing knowledge that is the most important instrument of the cooperation of university-industry and, of industry, as an institute transforming this into the application (Akdoğan, 2007: 86). The concept of university –industry cooperation, as old as that human beings began to live in a society, forms with working of the institutes having the distinct aims and targets in harmony, coming together for a common aim. Carrying out the scientific and technological studies, and that the government prepares organizations provide the social welfare to develop (Yücel, 1997: 69).

With the changes experienced in the production of knowledge, linear innovation model, known as network of indirect relationships that is sequential and takes long time and that has its effect on the world until 1970s, replaced with non – linear innovation model that rapidly gets result and where, all parts are in interaction. Together with non-linear innovation model, the structures, traditionalized for hundreds years, entered the new searches. These searches also brought together the clustering, innovative environment regional innovation systems, new industrial focuses, learning regions, Triple Helix, networks, and in-region and out –region interactions . Upon globalization period in the world, policies, applications and theories of University-industry cooperation showed change with new approaches. Understanding importance of innovation in this period activated internal dynamics of development. Beside development of models that use innovation as an important tool at university-industry cooperation, innovation became a part of global economy and countries have been assessed subject to their performances. In this regard roles of the actors in the countries have been determined; integration of education, research and innovation triple has taken its place in the agenda. The Concept of university –industry cooperation , The concept of Innovation ,Innovation in university – industry cooperation, Linear and non-linear Innovation Models, compared Triple Helix Characteristics and Trends in Japan, USA(United States Of America) and EU(European Union) will be examined at the study. Innovation that is key of economical development today will be considered and importance of innovation at university –industry cooperation and The Global Competitiveness Index in Detail will be mentioned in this study.

2. THE CONCEPT OF UNIVERSITY –INDUSTRY COOPERATION

University- industry cooperation is a cooperation area that expresses the activities of the education and instruction, R & D, and the other activities carried out by combining the existent resources of universities with the existent resources of industry in systematic way so that it can provide benefit to both parts (Dura, 1994: 101). Science, or scientific approach is a requirement of university –industry cooperation. University –industry cooperation plays important role in identifying the tasks of information transfer partnership and conceptualizing the information transfer between universities and industry. Besides that university-industry cooperation is an important actor in presenting the qualified technology and buying the industrial instruments, it also provides a competitive advantage, affecting the rantability, productivity, economy, and continuity and reducing the risks. (Gertner, et al., 2011:625-647). R&D activities, a part of university-industry cooperation is very important in developing the achievement factors such as rapidity, competition, and productivity in terms of business enterprises. In business enterprises, the density of R&D emphasizes that the efforts of university-industry cooperation should be accelerated (Rasiah and Govindaraju, 2009: 529-550). It is claimed by sciences historians that the first examples of university –industry cooperation initiated with the studies the European companies carried out together with the researchers in universities in 1880s (Etzkowitz,1998: 823-833). However, the history of university – industry cooperation first began in England in 17th century.

In 17th centuries, "History Of Trades" program, shaped by Francis Bacon's views, enabling the producers to benefit from each other, targeted on facilitating the scholars to produce solution for the problems emerging in the production and formed an product catalogue transferring to the paper how the main products were produced in detail. This thought was evaluated in "Royal Society of London", one of academic organizations (out of university) emerging in the second half of 17th century. Royal Society of London, laying the foundation of university- industry relationships, embraced "History of Trades" program and pioneered industry revolution that will start in England (Erdil, et al., 2013: 98). In the mid-19th century, in England, Cambridge university, thanks to licensing the inventions and structuring the companies, became one of the first scientific research centers. (Meyer-Krahmer and Schmoch, 1998: 835-851).

Toward the late 19th century, USA universities, transforming into the large research agencies, the entrepreneur universities stood out. In USA, the first examples of university-industry cooperation was seen in Harvard University and MIT(Massahusetts Institute of Technology) (Etzkowitz, 1998: 823-833). Also, the other European University, being under the influence of the change in England and USA, went toward the cooperation with industry.

Germans, in the mid-19th century, transferring the important resources to the universities improving the research aiming at industrialization and national development, first acquired the mission that the research is an inseparable function of universities (Meyer-Krahmer and Schmoch, 1998: 835-851). The beginning of an important change in university -industry cooperation is expressed with the development in the areas of science and technology during 2nd World War. In this period, between the academic and industrial sectors, the new agreements and cooperation were proceeded. (Atik,2007:361). The governments of Germany, England, and Canada benefited from the competency of the research university for the technology they used during the war. Thanks to the academic research, the new technologies such as nuclear energy and radar were further developed. After 2nd World War, it revealed that the academic research was an important factor in the national development. In this period, it clearly emerged that university research was a "basic research" and that industrial research was applied research (Srevatsan, 2011: 13).

The changes experienced after the 2nd World War influenced the research programs of universities and their structures and fund resources changed. In this period, university research was carried out by the funds of private companies, instead of public resources. This situation caused the subjects of research to shift to the different fields, planning and decision to pass to the private sector and, especially, the discussions and regulations related to intellectual property rights.

The cooperation between the universities, independent research agencies, and the firms of private sector increased. The importance given to the education and courses, initiated by universities, increased (Uysal, 2012: 64). "University originated research" approach that became successful throughout 2nd World War also continued after war until 1980s. The main pillar of this process caused the mere science to be shaped best and the conducted basic research to be shaped in the direction of improving the social life.

After 2nd World War, the report titled "Science-The Endless Frontier, written by Vannevar Bush, the head of scientific R&D institutes and consultant of US president in 1945, became one of the most important documents in the scope of the research dimensions of university that are increasingly institutionalized, the contributions of research outputs to the economic welfare and development, and applications of university –industry cooperation all over the world in terms of developing the idea and model (Kiper, 2010: 21).

In 1970s, the rises experienced in oil prices caused the recession in the industrial branches all over the world and decrease in the production. The countries, such as USA and Japan, going toward R&D activities in the industrial sectors, went to a close cooperation between universities and research institutes. Depending on the cooperation, in the areas such as space technologies, automation and robotics, new energy resources, and biotechnology, technological developments were experienced (http://www.pdfio.com/u/ stradigma_com/,30.09.2013).

In 1980s, the changing world balances resulted in reshaping of R&D activities, increase of customer satisfaction, growing importance of technology, and being to be focused on the firms that produce products meeting the demands of customer. In these years, the role of Fareast countries, particularly Japan, in the world market increased and USA also started to move about making a new university -industry cooperation. New cooperation model was termed as "competitive approach". Commercializing of universities, expected them to support the development in the local, regional, and national level, except for the education and research stood out (Uysal, 2012: 63). In these years, the importance of cooperation between university and industry was considered as a driving force of economy for the regional development. In 1980s, the policies supporting the university – industry cooperation had three aims. Among these, the first was university research supporting the technological developments in the sectors that are important to the local industry; the second was facilitating the cooperation research in university –industry centers; and the last was identifying the programs for university research to enter the small sized firms (Srevatsan, 2011: 14).

When arrived to 1990s, universities, adding the cooperation with the government and industry to their missions, obtained growth in this area. The developing countries encouraged the universities to make cooperation for developing strategies. In most of the members of Organization for Economic Cooperation and Development, this relationship was intensified (Martin, 2000:35). Toward the end of 90s, hese developments, together with them, caused the formation of the institutional; legal, administrative, and behavioral patterns. From instructional point of view, as a result of university research, spin off companies were established In the legal area, particularly the studies toward intellectual property rights, the positions of parts in the research project of university, and regulations toward financing the research projects by the private sector were carried out. University-industry partnerships, as administrative, independent research institutes, and university research institutes formed (Ranga, 2002: 1-28).

This process accelerated the commercialization process of academic research results and a number of entrepreneur university were founded. But the issuers such as that the resources are increasingly in the different groups; that university research projects consist of the projects that are short termed and have expectation of trade achievement; the interest confliction increasingly growing between social classes; the constrictions experienced in the funding possibilities of scientific research, and that the results are not adopted by public opinion became a current issue.

In the developed countries, the requirement that university-*industry* cooperation is reconsidered emerged (Ranga, 2002: 1-28). Today, in the framework of university-industry cooperation in the world, there are a number of institutes and research center. The best example of cooperation in the world are Silicon Valley, MIT, and Stanford University in USA.

3. THE CONCEPT OF INNOVATION

Innovation, a word coined from "innovatus" in Latin, refers to, in respect with its origin, "beginning to use the new methods in the social, cultural, and administrative environment" (Elçi et al., 2008: 25). Due to the definition of innovation and meanings it holds, from time to time, ambiguity can be experienced. Innovation, as a concept, tells both the renewal that is a process and novelty that is a result. According to EU and OECD (Organization for Economic Cooperation and Development) literature, innovation, as process, "expresses to transform an idea into a marketable product or service, into a new or developed distribution method, or into a method of a new social service" (Yağcı and Yavuz, 2010: 597). Innovation that acquires a place in Turkish and in the languages of world as a technical term, as also expressed in its lexical meaning, puts into words the result of novelty rather than it itself and the economic and social process depending on differentiating and modifying (Elçi et al., 2008: 25).Innovation was first defined by Schumpeter as a "driving force of development" and then this concept was considered by the different schools of economics in different forms (Mercan and Tünen, 2010: 614).

According to Schumpeter, innovation includes the activities such as inventing a new product, developing a new production method, establishing a new market, developing the new resources, and forming a new organization in any industry (http://www.lib.hit-u.ac.jp/service/tenji/amjas/Kurz.pdf. ,10.10.2013)According to Lowe and Marriott (2006:18-21), even though innovation is an ability to learn and apply, it includes, changing the opportunities to the opinions and using them in the common applications, the new methods and technologies in producing the new products. Thus, the firms can provide their competitive advantages through the movements of innovation. According to Mytelka and Smith (2001:8-11), the data on innovation in EU present that it is also commonly used in the service sector. The firms, beside R& D activities such as education, capital, market research, and design development, spend money on many input. Although the innovation made by firm is not only a decision independently made at the level of firm, but also it is also defined as a process shaping the behaviors of firm and showing its effect in the social and cultural context and the theoretical and organizational framework.

According to Kasza (2004:5), innovation is a research activity including discovery, experiment, development, imitation, and new products; new production systems; and new organizational installations. Dosi notes the features of ambiguity and cumulativeness of innovation. Cumulativeness reveals as a result of learning process of innovation. In terms of product and production process, innovative activities include the unknown discoveries. There is always risk in innovation.

3.1. Innovation in University –Industry Cooperation

The concept of university – industry cooperation, beginning from 17th century it became a current issue, was considered in the framework of the innovation and innovation models. Innovation models consist of the connections and cooperation between the various institutes such as academy, government, private sectors, markets, and cultural and political systems Even though the interactions between institutes lead to the new learning process and new information, also cause the increase of regional and technological innovation (Srevatsan, 2011: 3). The change in the innovation approach, after 19752, showed a parallelism with the policies of science, technology and industry.

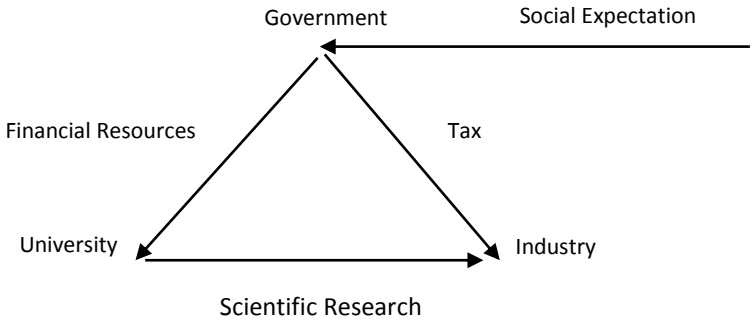
Especially, from the linear models, in which disciplinary approaches are dominant, the non-linear models, in which interdisciplinary approaches are based on, stood out (Kiper, 2010: 23). During and after 2nd World War, as a result of successful technological developments, linear innovation model gained importance. Linear innovation model considers the effect of a single variable in novelty.

Figure 1: Linear Innovation Model

Source: Kiper, 2007: 147, Godin, 2006: 639-667.

As seen in Figure 1, this innovation model starts, first of all, with a basic research being carried out by the universities, government, research institutes, and laboratory of some large firms and innovation activities and with applied research, experimental development, production, introduction of product, and realization of sale

Figure 2: In linear Innovation Model, Classical Relationship between University, Industry, and Government



Source: Kiper, 2007: 151.

According to Figure 2, in linear innovation model, the relationships of university, industry and government reflect a process in the form of that in the frame of social expectation, the government transfers resources to university; that university makes scientific research with this; that it delivers the results of research and industry makes production with this.

Non-linear models depend on the interactions between different variables rather than a single variable and include, as a result of the complex and continuous interaction in many people, institute, and environment; the feedback of research, technological and scientific information, production process, market toward the future, and invention (Srevatsan, 2011: 29).

Interactive innovation model explains that developing the cooperation between university and industry, the economic growth, renewals in technology, and science and technology occur through social responsibility (Harayama, 2003: 1-9). Non-linear innovation models, through feedbacks, considers the interactive and repetitive terms (Etzkowitz and Leydesdorff 2000: 109-123). 1970s and 1980s proved that the model considering the innovation process as linear remained insufficient.

Following Cold War, in the industrialized countries not carrying out a basic study in a large scale, the achievement in developing of technology became widespread the opinion that the linear model did not work. Introducing, spreading and applying the information, and focusing on the cooperation between institutes increased the importance of nonlinear innovation models. This situation caused the cooperation models of university –industry that are very complicated and multi-actor to become a current issue. Nonlinear innovation models were used in the studies carried out, policies, and structuring as follows:

1- National Innovation System

2- The approach of new “Mode 2” in the production of scientific information

3-Triple Helix” Model

Besides these models, the cooperation networks such as the regional innovation strategies, clear innovation, and clustering, the concepts and applications internalization etc. are also considered in the frame of innovation models.

3.2. National Innovation Model

National innovation system, evaluated an important element in the developments of countries, considers the necessary knowledge and experiences about being able to produce the various products in the quality that is associated with each other and supportive to each other. Also, the system of interest, in such a way that it will broaden horizon of the development and growth, it enables the groups of products and production process to be dentified (Soyak, 2007: 1-5). The effect of deficiencies in institutionalism on the development has an importance as large as technology deficit in the developing countries On this point, the institutes arranging the innovation activity serves as executive and holder of the competitive development programs. Economic development and institutionalism of innovation system are evaluated together. When regarding from a developmental perspective, national innovation system that is existent as a subsystem in contemporary nation-state scope goes toward the targets of national competition and national development simultaneously. For this purpose, about supporting the innovation activity, it provides the use of the institutes, and firms of R&D,; agencies supporting innovation, and innovation infrastructures effectively in national dimension (Arıkan et al., 2003: 215).

In 1990s, national innovation system approach, developed in different places of USA and EU, today, also continues to spread academics as well as policy makers (Işık and Kılınç, 2012: 175). In 1990s, the concept of national innovation model attracted a highly interest in the process of forming the science, technology, and innovative policies. National innovation model, besides it includes the agencies affecting the technological improvement, in terms of that it emphasizes the position of countries in the competition and jıb division, also became highly effective on the science and technology policies implemented (Saatçioğlu, 2005: 181).

The concept of national innovation model was introduced by Frederich List, German philosopher. List criticized the classical economists, because they did not give sufficient place the science, technology, and skill in the development of nations. List, suggesting that the dominance of England in the world market was resulted from its technological dominance, considers that, even though many English economist argue free trade, in practice, the English governments follow the policies that are protective and try to prevent the technology transfer abroad (Saatçioğu, 2005 181).

A general definition of National innovation system, again made a current issue by Freeman and developed by the contribution of a number economists, could not be made. Freeman suggested that its success depended on the educational system between and within the firms, managements, and sub –systems. Freeman argues that these interactions initiated, imported, modified, and spread the new technologies (Freeman, 1995: 5-24). The concept of national innovation system is considered as important institute for examining the technology by interactional organizations and policy maker in many places of the world. In order to be able to measure the success of national innovation system and to be able to compare the systems of countries to each other, systems are also developed. In this scope, collecting the statistical information pertinent to the countries by the agencies whose competencies are known, for the inputs and outputs of innovations, the measurable analyses are tried to be conducted. Among these, innovation ration card, provided by EU, gives an idea about the success of country innovation systems (Kiper, 2010: 25).

4. "MODE 2" INFORMATION PRODUCTION MODEL

Globalization is that the world economically becomes a great market and expresses the effect of technological developments on the human life, popular culture, culture, and similar concepts. Globalization affect each area and each institute. One of these institutes is education, and, depending on this, universities, because universities, together with modernism, are seen as one of the most important instruments (Yılmaz and Horzum, 2005:104). The change of social structures in universities caused, in time, the understanding of information producing to change. That information productions systems in universities themselves do not hold time concern and indifference to the problems experienced in practice reveals that a new road map should be drawn (Kiper, 2007: 148). Mowing away from introverted information production approach, stated as "Mode 1", in which academic concerns are dominant, one began to be worked with "Mode 2" approach, i.e. in daily life and in closer contact among the other information managers. "Mode 1" is defined as information production approach that stands out the disciplinary structure of universities and in which, the information produced by this approach are published in academic magazines and, generally with this way, shared with all academic community (Hahendahl, 2005: 1-21). While quality measurement of information outputs of Mode 1 is mostly realities, information output of Mode 2, is the "performance of employees". Via cooperation organizations such as clusters and networks, information terms are the important factors of "Mode 2".

5. "TRIPLE HELIX" MODEL

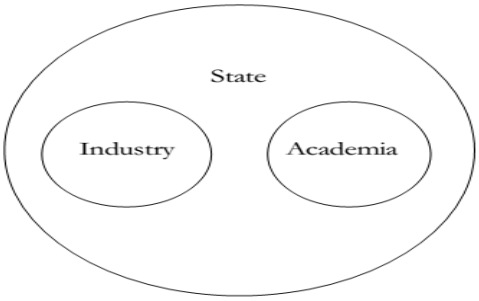
The increasing role of information from the view point of society, and of university from the view point of economy stood out the relationships of university-industry and the institutional relationships between government, private sector, and university toward innovation were analyzed by Triple Helix model (Etzkowizt, 2002: 1-18) This model, described by Etzkowitz nad developed by Leydesdorff, in contrast to linear innovation model, represent the instructional relationships between public, private sectors and academy world by Triple Helix and fix these relationships at the different levels of the structure under consideration and try to explain the use of information as capital (Kiper, 2007:153). Triple Helix model, introduced by Etzkowitz and Leydesdorff, inspiring from the similarity in double helix of DNA structure, with the motivation to encourage the academic research and economic development, as interweaved rings, was formed in the axis of university, industry and government.

Model attempts to explain the management of science and technology world, information spread; social responsibility and acceptability of science; and the relationship level of each actor in the innovation process (Çetin, 2009: 54). In 19^{th} and 20^{th} centuries, the different helixes formed by university-industry-government effectively occurred. However, In the exchange relationships between them and internal events in each of them, with historically examining three helixes in a single way, Triple Helix model appeared (Etzkowitz and Leydesdorff, 2000: 109-123; Shinn, 2002: 599-614).

The world now shifts to this model, in which it overlapped the roles of three actors on this model; the solidarity and cooperation, and continuous interaction are effective: Helix model evaluates the function of universities in the formation of new companies, and in facilitating the regional growth in the other projects such as science parka, incubation plants, universities, and Technology transfer offices (Etzkowitz, 2002: 1-18).

Triple Helix model is an important model for innovation structure of university –industry interaction in information based society (Etzkowitz, 2003: 293-337) According to Etzkowitz and Stevens(1995:13-31), "in addition to the connections between university - industry – government, each actor acts the role of the other one". Thus, universities, assuming beside academic dimension, the various studies such as marketing information as tasks related to entrepreneur, provide sharing of information between each other.

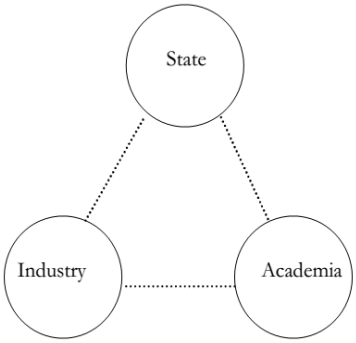
Figure 3: Statist University –Industry –Government Cooperation Model



Source: Etzkowitz, 2002: 1-18; Etzkowitz ve Leydesdorff, 2000: 109-123

As seen in Figure 3 statist university – industry -government cooperation model shows a relationship, in which national state includes in academy and industrial sector and manages the relationships between these two sector. This model is related to Soviet Union and East European Countries, where state owned firms prevail.. Model was seen in Latin America, and in European countries such as Norway (Etzkowitz, 2002: 1-18).

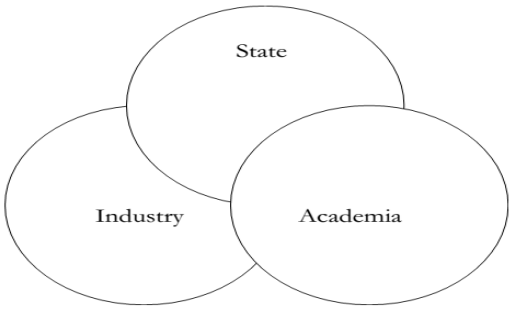
Figure 4: Liberal University –Industry –Government Cooperation Model



Source: Etzkowitz, 2002: 1-18; Etzkowitz ve Leydesdorff, 2000: 109-123

As expressed in Figure 4, liberal university –industry - government cooperation model expresses a system, in which the government are less dominant, the limits of each of institutional area is clearly defined, and the frame of relationship with the others. Swedish policy can be given as an example for this liberal model (Etzkowitz, 2002: 1-18).

Figure 5: Triple Helix Model in University - Industry -Government



Source: Etzkowitz, 2002:1-18; Etzkowitz ve Leydesdorff, 2000: 109-123

As seen in Figure 5, Triple Helix Model in university –industry- government is a model, in which there are dynamic triple relationships such as academic entrepreneurship, strategic alliances between companies, government –university - industry cooperation, the common use of facilities This model represents a developmental focused and innovative model, in which the three areas (university – industry -government) showing continuous development affects each other and the institutes act not only for realizing their own aims, but also the aims of the other institutes. This method, as known Triple Helix, are very frequently used in Europe (Etzkowitz, 2002:1-18; Lefebvre et al., 2009: 1-13).

In the framework of Triple Helix model, in the regional development, university undertakes roles such as regional agglomeration, human capital accumulation, governance, and cultural norms. As a result of establishing the new firm and location of the new or existent firms around university, changing the information into capital, and projects on capital accumulation occur in the framework of the region focused education, research and entrepreneurship activities, and regional agglomeration. Integrating the activities of education and information; establishing the firms; and developing the program that foresee between –institutes communication; developing the educational programs for meeting the regional need; recruiting region focused student and graduate; and forming the learning process that knows the region actualize via human capital accumulation. By examining the weakness and strength, bringing the industry and government into together, the capitalization of information; motivating the regional innovation strategy; again by making a contribution to the social and cultural base of the region, increasing the effectiveness of governance; shaping the regional networking and institutional capacity with the participation of the employees of agency in the relevant entities; and the service of information and examination to support making decision and networking and networking between the national cultural and international actors comply with governance.

The traditional university- industry – government jointing related to the information occurs in the framework of the cultural norms. The role of university in the regional development occurs by linking the region focused activity to the local environment of university. University getting close to its region, with the resources of human, skill, and information, increasingly makes more important contributions to regional networking, and developing the institutional capacity. Beside its scientific and technologic roles, university, contributing to the social and cultural base of the region, increases the effectiveness of governance. The concept of learning economy relates the economic success to the capacity to acquire the new information and talents; does not limit the instruction with high technology sectors; and takes place in all parts of society. In the learning region, individual skills, as a result of inter-groups information transfer, learning systems emerge (Durgut, 2007: 14-15).

Triple Helix model consists of actors at micro level, institutional structures at meso – level, and "codes and regulations " at macro level ((Viale and Ghiglione, 1998: 1-8; ; Kiper, 2007: 153-154).

Actors; Actors consisting of the sectors of academy, government and industry, play at micro level. In the framework of this model, the public researchers are asked to work in a company; private entrepreneurs to work in a laboratory or TTO of a university; academics to be small sized private entrepreneurs of the projects they developed; and the researchers of academic and industrial sector to serve in a public project or in management of the regional technology transfer institute.

Institutional structures ; These are, forming the technological information, the structures organizing the production and playing role in macro level. Hybrid innovation structures is hybrid formed structures that are directly responsible for the use of information and production; and that emerge from the interaction between university, industry, and government (For example, high technology based companies emerging from university, spin-offs, risk capital structures established by university).Innovation interfaces are the institutes functioning interface between business world and universities. Innovation coordinators that are kept responsible for coordination and management of the innovation efforts in the different areas.

Codes, rules and guidance; These are elements playing role at macro level. These elements fix the polices and their applications. Actors play their roles according to this framework and regarding to the finance supporting mechanisms. In USA, Code of Risk Capital, enacted to support high technology company with the instruments of the science, technology, and policy and Nasdaq Stock Market, established for these companies to benefit, are the examples of legal framework and institutional mechanisms serving this aim. Code od Risk Capital, enacted to support advance technology companies and some effective instruments such as Nasdaq Stock Market, established for the companies, similar to this, to benefit serve this aim (Kiper, 2007: 153-154).

From historical point of view, the countries suggested the innovation models by Triple Helix model, in which the government earlier largely affected the relationship and performance between the university and industry. In this model, the role of each actor is certain and these roles do not overlap.

Today, most of countries pass to Triple Helix model, in which each innovation structure, like interface and institutes, plays role (Sakınç and Bursalıoğlu, 2012: 97)).In 1970s, against the increasing technological competitive power of Japanese companies, in 1980s, in USA, considering the analyses drawn from the economic achievement of Japanese innovation system (e.g. low cost manufacturing), some reforms such as Code of Intellectual Property Rights are put into operation. In 1990s, the success of American innovation model that develops in the leadership of computer technology made leadership in the reform of national innovation system still continuing in Japan. At the present days, USA, based on some examples in the existent Japan policy strategy, concentrates on the more advance processes in the areas such as education and mobilization of human resources (Jofre and Andersen, 2009: 5).

Table 1: Compared Triple Helix Characteristics and Trends in Japan, USA and EU

	Performing Countries /Regions		
Triple Helix	Japan	US	EU
University	**Trends:** Privatization with corporate status: aiming more administrative autonomy and funding diversification, involvement of faculty staff in entrepreneurship, increasing excellence in education and research, and infrastructure modernization. focusing on attracting and keeping foreign skills, increasing (international) postdoctoral positions, increasing selectiveness of admission, recruitment of young scientist, creation of in-house Technology Licensing Organisations (TLOs); increasing volume, quality and impact of scientific production; increasing collaboration with industry (staff mobility, technology licensing, services and training). Tendency to increase scientific production and research support with industry, and number of patents applications. **Role:** Historically low to Moderate (aiming higher)	**Trends:** Autonomy and decentralization: aiming research and education excellence. Focus on high impact research, funding diversification, intense competition for human and financial resources nationally and internationally, highly selective standards for enrolment and admission, and increasing entrepreneurship capability and effective in-house IPR support. Scientific production rate tending to decrease in proportion to decreasing enrolment of foreign labour and enrolment of national students **Role:** High (aiming to sustain)	**Trends:** Public with focus on national priorities: open admission and low tuition fees schemes, rigidity of funding schemes, low incidence of non-EU foreign skills, recruitment and admission predominantly within nationals. Aiming excellence on education and research, more autonomy and funding diversification, increasing scientific production and international impact, national and international networking, attracting and keeping foreign skills, increasing and diversifying collaboration with industry, optimization of IPR mechanisms, increasing human resource mobility Tendency to: decrease admission and graduation rate, number of aging faculty and decrease labour pool, scientific production and international impact of publications **Role:** Historically high (tends to decrease)
Government	**Trends:** Undergoing reform of administrative bodies (less divisions, more autonomy and power), design of long-term and consensual S&T and R&D plans and strategies, encouraging and mediating industry-academy collaboration, aiming social consensus, aiming less "interference", increasing funding of R&D. **Role:** Historically high (aiming Moderate)	**Trends:** Dictating and keeping "rules of the game" through regulation and Deregulation, facilitating Innovation environment, setting up national priorities, aiming more "presence", aiming more funding to R&D **Role:** Moderate (aiming Higher)	**Trends:** Funding, coordination and basic orientation of communitarian R&D and S&T policies, formation and regulation of the communitarian market, aiming higher R&D investments, aiming higher coherence of communitarian S&T policies and national innovation policies. **Role:** Moderate (aiming Higher)
Industry	**Trends:** Highly organized and localized, nationally-oriented, with high incidence in Government's S&T policies and strategies (tends to sustain); strong "in-house" R&D and High embedded tacit knowledge (sustaining); long-term and large-size networks; low human resource mobility; low Venture Capital formation. Tendency to increase: risk capital, recruitment of foreign skill, international networking, outsourcing of basic research and collaboration with academy **Role:** Historically very High	**Trends:** Independent and competitive, highly localized, and internationally-oriented. Diversified R&D with lower embedded tacit knowledge, high labour mobility and foreign skill dependency, short-term collaboration networks, and active collaborating in Basic research, efficient in-house IPR support, and considerable venture capital formation Tendency to: decrease foreign labour recruitment, increase networking and collaboration span, and increase outsourcing **Role: Very** High	**Trends:** Highly fragmented, geographically dispersed, and nationally-oriented. Low incidence in the S&T policy design at EU level but higher at national level, dynamic and complex networking structure, highly skilled labour force with low incidence of foreign skills, dynamic but inefficient collaboration with academy due to prevailing IPR structure. Tendency to: increase number and weigh of SMEs, reduce skilled labour pool, aging labour market. Aiming to: increase foreign recruitment and outsourcing, increase global competitiveness, and improve IPR mechanisms **Role:** Historically High
Own source			

Source: Jofre and Andersen, 2009: 5

In Triple Helix model, in the context of university – industry –government, the way and tendencies followed in Japan, USA; and EU are summarized in Table 1 Triple Helix model are still conceptually very fluid. One of the most important reasons of this is the concepts such as national innovation system, techno-economic paradigms, new information society, innovation models, and approach of "Mode 2" information production are closely related to each other (Kiper, 2010: 30-33).

The problems experienced in the world economy in the financial meaning affect the countries. But, in the scope of innovation and R&D, the counties featuring university – industry cooperation can more easily come over these problems experienced.

R&D (Research&Development) and innovation are directly related to the height of the welfare level of countries. Beside the individual capabilities, entrepreneurship, and public supports, it is an important factor for innovation. The firms such as Google, Apple, and Boeing are in USA, because, besides USA is a leader country in the innovation area, it enables the most appropriate environment to form for the innovation of public policies, on ecosystem, cooperation environment, academics, entrepreneur, national market, financial system, and all other components. In Turkey, the inadequacy of national policy, and that ecosystem is not suitable, cause it lags behind in university – industry cooperation (MÜSİAD, 2013: 27-28).

Table 2: The Global Competitiveness Index in Detail

Country	Capacity for innovation	Availability of scientists and engineers	Quality of scientific research institutions	University-industry collaboration in R&D	State of cluster development	Company spending on R&D	PCT patents, applications /million pop.
Switzerland	2	14	2	1	9	1	2
UK	12	12	3	2	10	12	18
USA	7	5	6	3	12	7	12
Japan	1	2	11	16	5	2	5
Germany	3	40	10	11	8	4	7
South Korea	19	23	24	25	22	11	9
Singapore	20	13	12	5	3	8	13
China	23	46	44	35	23	24	38
Finland	4	1	13	4	6	3	3
Israel	6	9	1	8	58	6	4
Puerto Rico	38	3	38	32	32	35	-
Sweden	5	4	9	7	14	5	1
Taiwan	15	7	19	12	1	10	-
Italy	28	45	43	65	2	32	24
Turkey	48	41	88	70	43	56	42

Source: WEF -The Global Competitiveness Report 2012–2013

You will find alignment of some countries subject to their innovation capacities at Table 2. Japan is at the 1st order at innovation capacity among 144 countries in the world, Swiss is at the 2nd order, and Germany is at the 3rd order. Finland is at the 1st order, Japan is at the 2nd order and Puerto rico is at the 3rd order about growing scientist and engineer. Regarding to number of scientific research institution, Israel is at the 1st order, Swiss is at the 2nd and England is at the 3rd order. Swiss is at the 1st order, England is at the 2nd order and USA is at the 3rd order about university-industry cooperation. Taiwan is at the 1st order, Italy is at the 2nd order and Singapore is at the 3rd order about aggregation potential.

Swiss is at the 1st order, Japan is at the 2nd order and Finland is at the 3rd order about private sector and RE&DE expenditures. Sweden is at the 1st order, Swiss is at the 2nd order and Finland is at the 3rd order about usable patent. Turkey is at the 48th order at innovation capacity; at 41st order at growing scientists and engineer; at 88th order about number of scientific research institution; at 70th order about university-industry cooperation; at 43rd order about aggregation potential and at 56th order about private sector and RE&DE expenditures and at 42nd order about usable patent

6. RESULT

Although innovation process is expressed by the harmony of learning national economies with the global system, that the novelty potentials recognize the institutional variations is correlated to the development and competitive stages The process that is desired to be reported with the innovation system, through its making a contribution to realization of rationality action, is to provide the long termed optimal use of resources (Karaçor, 2007: 43). The fact that the decision makers are in mutual interaction reaching the aim function constitutes the main idea of the concept innovation. For the continuous formation off innovation process, while the government is protecting the stability of necessary information network structure of the developmental and competitive formation, the innovative firms, using information infrastructure generating the systems of economic growth and competition that forms and distributes information, establish the network structure. National innovation system forms by this effort of decision makers (Karaçor, 2007: 44). In many studies in the literature, it reveals that there is a linear relationship between innovation system and development. In the economic development that is associated with the institutional and organizational structuring of a country, innovation system is very important. (Işık ve Kılınç, 2012: 170).

Besides innovation is a scientific based structure having importance for universities and industry, it also the needs for market having importance and showing technological development for industry the production of new information, dominated by universities and large scientific based organizations; technological development, dominated by organizations; and that the customers express their needs and desires via the consumption of products constitute the conceptual framework of innovation. As a conclusion, in this study ; it is understood that innovative ability of a country needs one more than actors, such as university and industry, not a single actor; that these actors should act in a certain harmony; and or this, there is also a need for the other actors to provide this harmony.

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