

The Last Technological Innovations and Its Effects on Growth Process, LABOR MARKET AND SOCIETY

Editors

Asst. Prof. Dr. Gül Ekinçi & Dr. Burhan Akyılmaz

“Necessity is the mother of invention” Platon
“Never waste the opportunity offered by a good crisis” Niccolo Machiavelli

Innovation, having many other definitions, is defined as a new method, idea, product or service that results in a positive change.

“For an innovation to be called innovation in financial sense, it has to be repeatable with an economic cost and meet a certain need” while in development sense, “it has to lead to social innovation by bringing a more effective, productive, sustainable or newer solution to a social and environmental problem.”

In the next 20 years, the importance of emerging innovations can be better understood when it is thought that the rates of job loss will be %50 due to technology (digitalization, automation etc.). In addition; together with the doubtfulness of fast technological progress all over the world, it is expected that radical and high level innovations in the fields of new technologies and innovation (product, process, market, organizational and social) will create new types of business and employment. The more durable emerging radical innovations are, the more various stepwise innovations (they are also called constantly progressive, incremental or dynamic innovations) will be in the next evolutionary processes. The Covid-19 pandemic that appeared in 2019, has introduced a new pandemic culture to the world.

The Covid-19 pandemic that has introduced a new pandemic culture unexperienced before to the world together with the effect of globalization, has obliged people to create sudden innovations (Covid-Innovation). Being radical and new, these revolutionary Covid-19 innovations have proved the world how much important they are as being the main driving and leading force in economic, social and political perspectives.

This book emphasizes how technology and innovations effect economic growth, the level of welfare of future generations, cultural, social and political development, and also how comprehensive innovations emerging in these fields are and finally how they increase efficiency and in what ways they are performed

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Society**


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Asst. Prof. Dr. Gül Ekinci & Dr. Burhan Akyılmaz



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Editor • Asst. Prof. Dr. Gül Ekinci  ORCID 0000-0001-5512-4789

Dr. Burhan Akyılmaz  ORCID 0000-0003-4039-9442

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PREFACE

Innovation, generally based on curiosity and intuition, is defined as a discovery, invention and an R&D process that brings solutions to a social, environmental and technological problem and also that creates value and meets communal needs in product, process, market, organizational and social fields. All over the world, investments are based on capital accumulation; the idea of having more output with less input is based on production info; and technologies, production volume, the rise of motivation are based on labor force and therefore, they are all accepted as indicators of economic growth. Capital accumulation, technological developments and increase in labor force constitute the main dynamics of growth of the global world economy. Technological progress doesn't only provide high output and productivity but it also creates economic growth. Since growth in economic sense corresponds to the rise in tools and products that are used to meet human needs, innovations create new employment and business lines at this point. On the other hand; innovations, in social sense, fight against poverty, inequality and also exclusion being related to them. Innovations offer technological, effective, productive and sustainable solutions to these problems in social sense.

While developed countries that are more advanced in technology and economic growth, constitute only one fifth of the world population, they use four of five of the world resources and therefore, the gap between developing countries and them is increasing everyday. This situation is seen as an obstacle in front of the aim of a sustainable world. Since the direction of technological innovation is determined by social and economic needs, innovation types such as radical (disruptive), incremental, contrary, operational and marketing innovations create an effect of leverage with its niche role in sustainable development. Many problems, which are untouched in economic, social and technological senses and also which are seen desperate to solve, can only be solved through paradigm-shifting and disruptive (radical) innovations that should be applied in a way that will break the existing taboos. Disruptive innovations create new business lines by bringing radical solutions for the problems that seem unsolvable and stepwise (incremental, staggered) innovations strengthen the sub-innovations in these new business lines.

At this point; opening the way for innovations, attaching importance to creative ideas to increase efficiency, evaluating the

contribution of innovation and also managing the processes well are quite important in innovation management. The authors in this book consider innovations in different fields by evaluating the effects of innovations on labor market, society and economy in order to manage the process well and contribute to it.

Asst. Prof. Dr. Gül Ekinçi,

Editor, Writer

&

Dr. Burhan Akyılmaz

Editor, Writer

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CHAPTER I


SCIENCE, TECHNOLOGY AND INNOVATION POLICIES: GENERAL CONCEPTS

Esra Balli¹ & Muammer Tekeoglu²

¹ (Asst. Prof. Dr), Erzincan Binali Yildirim University, e-mail: esra.balli@erzincan.edu.tr

 ORCID 0000-0001-6993-9268

² (Prof.Dr.), Cukurova University, e-mail: toglu@cu.edu.tr

 ORCID 0000-0001-8270-3858

1.1. INTRODUCTION

According to the Academic Press Dictionary of Science and Technology (1992) discovering the facts about science, natural phenomena and conditions and the systematic observations of natural phenomena and conditions with the aim of formulating laws and principles based on these facts are defined as the organized mass of knowledge derived from these observations, and verified or tested by further research, and specific sub-branches of this general mass of knowledge, such as biology, physics, geology or astronomy (Morris, 1992:1926). Science comes from practical experience. It is also an effort to combine as much experience as possible. Therefore, science emerges only after a considerable accumulation of experience and plays a purely explanatory role on the underlying arts and crafts for a long time. No significant progress was made in scientific analysis until science had started to exert a creative impact on discovery and invention processes (Usher, 1929, s. 32). The Academic Press Dictionary of Science and Technology (1992) describes the invention as the creation and application of a previously unknown instrument or physical process (Morris, 1992:1136). An invention may be a new man-made device or process. A new device described as an invention may be in the form of a new physical product, a new biological life form, or a new piece of software. The process consists of a chemical, physical or biological chain producing a product or service. In order for an invention to become a patent, it must undergo authenticity testing. However, the fact that an invention is sufficient to obtain a patent does not guarantee that this invention can be turned into a profitable product. Each year, inventors realize numerous inventions but only a small percentage of them can be produced profitably (Norman, 1993:4). According to Mansfield (1968), an invention turns into innovation only when it is applied. When the time between invention and innovation is examined, it is seen that this time

differs across inventions. It took 22 years for television, 11 for steam engine, 10 for turbojet engine, 53 for cotton collecting machine, 8 for radio and telephone, and 79 for fluorescent lamps (Mansfield, 1968: 99-101).

1.2. THE RELATIONSHIP BETWEEN SCIENCE, TECHNOLOGY AND INNOVATION

It can be said that many of the inventions originate from basic sciences in origin. However, a significant portion of these discoveries later became the basis for important industrial practices, and some of them created large industries. For example, the discovery of neutron by Chadwick was accompanied by Cockcroft and Walton's artificial radioactivity, and Lawrence's contributions to nuclear processes soon became involved. All these have led to the emergence and growth of a nuclear industry with a number of important applications in addition to nuclear power generation (Townes, 1983:7679). While inventions can be made in many places, for example, universities, innovations often occur within companies operating in the commercial field. In order to turn an invention into a firm-level innovation, it is often necessary to bring together different types of knowledge, abilities, skills and resources in this process. For example, the firm may need production knowledge, skills and capabilities, market knowledge, a well-functioning distribution system, adequate financial resources and much more. Accordingly, the role of the innovator may be quite different from that of the inventor in the sense of the person or organizational unit responsible for bringing together the necessary factors or in the sense of the actor that innovation theorist Schumpeter calls "entrepreneur" (Fagerberg, 2004:3). Schumpeter argued that entrepreneurs are individuals attempting to reform or revolutionize the mode of production by making use of an invention or an untested technical opportunity to produce a new commodity or to produce an old commodity in a new way (Schumpeter, 1934:132). According to Landes (1998), the distinctive feature of the invention manifests itself in the constructive assimilation of pre-existing elements in new syntheses, new styles or new patterns of behavior. The objectives can vary in a wide range of creations that appeal to aesthetic desires at one end and mechanical devices to satisfy material desires at the other end. Thus, the invention establishes relationships that have never been established before, and the internal element of innovation lies in the completion of an incomplete form of behavior or in the development of unsatisfactory or inadequate behavior (Landes, 1998:11). According to Grossman and Helpman (1991), when firms make industrial R&D investments, the output is the technology itself. Accordingly, technology is a type of knowledge that plays an important role in the economic process. Technology should have the feature of unrivaled goods first. This means one party using that technology to produce goods or services does not preclude others from using the same

technology. Secondly, the technology is partly characterized by non-exclusive goods. According to this, the creators and owners of this technological knowledge may face difficulties in preventing unauthorized use of this technology (Grossman and Helpman, 1991:15). Technology level includes production process, product, production, management and marketing activities as well as after sales support. In order for technological development to carry an economic meaning, by taking risk, the company must present the technological development to the market in the form of innovation. While the source of the technologies generating innovation can be realized as a result of the increase in labor productivity through R&D activities of the company itself, this innovation can also occur as a result of some external factors (Kibritcioglu, 1998:211). According to Kirbitcioglu (1998), the external factors affecting technological development may differ according to the historical, sociological, political, psychological, cultural, religious time periods of the countries. In addition, the technology policies created by the states for economic growth have an external effect on macro and micro scale. According to Landry et al., (2002), the innovation for problem solving is realized in a system that involves different learning styles (learning by using, learning by doing, learning by sharing), occurs between firms and their environment and there is a legalized and implicit exchange of knowledge, and the interdependent actors' exchange of knowledge and learning is created interactively (Landry et al., 2002:683).

1.3. THE RELATIONSHIP BETWEEN CONCEPTUAL OF KNOWLEDGE, LEARNING AND INNOVATION

Innovation can come from many different sources. These can be individuals or inventors aiming at finding solutions to their needs, or research laboratories and incubators of universities and states, or private non - profit organizations. Firms have priority in innovation activities. As they have larger resources and management systems, they are more suitable for innovation activities than individuals. In addition, firms are also engaged in innovation activities as they may have the advantage of differentiating new products and services over other companies (Schilling, 2010: 19). Figure 1 shows the sources of innovation according to Schilling (2010):

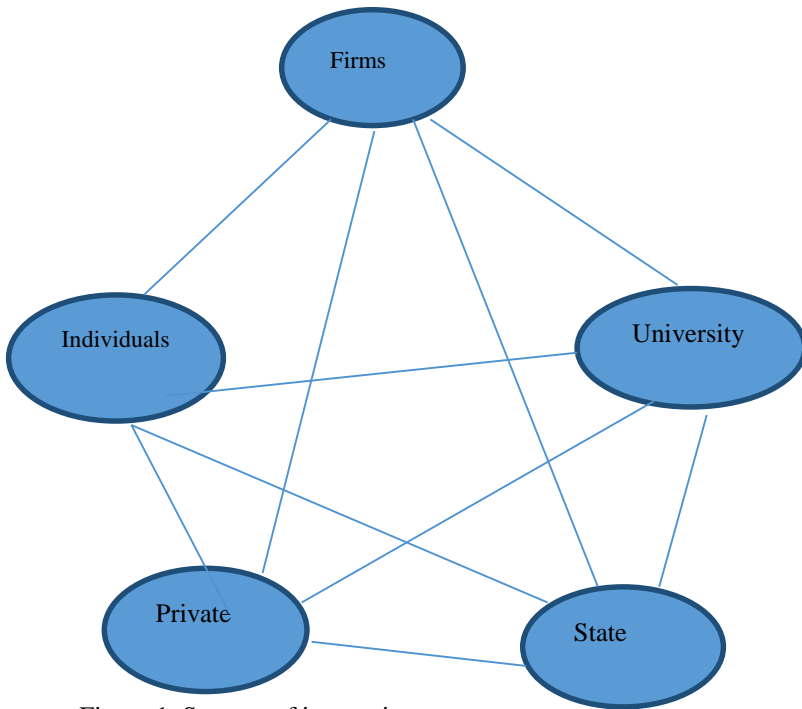


Figure 1. Sources of innovation

The ultimate goal of all innovation activities is to improve the firm's performance. In this direction, firms develop new products, apply new production methods and make institutional changes in the structure of the firm increasing significant sales. In addition, the general corporate environment determines the parameters the firms operate in. These are;

- Basic education system for the general population setting minimum education standards in the labor and local consumer market,
- University system,
- Specialized technical training system,
- Science and research base,
- Common pools of coded information such as publications, technical, environmental and management standards,
- Innovation policies and other government policies affecting the innovation of firms,
- Legal and macroeconomic environments such as patent law, taxation, corporate governance rules and interest and exchange rates, tariffs and competition-related policies,

- Communication infrastructure including roads and telecommunications networks,
- Financial institutions determining the ease of access to risk capital,
- Market accessibility, including close contact with customers as well as access and ease of access,
- Industrial structure and competitive environment including the presence of supplier firms in complementary sectors (OECD, 2005: 36-37).

According to Dodgson et al., (2008), the sources used by a firm in innovation strategy are as follows:

- Financial resources and risk tolerance,
- Human resources and capacities for innovation,
- Technological resources, both physical (plant and equipment) and intellectual (information, patents, trademarks),
- Marketing resources (brand ownership and market penetration, customers, market knowledge),
- Organizational resources (in-house routines, procedures, practices and policies),
- Network resources (partners of the firm, suppliers, customers, communities the firm operates in) (Dodgson et al., 2008: 97).

The state should also play an important role in the development of innovation. If the state does not contribute to the development of innovation, firms will invest less in technology and basic research. Therefore, the state should invest in R&D expenditures and research to prevent market failures that may occur. The state should encourage investment in R&D through patent laws, tax incentives, steps to improve cooperation in research, and the provision of subsidy funds for research (Audretsch et al., 2002, p.173). Porter (1990) lists the reasons why firms in some countries have the capacity to innovate continuously and increase their competitive advantage by following innovation as factor conditions, demand conditions, associated and supporting industries and firm strategy and structure of those countries. This, alone and as a system, constitutes the “national advantage apple” of each country.

It is widely accepted that science and innovation operate as a highly interdependent, multi-dimensional and non-linear complex system. To bring together the key actors, elements, interactions and interdependencies of this system, Allas (2014) developed a simplified Six-Part Framework and, using this framework, described the elements of the science and innovation system that are important for economic and social

outcomes in broad categories. Allas (2014) analyzed the performance of the science and innovation system under the following headings:

1-Money: It is the key input for all parts of the system to be used in infrastructure, new information, absorption capacity and innovation investments.

2-Talent: means the human capital required for demanding, developing, sharing and using new and existing knowledge. Ability is vital because it determines absorption capacity and therefore the ability to benefit from science. Particularly important elements are:

- Researchers: In universities, public laboratories and industry,
- University graduates: Economy-wide,
- Teachers: In high and higher educational institutions, but also towards the lower levels of the education system to inspire future generations,
- Professional tasks: Laboratory assistants and technicians ensuring the smooth operation of the infrastructure elements,
- Managers,
- Entrepreneurs.

3-Knowledge assets: It consists of intermediate outputs displaying the quality and potential of the system and are relatively easy to measure.

4- Structures and incentives: It consists of institutions and interconnections determining how effectively the actors in the system work together to achieve certain results.

5-Wide environment: It constitutes the economic and social context where science and innovation system interacts in.

6-Innovation outputs: It consists of measurable outputs as representative of the desired final outputs, namely economic and social benefits (Allas, 2014:17-19).

1.4. TECHNOLOGY, PRODUCTIVITY AND INNOVATION

According to Balaam and Veseth (2000), four important revolutions had profound effects on economic life. These are the Agricultural Revolution, the Industrial Revolution, the Technological Revolution and the Information Revolution. In this context, three trends emerge. The first is that information and technology are of increasing importance as the determinant of power. Therefore, technology should be given importance in order to increase economic success and political effectiveness. Secondly, technological development is taking place very quickly. Finally, the global diffusion of knowledge and technology is increasing. Accordingly, knowledge is a power for those who can control

it. Therefore, companies and countries that cannot control or renew technology face the lagging situation (Balaam and Veseth, 2000:209-210). For the development and diffusion of technology, there is a need of an education system teaching the principles of technology, a legal regulation on intellectual property rights, standardization activities reducing transaction costs and of transparent and effective markets (Ergas, 1987:52). According to Stoneman (1987), the diffusion includes the process of proliferating the innovated products in the economy (Stoneman, 1987:154). The most traditional type of knowledge flow in the innovation system is the diffusion of technology as new equipment and machinery. The diffusion of innovations takes place in a process that is slow enough to take many years. While the speed of adoption of technologies varies considerably from one sector to another, these deviations depend on national circumstances and a range of characteristic features at the firm level. In addition, the innovation performance of firms is increasingly dependent on the adaptation of technology to the business environment using innovations and products developed at different locations. Customers and suppliers can be the source of knowledge about technologies as well as competitors and public institutions. Diffusion of technology is particularly important for R&D practitioners or non-innovators in traditional manufacturing and service industries themselves (OECD, 1997: 15). The most important point of the debate about the diffusion of technology is the slow movement of firms to adopt new technologies. If a new technology really has a significant improvement over existing technologies, it is important to investigate why some firms are moving slower than others. According to Geroski (2000), this may be due to the fact that other firms are late in acquiring knowledge about new technology (Geroski, 2000:604). Mansfield (1989), in his study of calculating the adaptation time of new technologies for the United States, he says this period is of 12 years for industrial robots, 9 years for diesel locomotives, 15 years for by-product coke ovens, 14 years for central traffic control; 5 years for aircraft engines (Mansfield, 1989:184). Mansfield (1968) linked some of the reasons why some firms quickly adopted new technology, while others failed to do so with the characteristics of firms. Accordingly, the size of firms, the expected level of profitability from the new technology, the growth rate of the firm, the profitability level of the firm, the age of the personnel managing the firm, the liquidity status of the firm and the profitability trend of the firm affect the speed of the adoption of the new technology (Mansfield, 1968:123). The actual impact of innovation cannot be predicted until the diffusion mechanism is realized. The real effect can be seen when technological innovation is used and diffusion and economic benefits are achieved. According to the study of Keller (2004), very few developed countries are the creators of new technologies taking place in the world. For many countries, growth in

production is driven by foreign technology (more than 90%). When a new technology is discovered, the next step is society's adoption of that technology. Having a larger, faster and more powerful device does not mean it will be accepted. Numerous technologies have never been adopted or adopted after long-term resistance (Diamond, 1997: 247).

The diffusion process generally depends on improvements in the performance characteristics of an invention, the innovative change and adaptation situation meeting the needs or specialized requirements in various sub-markets, and the availability of other complementary inputs making the original invention more useful (Rosenberg, 1982:21). Diffusion of technology can take place in a planned framework as well as spontaneously. The success of the diffusion can occur through official or informal channels. According to this, diffusion can be formed by a group making collective and binding decisions, or as a result of authoritarian decisions. The relative superiority, adaptability, difficulty, ease of the trial process and observability of innovation constitute the characteristics that should be taken as basis in the diffusion of innovation. There are well-known examples of unsuccessful or unacceptably slow diffusion of useful innovations. Although the opinion that a disease caused by vitamin C deficiency in the British navy could be solved with citrus fruits was suggested in 1601 by the sea captains, and after 150 years, the British navy doctors had confirmed that the citrus fruit was a remedy in the treatment of this disease, the use of citrus fruit innovation against this disease was only realized in 1795. Another important example concerns the technologically superior Dvorak keyboard, made by Professor August Dvorak in 1932. The QWERTY innovation did not replace the relatively slower Dvorak keyboard used at that time. QWERTY dominated the market only when Apple IIC Computer's use of this keyboard 40 years after the patent date of 1932 (David, 1985:332). In the case of QWERTY, the cost of developing printers that can be used with the QWERTY keyboard has been an obstacle to this choice. Diamond (1997) compared the acceptance process of different inventions in the same society. There are four factors in this. First, economic superiority over the existing technology is an important factor. The second is social value and prestige that can replace economic benefits. The third factor is the adaptation of the new technology to the interests. Fourth is the ease of observing the advantages of new technologies (Diamond, 1997: 247-249).

According to Cameron (1998), although international technological diffusion is important, it does not constitute the real reason for the increase in productivity in that country's economy. According to the author, the innovative approach of domestic firms is more important. Accordingly, countries are required to carry out a significant amount of domestic research in order to use the results of foreign research in their

own interests. In addition, due to geographic secrecy and cultural barriers in diffusion, it takes a long time to see the impact of the results of foreign studies on the domestic economy. Finally, higher education plays a very important role in the formation of human capital. According to Rodrik (2009), the dynamism of production should be continued in order to sustain the economic growth. The discovery of new natural resources or a new free trade agreement can accelerate economic growth over a limited period of time. Therefore, policies need to be diversified continuously. East Asian countries have continued their success by continuously focusing on the needs of their economies and developing their technologies (Rodrik, 2009:103). The world economy has been experiencing unprecedented growth during the last two centuries.

Between 1820 and 1997, it was understood that the world's gross domestic product increased by 2.2% annually, six to seven times more than the 1500-1820 period. However, this growth is not equally distributed over the world. Similar acceleration has been in various parts of the world economy since 1950. However, countries have benefited from this growth in different degrees in terms of living standards. As a result, per capita income in America, Japan and Northwest Europe has increased much faster than in the rest of the world (Van Ark, Kuipers and Kuper, 2000:1). According to David Landes, if the richest developed country Switzerland and the poorest non-industrialized country Mozambique are investigated, it is seen that the per capita income gap between the two countries is about 400 to 1 today. 250 years ago, the gap between the richest and the poorest was 5 to 1. The difference between Europe and East or South Asia (China or India) was in the range of 1.5 or 2 to 1 (Landes, 1998: xx). However, despite this long-term deviation in productivity and income, there are a number of examples of countries closing the productivity and income gap between their counterparts and the countries ahead of them (catching up) and resisted this trend at different times (Fagerberg and Godinho, 2005: 6). The catching up hypothesis suggests that backwardness in terms of productivity also has the potential for rapid progression. Another suggestion is that in any comparison between countries for any long term, productivity growth rates are in contradiction with initial productivity rates (Abramovitz, 1986:386). According to Fagerberg and Godinho (2005), while catching up alone relates to the ability of a country to close its productivity and income gap compared to a leading country, convergence refers to a tendency to reduce the overall difference in productivity and income in the world as a whole.

Abramovitz (1986) showed that differences between countries in terms of productivity levels create a strong convergence between these levels in the future, provided that countries have sufficient social capacity to absorb more advanced technologies. He defines a country's social

capacity as a technical competence, at least for Western countries, characterized by political, commercial, industrial and financial institutions and assumes that the year of education will be a vulgar proxy variable. The institutional and human capital components of social capacity, the levels of education and organization, are evolving very slowly as they respond to the requirements of technological facilities and the experience of using technology. Their degree of development sees the technological potential as limiting function. In addition, the rate at which the catching up potential is implemented depends on a number of other conditions governing the diffusion of knowledge, the fluidity of resources, and the investment rate (Abramovitz, 1986:405-406).

The findings of Gao (2015) in his study of the state's intervention mechanism for technology and innovation in the context of China's catching up experience show that there are different innovation focal points and different challenges in the development and dissemination of technology and this affirms that all these have pushed the state to intervene with a mixed policy of legal, financial and administrative instruments.

1.5. INFORMATION SOCIETY INNOVATION CULTURE AND CREATIVITY POWER

According to Acemoglu, Johnson and Robinson (2005), while some forms of social organization encourage people to take risks to innovate and save for the future, find ways to do better work, self-educate and learn, solve problems related to collective action and produce public goods, some forms of social organization lack such incentives. Many hypotheses have been developed that explain the formation of an innovation culture and why different societies are at different levels of development. This section will focus on geography, culture and ignorance hypotheses. In addition, the role of institutions in the creation of innovation culture and creative power will be discussed.

The geography hypothesis suggests that the geography, climate and ecology of a society shape both the technology of that geography and the motives of those living in that geography. This hypothesis emphasizes the forces of nature as the main factor in the poverty of nations (Acemoglu, 2003:27). According to Diamond (1997), if populations in Australia and Eurasia could have been changed during the late glacial period, the original Aboriginal Australians would now occupy much of America and Australia as well as most of Eurasia, and the original Aboriginal Eurasians would now make up the oppressed population in Australia. All human communities include creative people. Only some environments provide more starting material and favorable conditions for inventions than other ones (Diamond, 1997: 405-408).

Sachs (2001) used geographic information system (mapping) to combine climatic and economic data. According to his observations, per capita GNP in tropical regions in 1820 accounted for 70% of GNP in the temperate zone. As of 1992, per capita GNP in the tropical regions declined to 25% of GNP in the temperate zone. Thus, between 1820 and 1992, the per capita GNP of the temperate region grew by 1.4% on average, while the increase in the non-temperate region remained at around 0.9%. In the 1960-1992 period, both regions showed an annual growth rate of 2.3%. These observations show that Asia in the non-temperate zone has grown rapidly at 2.9%, while poor growth performance in Africa and Latin America continues. At the heart of this long-term growth has been the continuous development of technology, a process that is more useful for temperate region countries than tropical countries. Production technology in tropical countries lags behind technology in temperate climate countries in two critical areas, agriculture and health. The difficulty of mobilizing energy resources in tropical economies also contributed to the income gap between climatic zones. These factors have further strengthened the difficulties in applying technological advances in the temperate zone countries to tropical ones. Agriculture, health and some manufacturing industry technologies that are likely to spread in ecological generations, have not spread among tropical climate countries.

Contrary to these views, Acemoglu and Robinson (2012) argue that there is no relationship between climate, geography and economic growth. Accordingly, the Aztecs used money and writing, and the Incas recorded their information on threads called quipu. When the period that Aztec and Incas reigned is investigated, it is seen that those having a tropical climate have higher technology and wealth than those having a temperate climate. However, they said that backwardness on the African continent could not be explained by the geographic hypothesis, one of the main reasons for this was the state taking no measures to prevent diseases and eradicate poverty.

Accordingly, the 19th Century-England had an unhealthy living space, it gained an effective health structure as a result of the infrastructure investments made by the states. In addition to this, they are also opposed to the thesis, frequently mentioned in the geography hypothesis, that the tropical countries are poor because of the inefficiency of their lands. Their opposite argument is that the major inequalities that began to emerge in the 19th century were not due to productivity differences in the agricultural sector, but to industrial technologies. According to Acemoglu and Robinson (2012), the source of the ongoing inequality is technology differences. In addition, the geography hypothesis is far from explaining why countries such as Japan and China, that have been in recession for a

long time, are in a phase of rapid economic growth (Acemoglu and Robinson, 2012: 53-59).

Culture hypothesis, the second generally accepted theory, relates prosperity and culture. The cultural hypothesis dates back to the Max Weber. He argued that the Protestant ethics revealed by this reform played a key role in facilitating the emergence of modern industrial society in Western Europe. The cultural hypothesis is no longer based solely on religion but also draws attention to other types of beliefs, values and ethics (Acemoglu and Robinson, 2012:62). The final explanation of this approach to economic growth emphasizes the view that different societies have different cultures due to different common experiences and religions. Culture here is seen as the main determinant of individual and social values, preferences and beliefs, and these differences are suggested to play a key role in shaping economic performance (Acemoglu, et al., 2005:400-401).

Granato et al., (1996) suggest that pre-industrial economies are zero-sum systems. According to the authors, the characteristic of these economies is that upward social mobility accompanied by very low or zero growth is possible only at the expense of attracting another. The cultural system of a society generally reflects this fact. Social status is inherited rather than something achieved, and social norms encourage people to accept their social position in this life. The demands for social mobility are harshly suppressed. Such value systems contribute to the maintenance of social solidarity and hinder economic accumulation. While Weber's general concept that certain cultural factors affect economic growth is important and valid, his emphasis on the role of Protestantism can catch up a significant part of reality. According to them, the Protestant Reformation, combined with the birth of scientific logic, broke the narrow patterns of the medieval Christian Worldview in a significant part of Europe. In the context of Protestant culture, individual economic accumulation is no longer a rejection. Protestant Europe demonstrated an economic dynamism that would surpass Catholic Europe (Granato et al., 1996: 609-610). Hofstede and Bond (1988) argued that compliance with this order by making arrangements according to the status was provided by Confucianism. Although hierarchical relations and interconnection lie at the heart of Chinese conceptualization of human beings, this complementary hierarchical understanding of relationships has created the reasons facilitating the emergence of an entrepreneurial role. Having a sense of shame as a value strengthened the interconnectedness of social connections through sensitivity, and the value of fraternity brought along savings meaning a significant gain for economic growth and the presence of capital to be re-invested. The value of persistence or patience refers to a general determination while a person is running for the goals, including

economic ones, s/he chooses for him/herself. The relatively weak acceptance of the values on the right side of the “Confucian Dynamism” dimension supports economic growth. While much respect for tradition drives innovation, the economic success of Asian tiger economies and Japan is partly hidden in their ability to easily accept Western technological innovations (Hofstede and Bond, 1988:18). Unlike Hofstede and Bond (1988), Acemoglu and Robinson (2012) suggest that the cultural hypothesis is far from explaining the current economic growth performances of South Korea and North Korea. According to this, before the Korean War, these two countries have a common history, language and origin, while today South Korea is at the top of the list of the countries with the highest income (Acemoglu and Robinson, 2012:61). According to the ignorance hypothesis, the source of inequality in the world is that we and those governing us do not know how to enrich the poor countries. This view is accepted by most economists following the hint of the definition put forward by British economist Lionel Robbins in 1935 as “economics is a science that investigates human behavior as a relationship between goals and scarcity, that is, the alternative uses between them (Acemoglu and Robinson, 2012:63). If economic growth cannot be achieved due to the problem of ignorance, this problem can be solved by increasing the welfare level of countries by identifying the economic policies that should be implemented through the advice of knowledgeable managers and politicians. However, according to Acemoglu and Robinson (2012), the failure to realize economic growth and the inability to raise prosperity is not due to the ignorance hypothesis but rather to states and administrations with different political interests. Accordingly, the cause of poverty in countries is due to the decisions of those having power (Acemoglu and Robinson, 2012:69-70).

Although the history of the use of the concept of institution in social sciences dates back to 1725, there is no consensus on the definition of the institution (Hodgson, 1988:1). According to North (1990), institutions constitute the rules of the game in a society. Institutions consist of constraints designed by people that shape their interaction politically, socially or economically. Institutional change also shapes the development of societies over time (North,1990:3). According to the institutionalist hypothesis, since some societies have institutions promoting mechanization, human capital and advanced technology, these societies will have better economic conditions. Accordingly, good and powerful institutions contain three basic features. The first is the guarantee of property rights. In societies where the right to property is guaranteed, individuals will participate in economic life by spending and investing. The second is the restriction of the domination of elites, politicians and powerful groups over other groups of society. Third, good institutions should offer opportunities to invest in large segments of society, increase

their human capital and engage in productive economic activities (Acemoglu, 2003:27).

Keefer and Knack (1997) have argued that poorer countries are lagging behind rather than catching, in contrast to early neoclassical analyzes predicting poorer countries will grow faster because of technological advances and reduced returns compared to rich countries. The authors cited the imperfect institutions as the root cause of this deviation. As the imperfections in the institutional environment can reduce investment and weaken the ability of countries to adopt technological advances abroad, countries will grow more slowly. The authors demonstrated that the ability to capture poor countries was largely determined by the institutional environment, using a set of indicators that measure institutional quality, including the rule of law, the degree of corruption, expropriation and the risk of non-recognition of the contract, and they showed that institutions in these countries are powerful determinants of the ability to exploit the catching up effect. Although poor countries are advantageous due to the low cost access to advanced technology and the phenomenon of declining returns faced by rich countries, the impression that experience exudes is that these potential advantages are also wasted due to their poor institutional frameworks (Keefer and Knack, 1997:601). According to Perez (1983), it is essential to make radical innovations in the areas of demand management and income redistribution in order to move from a system based on the growth of sectors such as steel, capital goods, heavy electrical equipment, major engineering works, requiring states to spend enormous amounts to a mass production system meeting the needs of consumers and the enormous defense industry (Perez, 1983:370).

After World War II, a form of development involving the harmonization of the institutional framework and the new technological style has gradually emerged in the leading developed countries. Among the main institutional changes that encouraged this was the decisive expansion of the role of the state in economic life. Keynesian policies adopted by many countries led to the emergence of a number of demand management mechanisms that can be exploited both through infrastructure, defense and public spending, and the redistribution of income by taxation, interest rate and public employment. The other important social-institutional change was the expansion of secondary and higher education levels in order to meet the large-scale increase in the need for white-collar, technical and office personnel. Both became important sources of employment and thus the redistribution of income (Perez, 1983:371).

1.6.CONCLUSION

In this chapter, science, technology and innovation policies were discussed. The sources of innovation were explained. Furthermore, more attention was given to the development of technology and innovation and the effects of technological changes on the countries' economy. Besides, we focused on the hypotheses, namely geography, culture and ignorance hypotheses, to explain the formation of an innovation culture and the different levels of economic development of countries. Finally, the role of institutions in the creation of innovation culture and creative power were discussed.

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CHAPTER II


TECHNOLOGICAL CHANGE, INNOVATION AND UNEMPLOYMENT

Esra Balli¹ & Muammer Tekeoglu²

¹ (Asst. Prof. Dr), Erzincan Binali Yildirim University, e-mail: esra.balli@erzincan.edu.tr

 ORCID 0000-0001-6993-9268

² (Prof.Dr.), Cukurova University, e-mail: toglu@cu.edu.tr

 ORCID 0000-0001-8270-3858

2.1. INTRODUCTION

Science and technology have long been seen as determinants of economic growth. From an economic point of view, innovative entrepreneurship dates back to the period of physiocrats in France in the mid-1700s (Audretsch, Bozeman, Combs, Feldman, Link, Siegel, and Wessner, 2002, pp. 155-157). Technology is a critical factor for long-term economic growth in modern industrial societies. However, the success of technology functions is only possible through effective complementary inputs and incentives that support the innovation process. During the time of Adam Smith, technology was seen as an exogenous factor, but Karl Marx admitted that technology was endogenous factor. Furthermore, Marx asserted that technology is endogenous factor and at the same time the cause of large-scale unemployment that would eliminate the capitalist system. From the 1950s, Solow and Abramovitz began to examine the determinants of economic growth and pointed out the large difference in the macroeconomic level of GDP and the measurement of labor and capital inputs (Landau and Rosenberg, 1986, p. 4). Mokyr et al. (2015) stresses out three concerns about technology. The first one is that technological advancement will cause the replacement of machines for labor force, the second is the impact of technological development on human welfare, and finally, the third is the inadequate technological progress.

Mansfield (1968) states that technological change is one of the most important determinants of the shape and evolution of the American economy. Technological change has led to the development of working conditions, shortening the working hours, increasing the flow of products and adding many new dimensions to our lifestyle (Mansfield, 1968, p. 3). In the second half of the 18th century, large-scale technological

breakthroughs in textile production in Great Britain and the implementation of steam power to production had a profound impact on their period and the latter. In the 19th century, the term industrial revolution was derived to describe these developments by looking backwards. Great Britain was both the first industrializing country and the technological leader of the world economy, as well as a model for other countries. In the 19th century, the manufacturing industry became the main engine for accelerating economic growth. Production technologies in the manufacturing industry have spread to other countries, thus a global industrialization race has begun. The countries that followed the industrialization process firsthand were European countries such as Belgium, Switzerland and France. In the 19th century, the US followed a different path of industrialization based on raw material exports, abundance of land and resources, and labor shortages (Szirmai, 2012, p. 406).

Acemoglu and Robinson (2012) indicate that European History is a vivid example of “creative destruction”. In Europe before the Industrial Revolution, aristocrats and elites were earning their income through land ownership and the monopolies of monarchic governments. With the industrial revolution, as a result of the establishment of industry, factories and urbanization, the price of land owned by this class decreased, while the wages of the workers working there increased. With the emergence of a middle class and the working class, aristocrats began to lose their political power. With the emergence of the danger of losing economic and political power, they have shown resistance to industrialization. Along with industrialization, elite and artisans opposed industrialization. However, the opposition of the aristocracy in England was suppressed and England continued industrialization. On the other hand, since absolutist monarchy is more dominant in Austro-Hungary and Russian Empires, industrialization is prevented (Acemoglu and Robinson, 2012, pp. 84-86). Acemoglu (2002) argues that many technical changes occurred in the beginning of the nineteenth century can be explained as a result of skill-based developments. While there was an increase in need of unskilled workers in England for making technologies profitable in the beginning of 19th century, in 20th century, there was an increase in skilled workers because of the skill-based technical changes.

The top three companies operating in Detroit, considered the main center of traditional industries for the period, had a market value of 36 billion USD, an income of 250 billion USD and 1.2 million employees in 1990, the top three largest companies operating in the Silicon Valley have had a market value of 1.09 trillion USD, an income of 247 billion 137 thousand employees since 2014. In the last 24 years, the income of these three companies has not changed, but the number of labor force has

decreased by 10 times (Schwab, 2016, p. 10). Akcomak (2016) argues that technological developments can affect labor markets in two ways: increasing productivity and creating new jobs. Technology can replace a worker totally or replace only a part of that work (Akçomak, 2016, p. 301-304).

In the past, technology helped the job market in the creation of more jobs than it reduced mostly affecting unskilled workers. Besides, economic development lead to generation of more jobs than technology (Rumberger, 1984:24). Most scholars agree that the effect of technology on economic growth is positive, however, it affects employment negatively. Table 1 shows the percent of employment in manufacturing covering the period of 1971-2012 in the USA, France, Germany, Japan, Canada, Italy, and Australia

Table 1. Percent of Employment in Manufacturing in Selected Countries

Year	USA	France	Germany	Japan	Canada	Italy	Australia
1971	24.7	28.5	37.4	7.4	1.8	28	24.1
1972	24.3	28.8	36.9	7.3	21.8	27.9	23.5
1973	24.8	28.9	36.7	7.8	2	27.9	23.3
1974	4.2	28.8	36.5	27.6	1.7	28.1	22.9
1975	22.7	28.5	35.7	26.1	20.2	28	21.3
1976	22.8	28	35.2	25.8	19.2	27.7	21.2
1977	22.7	27.7	35.1	25.3	18.8	27.6	20.9
1978	22.7	27.2	34.8	24.8	18.9	27.3	19.9
1979	22.7	26.7	34.5	24.6	19.2	26.9	19.6
1980	22.1	26.3	34	25	19.1	26.9	19.4
1981	21.7	25.8	33.4	25.1	18.5	26.3	19.2
1982	20.4	24.4	32.8	24.7	17.2	25.8	18.6
1983	18.4	24.1	32.2	24.8	16.8	25	17.8
1984	18.5	23.7	32.1	25.2	17.1	23.9	17.3
1985	18.1	23	32.3	25.3	17	23.2	16.1
1986	17.8	22.3	32.3	24.9	17.1	22.9	15.6
1987	17.3	21.8	32	24.4	16.7	22.5	15.4
1988	17.3	21.4	31.6	24.5	16.6	22.6	15.3

1989	17.2	21.2	31.6	24.5	16.5	22.8	15.1
1990	16.8	21.3	31.6	24.3	15.8	22.6	14.4
1991	16.3	21.1	30.7	24.6	14.8	22.1	13.8
1992	15.9	20.4	29.5	24.6	14.3	22	13.7
1993	15.4	19.7	28.1	23.9	14	24	13.5
1994	15.4	19.3	26.6	23.4	14	24.3	13.5
1995	15.5	19	25.2	22.7	14.4	24.1	13.0
1996	15.3	18.7	24.3	22.5	14.4	23.7	12.8
1997	15.2	18.6	24	22.2	14.8	23.5	12.9
1998	15	18.4	24.1	21.4	15	23.7	12.3
1999	14.3	18.2	23.8	21	15.3	23.4	11.8
2000	14.4	17.9	23.9	20.7	15.3	22.9	12.1
2001	13.5	17.8	23.7	20.2	15	22.4	11.6
2002	12.6	17.4	23.6	19.1	15	22.3	11.5
2003	12.3	17	23.3	18.8	14.6	22.1	11.0
2004	11.8	16.7	23.1	18.3	14.5	21.9	10.9
2005	11.5	16.4	22.2	18.1	13.8	21.6	10.4
2006	11.3	16.1	22	18.3	12.9	21.2	10.0
2007	11.2	15.7	22.2	18.3	12.1	21.2	9.9
2008	10.9	14.6	22.2	18.1	11.5	20.1	9.8
2009	10.2	13.9	20.5	17.3	10.6	19.5	9.3
2010	10.1	13.3	20.1	16.9	10.3	18.9	8.9
2011	10.2	13.4	20	16.8	10.2	19	8.5
2012	10.3	13	19.8	16.6	10.2	18.6	8.4

Source: FRED (2019)

As it can be seen from Table 1, technological change in manufacturing leads to a reduction in employment in this sector, and in all countries under consideration. Regarding the USA the percent of employment range from 24.07 to 10.3 between 1971 and 2012. In the case of France, while the percent of employment was 28.5 in 1971, it became

13 in 2012. For Germany, the percent of employment declined from 37.4 to 19.8. The percent of employment in manufacturing in 1971 was 27.4, 21.8, 28, and 24.1 in Japan, Canada, Italy, and Australia, respectively.

The remainder of chapter as follows. Section two discusses the development of technology and innovation and the role of public sector and universities. Section three gives clear picture about job creation and job losses through technology and innovation. Section four discusses technological advancement and technological unemployment, finally, section five concludes.

2.2. THE DEVELOPMENT OF TECHNOLOGY AND INNOVATION

For the period from the Neolithic agricultural revolution to the end of the 19th century was identified nearly two dozen general-purpose technologies serving to transform societies. Dates show not only the date they were first discovered, but also the dates when these technologies were begun to have a transformative effect on Western economies. Iron, for example, before it was entered into general use and transformed Western society both economically and militarily, had been produced in the 1000s BC. Technologies are divided into six main classes as material technologies, energy, information and communication technologies, tools and equipment, transportation and organization technologies. Accordingly, in 10,000 BC plants were domesticated. Domestication of animals occurred in the 8,000s BC. Pottery was found in 6,000 BC, wheel in 5,000 BC, writing in 3400 BC; Bronze emerged in 2,800 BC and iron in 1200 BC. The lever and the principle of force gain used as reel were used during the Greek modernization, the wheel and the heavy plow was used in the beginning of Middle Ages. The printing press was the product of the 15th century, the steam engine, the factory system of the 18th century, and the automatic machine of the late 18th century. Railway was built in the 19th century, steam ship in the second half of the 19th century. The internal combustion engine and dynamo were invented in the second half of the 19th century (Lipsey and Nakamura, 2006, pp. 42-43).

Kondratieff (1935) examined the waves of economies using the price levels of France, England and the United States during the 140-year period, finding that the first wave occurred between 1789 and 1814, they were in decline from then until 1849, and this wave continued for 60 years in total. The second rise was begun in 1849 and ended in 1873 and there was a decline until 1896, lasting for 47 years. The third wave was continued from 1896 to 1920. Looking at the periods when economies were entered into recession, it was observed that important techniques in production were discovered in these phases, gold prices generally increased during the uptrend, but wars and revolutions took place during

the rise of the waves. The end of each wave of Kondratieff tends to take the form of the collapse of old structures and the creation of the new ones (Marchetti, 2010, p.23).

The most systematic innovation theory developed by Joseph Schumpeter deeply influences all the theories of innovation. Schumpeter argued that economic development is characterized by “creative destruction” and that new technologies are driven by a dynamic process in which the old ones replace. According to Schumpeter, “radical innovations” create significant destructive changes, while “gradual innovations” continue the process of change without interruption. Schumpeter proposed a list of five types of innovation. The first is the presentation of a new product or a new property of a commodity consumers have not known yet, the second is the introduction of a new production method that has not been tested with experience in the relevant manufacturing sector. The third is the opening of a new market, put differently, a country entering a certain branch of manufacturing, whether it already exists or not, enters a market that it has not entered before. The fourth is the capture of a new supply source, raw material source, or semi-finished source, regardless of whether it is already present or newly created. The fifth is a new organization of any industry in a way to create or end the monopoly position (Schumpeter, 1934, p. 66).

Schumpeter (1912, 1942) emphasizes that innovation is the process through which a firm brings new technology to the economy. Schumpeter draws attention to a lack of standard neoclassical microeconomics theory and links the new technology to economic growth. The theory of neoclassical economics is based on the assumption of full competition between firms producing similar outputs by using similar inputs. In this context, competition is important; because competition does not allow any single firm to increase its output price, including a fair return to investors with salaries of competitively determined salaries, beyond its input costs. Innovation is a process that fundamentally shakes this assumption. Firms developing more innovative and inexpensive ways of manufacturing the existing goods can reduce their costs and thus gain extra profits for output at current prices. Firms developing new and better products can similarly profit above input costs, because these companies are capable of producing new products by themselves. In both cases, the basic idea is that innovation gives the “monopoly power” to some degree to the innovative firm (Morck and Yeung, 2001, pp.6-7). According to Schumpeter, the “creative destruction process” constitutes the twin process of “propagation” innovation. With creative destruction, companies are starting to use new technology instead of old one (Sengupta, 2011, p. 29).

Trott (2005) defines innovation as technological development, production, new developed product or process innovation. The author

states that innovation consists of seven types: product, process, and organizational, managerial, production, commercial / marketing and service innovations. On the other hand, Blaug (1963) divides innovations into two classes: process innovations and product innovations. While the introduction of a cost-cutting process is accompanied by a change in product mix in some cases, new products often require new equipment. In practice, these two are often intertwined to such an extent that a distinction between them is arbitrary. In addition, it is principally possible to make a distinction between making old goods with new methods and making innovations with old methods (Blaug, 1963, p. 13) Edquist, Hommen and McKelvey (1998) consider process innovations as a technological and organizational innovation, and product innovations as goods and services. The diffusion of technological products and process innovations takes place differently. For example, the Swiss industry is successful in the diffusion of process innovations, but weak in the diffusion of product innovations. The determinants of the diffusion patterns of technological production processes and product innovations are realized differently. The determinants of process innovations are industry structure, relative factor prices, regional wage differences, and unemployment rate. In addition to being different from each other, the results of different forms of innovation on productivity work depending on different mechanisms. While process innovations try to increase productivity by reducing labor input, this may not be the case for some organizational process innovations. In contrast to process innovations, the increase in productivity is associated with new products and in this case, changes in labor productivity are realized (Edquist et al., 1998, pp. 132-133). Figure 1 shows the effect of product and process innovation on employment. Vivarelli (2015) argues that product and process innovation and product innovation have different impact on employment. While process innovation leads to job losses due to introduction of automation that can be displaced for labor without reducing the level of output, product innovation contributes to job creation because of the new product and markets.

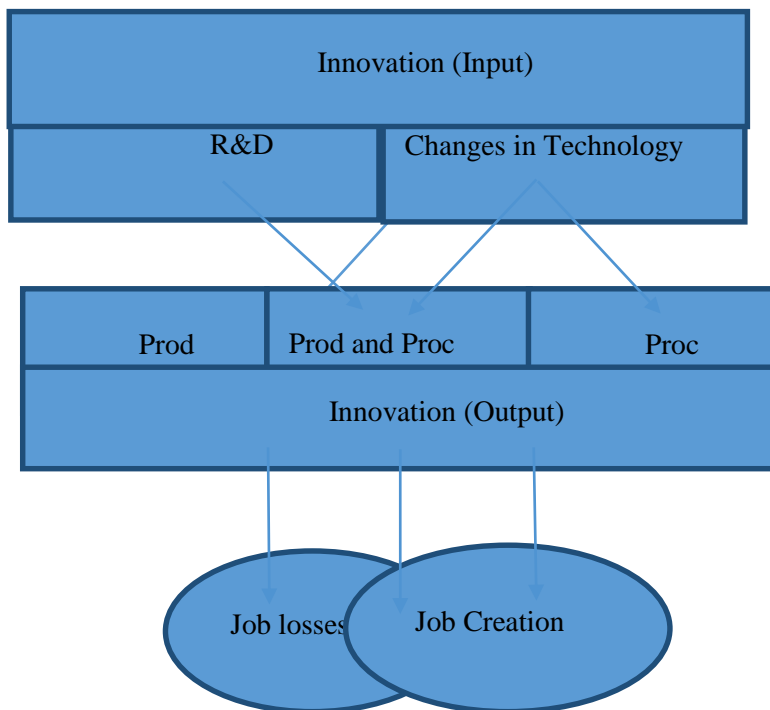


Figure 1. The effect of product and process innovation on employment
 Source: Vivarelli, M. (2015). Innovation and employment. IZA World of Labor

Acs, Anselin and Varga (2002) emphasize that economically useful information leading to innovation and economic growth plays an important role in international trade and development. Mensch (1979) argues that stagnation stems from the lack of basic innovations. Mensch divides innovations into three different categories: radical innovation, developmental innovation, and image innovation. Radical innovations are innovations that bring out completely new product and production processes. These innovations lead to new industries, markets and areas of expertise, as well as a radical change in the way of production and consumption from the current economic system to a new and better one. As these innovations have an impact on the economy, they transform the socioeconomic structure. Development innovations refer to improvements in existing products and production processes. While these innovations increase productivity and reduce production costs on the supply side, they increase customer satisfaction on the demand side. Development innovations can be very important or less important innovations. Kuznets (1972) affirms that innovations lead to other innovations. Because an

innovation that is technically reasonable and feasible but has no economic attraction until the moment of implementation would be able to raise the economy rapidly, requiring another innovation. More generally, an innovation enables further innovations to emerge to the extent that it is possible to conceptualize, design, and work on a large number of complementary and other related technologies (Kuznets, 1972, p. 437-438).

2.2.1. The role of public sector in technological innovation

Governments have traditionally played an important role in promoting technology, either by supporting technological development or by creating a suitable environment for technological development (World Bank, 2010, p.7). Innovation is also very important in terms of competition. However, innovation is also important in the government sector as it increases service quality and reduces costs. In addition to important indicators such as productivity growth, factors such as new regulations and policies increase public sector innovations. During the global economic crisis, public sector innovations were the source of radical solutions (Cankar and Petkovšek, 2013). Zschou (1986) stresses out that the role of the state in technological development and economic growth cannot be denied, but the role of the state at this stage should be appropriately determined. The appropriate role mentioned here is not related to targeting specific firms, industries or technologies, but which of these firms, industries, and technologies promotes the innovation process. In this case, the state should have a role in the creation of an environment that new ideas and organizations will develop in. When the developed countries are examined, it is seen that the public sector has an important share in the Gross Domestic Product. Efforts to achieve innovation in the public sector are expected to create public benefits, such as rising living standards. In addition, increase in production, service efficiency and increase in quality of public services can be considered (European Public Sector Innovation Scoreboard, 2013).

Governments play a vital role in innovation systems in two ways. First, they produce and spread new information through government research centers, universities and companies. Second, governments finance and support science, technology and innovation activities by creating legal institutions, regulations and policies. There are many tools available to governments to develop innovation systems, such as trade and public investment policies, supporting the small and medium companies, education policies, and regional development of science, technology and innovation policies (Padilla-Pérez and Gaudin, 2014, p.750). Likewise, Landau (1986) argued that governments can promote technological innovations through macroeconomic policies. Accordingly, governments can raise spending levels, implement tax-favorable investment policies,

control money supply and intervene in international money markets to control the value of the currency (Landau, 1986, p. 21). Freeman (2004), asserts that no matter which countries or institutions put forward the original scientific and technical ideas, the constant success of innovations in the new technological system is related to the quality and number of people being able to understand this information. This situation depends on the control, information, education systems and openness level of that society (Freeman, 2004, p. 552).

Lundvall and Borrás (2005) argue that science, technology and innovation policies should be established with the help of systematic strategies. Science policies should focus on creating scientific information and support universities, public research centers and R&D laboratories. Technology policies should focus on the development and transformation of technological information and innovation policies should generally be established in a manner that encourages the process of innovation, commercialization and dissemination. In their approach on supply and demand policies, Elder and Georghiou (2007) favor the creation of policies in the supply policies such as providing financial support such as tax incentives, providing technical support to small and medium enterprises, and giving awards to industrial research and information sharing. Demand policies include legal regulation, public procurement and private demand support. Nelson and Langlois (1983) observed that political factors were taken into account in their study of the seven industries in which the US government supports technological development. From basic research in the aviation, computer and semiconductor sectors, it has been seen that government has an impact on the experimental development of new ideas.

The quality of the public research infrastructure and the industrial connections of this infrastructure constitute one of the most important national resources in terms of supporting innovation. State-funded research institutes and universities are the main actors of these researches, not only producing basic information for the industry, but also introducing new methods, tools and invaluable skills. Research conducted in organizations such as state-funded research institutes and universities is increasingly supported by enterprises cooperating with public institutions in joint technology projects, contracting about specific research, or financing staff and researchers. In addition to this R&D cooperation, the public research sector serves as a comprehensive pool of scientific and technical information in specific areas. The ability of industry to access this information in general is gaining importance. This access is provided through patent data, published information on new scientific discoveries, information in new tools and methodologies, access to scientific networks, and technology-fed firms (OECD, 1997, p. 9-10).

2.2.2. The role of universities in technological innovation

Regarding universities, they play an important role in the source of knowledge and in the development of industry-based technology. Since the relations between universities and industrial innovation increased since the 1970s, governments have taken various initiatives. The main purpose of these initiatives was to achieve economic development with the contribution of university research. These include the creation of science parks on campuses close to the university, the establishment of business development centers and the support of the initial capital of these centers by the public, and the establishment of bridges in the connection between universities and industrial innovation (Mowery and Sampat, 2005, p.209). Kennedy (1986) indicate that there are two reasons for increasing the link between industry and research universities. The first is to fill the gap if the government withdraws research support from universities, and the second is to expand the technology transfer process.

Martin and Johnston (1999) analyzed the transition to the knowledge economy, the increase in the number of organizations involved in research and technological development, as well as why the concept of national innovation system becomes more important as a result of some factors such as the increase in the number of innovation-organizations that need to share information, learn from others or partners. In addition, they argued that there is a need for revitalization, expansion and deepening of interactions between actors in order to strengthen the national innovation system. For instance, Anselin, Varga and Acs (1997) found a positive and meaningful relationship between university research and innovative activity. Audretsch and Feldman (1996) found that university-based R&D activities led to significant expansion, particularly in the electronics sector. Audretsch (2014) argued that the forces that shape economic growth and performance also affect the role of the university. While the entrepreneurial university is developing to transfer technology and produce new knowledge-based initiatives, the role of the university in the entrepreneurial society has also started to increase. Cohen, Nelson and Walsh (2002) found public-sector industrial R&D is critical for a small number of industries and industrial R&D has a significant impact on a large part of the manufacturing industry. The results also show that university research affects industrial R&D through published articles and reports, public conferences and meetings, informal information exchange and consultancy services. D'este and Perkmann (2011) showed that in the UK, researchers in the physical and engineering sciences interact with industry to advance research rather than commercialize information. Using a data set covering all UK universities, Perkmann, King and Pavelin (2011) found a positive relationship between the quality of faculty members and industry participation in technology-oriented disciplines. Hottenrott and Lawson

(2014) concluded that industry-funded research units were more likely to receive ideas from the private sector.

2.3. TECHNOLOGICAL INNOVATION AND TECHNOLOGICAL UNEMPLOYMENT: JOB CREATION AND JOB LOSSES

Technological advancement lead to the 4th industrial revolution has caused to concern about the future of employment resulting in job losses (Sorgner, 2017, p. 11). Rumberger (1984) indicated that previously, technological advancement replaced unskilled labor in several different industries; however, technological innovation currently threatens the skilled workers. Moreover, Vivarelli (2015) asserts that technological innovation stimulates the economy of countries by virtue of process and product innovation, which have different impact on the employment. The author concludes that process innovation causes job losses in result of the new type machinery which replaces labor force. However, product innovation may create new job opportunities. Vivarelli (2013) provides comprehensive survey on the impact of technological change on employment. Hall, Lotti, and Mairesse (2008) find that product innovation contributes to a positive effect on employment for Italian firms spanning the period of 1995-2003. Harrison, Jaumandreu, Mairesse and Peters (2014) obtain similar result. The authors conclude that product innovation leads to employment growth in a positive way for France, Germany, Spain and the United Kingdom using community innovation survey. Jaumandreu (2003) find that product innovation has a positive effect on employment for Spanish firms. Similarly, Crespi, Tacsir and Pereira (2019) find that product innovation leads to employment growth at firm level for Argentina, Chile, Costa Rica, and Uruguay. The same result is obtained for the Korean manufacturing firms by Lim and Lee (2019). Elejalde, Giuliodori and Stucchi (2015) provide evidence that while product innovations contribute to employment growth, process innovations do not lead to employment growth. Dachs and Peters (2014) show that successful product innovations lead to an increase in employment. Benavente and Lauterbach (2008) reveal that employment is affected by product innovations positively. Castillo, Maffioli, Rojo and Stucchi (2014) present that both process and product innovation lead to an increase in employment and wages in Argentina. Okumu, Bbaale, and Guloba (2019) find both process and product innovation have a positive impact on employment growth in Africa using World Bank Enterprise Survey. Lachenmaier and Rottmann (2011) find that the impact of innovation on employment is positive for German manufacturing firms for the period of 1982–2002. Piva and Vivarelli (2004); Piva and Vivarelli (2005) find a positive effect of innovation on employment for Italian manufacturing firms spanning the period from 1992 to 1997. Van Roy, Vértesy and Vivarelli (2018) show

that innovation affects employment positively in high-tech and medium-tech firms.

Houseman (2018) argue that the reason behind the job losses in manufacturing sector is that the real output growth in manufacturing and the labor productivity growth. Borenstein (2011) argues that while robotic innovations create new job opportunities, the other jobs will be reduced. Loi (2015) agrees that technology will increase the demand of more skilled workers. Arntz, Gregory and Zierahn (2019) indicate that the power of computing increases at a significant rate. Nowadays, machines are more capable of performing important tasks. By virtue of these developments, there is great concern about technological unemployment. Bloom, McKenna and Prettnner (2018) argue that workers in many occupations become at risk of automation. For instance, Frey and Osborne (2017) examined the impact of technological advancement on current jobs implementing a new methodology for 702 occupations. The authors find that 47% of total US employment's job is at risk including, transportation, administrative support occupants. Following the approach developed by Frey and Osborne (2013), Arntz, Gregory, and Zierahn (2016) provide evidence that 9 % of jobs are automatable in 21 OECD countries. Besides, the share of automatable jobs varies across countries. Utilizing the same methodology, Chang and Huynh (2016) examine the effects of computerized technology for five ASEAN economies. The results show that 56 % of jobs are at risk, including hospitality, wholesale, and manufacturing. Using survey of adult skills, Nedelkoska and Quintini (2018) investigate the risk of automation for 32 OECD countries. The authors' find that 14% of jobs in OECD are more likely to become highly automatable. Using task data Arntz, Gregory and Zierahn (2017) conclude that the risk of automation in US jobs fell from 38 % to 9 % when taking into account the spectrum of tasks in occupations. Borland and Coelli (2017)examine the impact of computer-based technologies on employment for Australia. The authors provide no evidence that computer-based technologies lead to e reduction in the availability of the total amount work. Sorgner (2017) find that the expected probability of occupational changes such as losing a job, changes at the place of employment increases with the automation. The time of occupational changes will be expected to take place in two years by respondents. On the contrary, on the baseline scenario for Germany, Reljic, Rinaldo, and Mario (2019) show the plans of firms on the technological investment leads to an increase in employment by 1.8%. Dauth, Findeisen, Südekum and Woessner (2017) analyse the impact of robots on manufacturing sector in Germany. While the results provide no evidence that robots cause total job losses, they change the composition of employment. However, the robots responsible for about 23% of the decrease in manufacturing employment for the period of 1994-2014.Regarding US local labor markets, Acemoglu and Restrepo (2017)

reveal that industrial robot usage may lead to a reduction in both employment and wages. Graetz and Michaels (2018) investigate the economic impact of industrial robots for in 17 countries spanning the period 1993-2007. The results show that the impact of robots on labor productivity growth is 0.36 %. Besides, the authors find that while robots do not cause a significant reduction in total employment, they reduce the employment share of workers with low-skill. Cords and Prettnner (2018) stresses out that automation capital changes the labor market balances. An increase in automation capital leads to decrease in low-skill labor and increase in high skill labor, causing a rise in unemployment rate in low-skill labor, and a decrease in unemployment rate in high skill labor. Zhou, Chu, Li and Meng (2019) investigate the effect of artificial intelligence technology on occupations for China. Authors find that artificial intelligence technology has significant substitution impacts female, low education, low-income labor. Piva and Vivarelli (2018) investigate the nexus between innovation and employment for 11 European countries. The authors find that capital formation causes a reduction in employment, suggesting that a technological change affects labor force negatively. Meriküll (2010) show that innovation contributes to an increase in employment in Estonia. Aldieri, Makkonen and Vinci (2019) find that regional innovation activities have a positive impact on employment for Finland. However, low-skilled labor is affected negatively from regional innovation activities. On the other hand, Matuzeviciute, Butkus and Karaliute (2017) do not find any significant relationship between technological innovations and unemployment in 25 European countries.

2.4. CONCLUSION

In this chapter, the impact of technological on the economy and its effects on the employment were discussed. Furthermore, more attention was given to the development of technology and innovation and the effects of technological changes on the countries' economy in the 19th and 20th centuries. Besides, most theoretical and empirical literature indicate that technological development may lead to job losses. Vivarelli (2015) asserts that changes in technology contributed to the product growth, which resulted in reduction in job losses in manufacturing sector. In addition, as it is shown in Table 1, technological advancement causes a reduction in the percent of employment in manufacturing in many countries supporting the decline of employment process. Most empirical studies reveal that job losses may occur in results of product innovation; on the other hand, product innovation contributes to job creation. In other words, while product innovation creates the job opportunities, process innovation destroys it. Thus, policy makers should design and implement effective innovation policies to create more job creation- friendly environment

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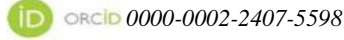
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CHAPTER III

EFFECT OF INNOVATIONS ON MARKETING

Fatma Gül Bilginer Özsaatçı¹

¹ (Dr.), Hasan Kalyoncu University, e-mail: fatmabilginer@gmail.com



3.1. INTRODUCTION

Innovation is defined as “*the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations*” in OSLO Manual.

Innovation is inevitable in the current markets, in which the cutting-edge technologies are implemented. There is no field, establishment or a department where the innovation is not in effect. Yet, an important aspect at this point is the successful integration and implementation of innovation in all processes. The changes and cycles experienced in the markets are significantly effective in consumer behaviours and consumer relations as the target audience of marketing departments, marketing strategies, marketing communication, brands and in emergence of new strategies.

Therefore, this section explains the effects of innovation in marketing and aspects of brand as the heart of consumer, which is the target audience of marketing, and the emerging new marketing approaches were addressed.

3.2. INNOVATION AND CONSUMPTION TRENDS

The changing technology and internet are effectively used by generation Z, who is particularly highly influential in current consumption trends. Therefore, we will shortly mention the features of generation Z under the heading of innovation and consumption trends and lay emphasis on their consumption habits and their influence on marketing activities and the marketing itself.

There are habits and mindscapes in all periods of humankind emerging in accordance with that era’s specific culture, values and living standards. The understanding of these periods became easy with creation of concept of generation.

The things transferring onto a new generation changes during the transfer (Polimeni, Burke and Benyaminy, 2009:64). Innovation is considered to be one of the driving forces of these changes. In this sense, the changes experienced between generations have caused the change of consumer habits, desires and needs and expectations. Thus, innovation is considered to be an effective power in changes of consumer habits and trends.

65 percent of global population will consist of generation Z in 2025. In this sense, the current establishments may only continue to exist in the future if they operate as per the requests and needs of this generation.

Four basic tendencies characterizing the consumers of generation Z are as given below.

3.2.1. Focus on innovation

This generation has an innate contentment for the virtual world. The internet has always been there for these consumers. This generation does not feel surprised against aging of products, instead, they have a higher expectation for smaller better versions of technological products. It is likely that these consumers will feel that innovation is provided continuously, rather than feeling that they have been left behind and overloaded with planned aging. As consumers, generation Z has always had more options in the market than previous generations, therefore, dependence on design or aesthetic difference will probably make it difficult for them to choose. While spending can be discriminatory in many areas where technological and design innovation is present, this is the area where this generation is willing to spend its money.

The only limit to the expectations of this generation may be innovation. Generation Y consumers have lower expectations for future “radical” changes in retail environments and market delivery than their parents because generation X (Baby boomer) has seen less change than their parents. While the new trend (e-commerce, barcodes, etc.) is as usual for the young people, on the other hand, it is obvious that older consumers who have seen seismic shifts in retail over the past two decades are expecting constant changes.

3.2.2. Convenience

Although generation Z is unique in many ways, they will insist on comfort as a way of forming parents. If we recall that the majority of generation Z is children of generation X, Generation X has often been overlooked by marketers, as they do not have the size of the Baby Boomer ancestors or the "boomlet" generation Y they follow. Generation X is known for their independence, cynicism, and brand infidelity. As most of X generation grew, they have become latchkey children responsible for

taking care of themselves and their siblings, and they are very confident in finished products. It is probable to see the reflection of comfort item usage at home in Generation Z.

It is likely that the lack of exposure to consumption from scratch and the pressure for success on today's youth at a young age will reflect on increased reliability regarding product features (eg time-saving devices or mobile devices), product delivery (eg retail channels that increase the convenience of purchasing), product experience (for example, products that are easy to cook, consume, install, etc.) and product messaging (for example, "just in time, mobile" or abbreviated ads) for convenience. It is clear that most e-commerce features (eg delivery charges, consumer tracking) that create uncertainty or concern for Baby Boomers or Generation X will not have the same concern for Generation Z.

Generation Y (similar to Generation Z at this point) showed much less concern than Baby Boomers about being watched by large companies. Generation Y saw this as an acceptable and normal practice that would help companies offer better and more specific products to them. While Boomers wanted "anonymous personalization" (for example, by self-designing in the drop-down selection), Generation Y felt much more comfortable to be "recognized" by the companies and getting pre-designed options.

3.2.3. Confidentiality

Like the parents of generation X, generation Z will be greatly affected by growing in difficult economic times. Studies of the recession periods and 1970s around the Great Depression indicate that children growing in the recession feel generally less secure, settled in low wage jobs, and more afraid of financial difficulties.

However, how children react to such an environment (for example, college-age individuals are often the most affected by future earnings potential) vary greatly by family status (for example, the possibility of decreasing the earning power is higher for the sons of fathers who have been laid off in a recession than the ones whose fathers have continued their employment) and personality. It is believed that the generation y and z generation in general are less concerned about privacy than Baby Boomers and generation x.

Generation Y is generally defined as "rightful" consumers with high expectations of lifestyle and comfort. Given a different parental influence and the current economic environment, generation Z may be more pragmatic and famine oriented. Generation Z may feel more careful and discriminatory on where to spend money. Similar to Generation X, this can lead to very brand-sensitive but not brand-loyal consumers. For some

Generation Z individuals, it can lead to lower lifestyle levels than expected, but it can act as a motivating force for others.

3.2.4. Escapism

Generation Z can be a strong market for products appealing to escapism. There are several reasons for this. First, this behaviour at home will most likely reflect the generation of their parents. Generation X is often described as a generation prone to the inevitable pursuit of consumption, including entertainment (eg movies, music, video games), extreme sports, eating out, and promoting social "tribes" (networks of friends that replace distant families). For generation X, this was the answer to economic difficulties, increased responsibilities at a young age, and displaced families. Generation Z, on the other hand, is not in the "latchkey child" mode, despite the similar and increasing responsibilities, today it is known that most children are under more stress and pressure to succeed at a young age.

The technological developments 1) creating entertainment products such as more realistic and attractive video games, 2) offering more access to social networks 24/7, and 3) offering more mobility in devices that offer the ability to escape (e.g. having mobile phones with media and internet availability) has been a facilitated opportunity for the desire to escape from these facts. Generation Z is increasingly motivated to create or find "virtual" or "produced" worlds where experiences draw near ideal dreams.

As the Internet, social media and technology penetrate more into people's lives, consumers' behaviours are changing. Now consumers are much more knowledgeable, conscious, questioning and sceptical than before. While examining a product in more detail, making a comparison and making the decision to purchase, the consumers desire to be fully convinced. The consumers do not buy the product without being sure of the quality, of getting what the consumers expect, and the price.

The characteristics of these new generation global consumer trends are as given below (Kasriel-Alexander, 2017):

We have reached a point where mass produced products have lost their popularity with innovation. The internet enables consumers to purchase and discuss unique, customized and exotic products and services. These extraordinary consumers compete to be the centre of attention and express their needs clearly. These consumer groups are exploring more purchasing options and turning to solution-based designs. In addition, these consumers talk more openly and more in areas such as travel, hotel accommodation, furniture design, medical care and fashion, which reveals that these needs are less niche and more popular.

Today's consumers are very impatient. The digital world has provided more of what they want when they want, called "IWWIWWIWI" (I want what I want when I want it). These consumers are seeking impressions and immediate satisfaction. These consumers are seeking impulses and instant satisfaction. These consumers wanted service yesterday and now they want a real-time virtual dialogue with their brand. Ordering in advance is not enough anymore. Brands respond with a range of accelerated business models. At this point, smartphones got involved. For example, in traditional fashion collections, where consumer impatience is the most, the competition has been extremely heated with access to mobile internet since traditional systems have failed.

Despite the personalization of mass-produced products, today's consumers have come to the stage of demanding experiential luxury from the stage of demanding high-level personalization. Consumers shifted to enjoy luxury services without buying focus. Consumers can now accept customized or at least partially customized products. While more mass-produced personalized products are available, high-level personalization changes as the demand shifts from the necessity of accepting what is happening to experiential luxury.

Another indispensable element for today's consumers is the aftersales experience, which has become an increasingly important part of the value proposition of a product or service. The form and tone of the answers given in communication with after-sales customer representatives are also critical parts of this customers path. As the customer service expectations of consumers increase, they are more willing to address the questions after purchasing the brands and the complaints and criticisms that will affect the consumer's recommendation and the next purchase.

Another concern of consumers in our rapidly changing world is the security. Consumers are also experiencing uncertainty mixed hope with the promise that artificial intelligence and technology will protect us from harm in an uncertain world.

3.3. EFFECT OF INNOVATIONS ON MARKETING STRATEGIES

With a rapidly changing world in a globalized and ever-growing competitive environment, businesses must constantly change their products or services, management styles, marketing and business development strategies. The best way is to determine the innovations that the customer wants and what the customer needs in line with the production process in this scenario where competition is intensified. This is because innovation is seen as one of the main strategies for gaining customer loyalty. The fact that customer satisfaction has become extremely important for businesses has led to an increase in interest in the field of

production. This has revealed the need for innovation and customer focus to work synchronously to increase business performance (Pishgar et al., 2013).

Innovation not only protects existing consumers but also attracts potential customers. Consumers are giving up their brands not only for lack of performance and quality but also for lack of innovation. Innovation contributes to a sustainable business cycle. Customer loyalty can only be achieved through customer satisfaction. Customer satisfaction is essential not only in terms of quality but also in ensuring customer loyalty in terms of profit, expectations and corporate image. (Blut et al, 2014).

From a business point of view, innovation is associated with new product development, product-specific features, packaging, and even design. When viewed from a broad perspective, it briefly means that new ideas and methods create a change in the present state. Innovation enables businesses to become distinct and stand out in the competition in the market (Seng& Ping, 2016). This is significantly true in non-homogeneous and competitive markets.

By providing a convenience, feature or design that cannot be obtained from their competitors, companies encourage customers to predominantly choose them. Innovations provide many contributions to products. The success of innovation on the product both provides added value to the product and is effective in increasing performance. In this way, the product becomes more attractive for consumers. In today's fiercely competitive markets, packaging is extremely effective in differentiation of products and in the consumer purchasing decision process. The success of innovations in packaging also affects consumer decision-making processes, making the product attractive for customers (Simha, 2013).

There are basically two types of innovation, technical and non-technical innovation. In the non-technical type of innovation, the focus is on management and sales management as well as strategic marketing strategies. In this type of innovation, it is possible to ensure loyalty by synchronizing market and marketing innovations in the harmonization of brand personality and brand identity. Technological innovation both makes a new product more dynamic and can measure the effectiveness of outputs. While technological innovation is effective in the formation of high-tech operations and services, non-technical innovation is effective in the management, sales and marketing of products or services (Foroudi et al., 2016). Non-technical innovation, which is effective in the success of technological innovation, is extremely effective both in the formation of a collaborative structure and in adapting to changing market conditions. In addition, when both types of innovation are effective in customer loyalty, they must work in a way that complements each other (Hervas-Oliver et

al., 2014). Moreover, technical and non-technical innovation capacities of enterprises are effective in the formation of consumer experiences. This capacity is effective in building reputation and brand loyalty. In addition to innovation, which has a strong relationship with business performance, customer loyalty is also directly related to business performance. As a result, consumer participation and loyalty, which are the indirect results of both innovations, are a measure of the performance of the business (Ngo & O'Cass, 2013). On that note, the more successful businesses are in both innovations, the more success they have in brand loyalty, which is extremely effective in both their performance and the sustainability of the business. Because the important thing for today's businesses is to establish brand loyalty and to ensure its continuity.

3.4. EFFECT OF INNOVATIONS ON MARKETING COMMUNICATION

Since the day they were founded, businesses have had to communicate with the society which they live in, with the potential and existing consumer masses, the public as well as all partners and competitors in order to sell their products or services and to express themselves.

One of the fields, where developing technologies cause big changes, is communication. Innovation has become an important element in the field of communication as in every field. Sustainability and success in communication can be achieved through innovative ideas and activities.

The increase in the use of the internet with the innovation and the rapid spread of social media applications have revealed online communication channels that can meet with the consumer in the field of marketing, provide interactive communication, reach a wider audience and bring creativity to the forefront. Innovation, which is also very effective in communication, helps to communicate better with consumers through new channels and improve the services offered to customers in social and digital media, communication companies and advertising agencies. Therefore, innovation must be effective in all communication channels.

Marketing communication is a continuous dialogue between business and consumers based on sharing, by using all the actions of a business, in order to affect the product qualities that can satisfy the needs of a business psychologically and physically, and to affect the purchasing decisions.

The concept of marketing communication is synonymous with the concept of promotion and is a strategic marketing tool that informs consumers about the goods or services involved in the business activities and enables the business to continue its activities (Mucuk, 2010: 173).

With the development of technologies and globalization, an integrated marketing communication approach, which is indispensable for today's markets, has emerged as a result of the insufficient marketing communication.

Integrated marketing communications is as given below according to the definition of the American Marketing Association (AMA); *“Integrated marketing communications is a concept of marketing communications planning that recognizes the added value of a comprehensive plan that evaluates the strategic roles of variety of communication disciplines – for example, general advertising, direct response, sales promotion, and public relations – and combines these disciplines to deliver clarity, consistency, and maximum communications impact.”*

The importance of integrated marketing communication that emerges at the end of the 20th century is increasing day by day (Grove, Carlson & Dorsch, 2002; Cornelissen, 2001; Hartley & Pickton, 1999). changes have occurred (Kitchen et al., 2004a; Phelps & Johnson, 1996; Duncan and Everett, 1993).

These changes are the multiplication of media tools, the spread of consumer markets and the value of the Internet in today's society, thus, have affected technological innovation (Pilotta et al., 2004; Peltier, Schibrowsky and Schultz, 2003; Reid, 2003; Garber and Dotson, 2002; Fill, 2001; Low, 2000; Hutton, 1996). This left marketers in a challenging and competitive environment, while trying to meet the demands and needs of the customers, they also developed long-term relationships with them. Integrated marketing communication helps to create coordinated, simultaneous and consistent messages among various communication channels. In addition, integrated marketing communication is valuable as it places great emphasis on the importance of all stakeholders and especially customer loyalty that can only be created through strategic relationship (Jin, 2003/2004; Cornelissen, 2000; Eagle and Kitchen, 2000; Pickton and Hartley, 1998; Rose. and Miller, 1994).

As a result of the increase in media channels at the end of the twentieth century and the beginning of the twenty-first century, the coordination of integrated marketing communication efforts that provide a single and unique image to all target audiences through all communication channels has become both more difficult and more important (Kitchen & Burgmann, 2010).

Technology and innovation can affect integrated marketing communication (IMC) in two fields, namely marketing and consumer perspectives (Kitchen et al., 2004a; Schultz, 1993f).

The markets have become more integrated and dependent on each other with the globalization. Therefore, the brands had to integrate the elements of the promotional mix by coordinating both national and international brands together (Kitchen, & Burgmann, 2010).

A global market that becomes more temporary (non-permanent) worldwide via the Internet can lead to a consumer- and consumption-oriented marketing environment. This environment also supports the technological development of marketing communication strategies so that it is implemented in new extraordinary applications such as PR, database and one-to-one marketing as well as traditional advertising techniques (McGrath, 2005a; Edelman, 2004; Gonring, 1994; Nowak & Phelps, 1994). An example is the social networking website MySpace, which hosts more than 17 million monthly visitors in the United States. Marketing communication experts recommend the use of these new social networks to establish a continuous communication with existing and potential consumers (Economist, 2006a). As a result, technology not only provides communication and connection between individuals, but also facilitates communication and connection between businesses and individuals.

The experienced changes and transformations had a significant impact on advertising. Consumers now state that they are tired of being too intrusive to Advertising (including digital advertising).

So, what has changed in the past 20 years? Basically, everything: More media outlets. Different lifestyles. Different behaviours against the media. Consumers are becoming more and more sceptical about advertising and the authority of companies. New social pressures. New insights on issues affecting the way institutional discourse is absorbed, such as gender, policy and the environment. Finally, a new context of digital interaction, expression and collaboration has been developed that is called the web which creates more complexity. This is also a digital context driven by consumer content in recent years, hence a social environment. In this equation, only the people factor is still the same. People still need to buy something, and they need information to understand the world. Another factor that remains the same is the organizations trying to reach people with persuasive messages. While the advertising model is considered to be intrusive today, the agency model is considered outdated and they asked people to be innovative. It has become quite difficult to attract the attention of consumers today. When we look at how to be innovative in such a situation, marketers today have new powerful tools in the context of advertising. These are (Costa, 2015)

Data: Innovation is achieved by listening to consumers and resolving trends. Social media is the biggest unmanaged focus group so

far. From a quantitative perspective, it can unlock trends based on word of mouth and rumours spread across the network.

Content: Innovation comes from a combination of content that people consume today from different sources, in different formats, at different moments. This is a creativity challenge in principle. Companies and agencies can use an incredible range of options to create responses, links and to express brand recommendation. One way to do this is to use the audience as a digital mouth-to-mouth advertiser. The other is to integrate into the same environment and offline medias to connect with the brand. Advertising creativity is in a 3D and closed/online state today.

Metrics: Lastly, you can get feedbacks from all this process and continue to innovate with active metrics from various sources. The advertisers never had too much data to feed their dashboards. Now the question is how to make all these metrics meaningful.

Innovation is to be more sensitive and react to data captured simultaneously from companies for all companies today. Innovation is the more flexible acknowledgement of marketing communication organizations (customer + agency) what consumers want to hear and when they want to hear. New marketing is based on speech. It is necessary to maintain the flow of speech profitably for success.

Innovative methods are the elements that bring success in communication, product promotion, advertising campaigns, announcements and brand building processes. In addition to their usual methods, companies that differentiate with innovation will be the ones who use new ways of communication and produce creative solutions. In this way, the perceptions of consumers will also change, and businesses will be standing out from their competitors.

Today, the positioning of the brand has become an important element in the perception of the brand they promise with the brand personality dimension. It is necessary to manage the perception process of the brand with a difference and innovation that is in harmony with the target consumer mass and focused on emotions in order to lead in the competition and gain an advantage.

3.5. EFFECT OF INNOVATIONS ON COSTUMER RELATIONSHIP

The world is changing faster than ever before. Every day we wake up to a more technological world. The concept that develops these new technological developments and provides serious competitive advantage for countries is “innovation”. Innovation makes itself felt in every aspect of our lives and reshapes our lives. Let's consider consumer behaviour such as food, transportation, consumption, purchasing, sales, consumer

behaviour, etc. innovation does not only change a field, but also adds a different dimension to the understanding of marketing along with consumer behaviour. The concept of marketing is interpreted as the promotional activities that should be done for many people just to sell the products. However, marketing covers all activities from the emergence of the product idea and until the end of the product life cycle. Marketing is the most effective and obligatory way to achieve personal or corporate goals in this sense.

The understanding of marketing has changed over time. In the past, marketing was focused only on the sale of manufactured products. The marketing concept has evolved to offer customer-oriented solutions with the evolving environmental conditions and consumer behaviour, technological developments, increasing importance of web 3.0 tools in our lives, and the undeniable effect of global trends on our lives. The aim now is not to increase profit by selling more products to the customer, but to increase sales by satisfying the customer.

Customer-oriented marketing understanding has improved as a result of the spread of the internet, changes in market opportunities, developments in consumer tendencies and communication, globalization and the formation of new competitive markets, and the increase of the level of education and communication. The expectations of customers from products and services have increased, therefore, customer/service-oriented marketing understanding has emerged with all these developments.

Significant changes have occurred in marketing practices, marketing understanding and approaches until this day. These changes have led to the emergence of today's markets, where competition is extremely hot, product differentiation becomes difficult, global markets and competitors are increasing and customer satisfaction is getting more difficult. The fastest change was seen in the consumer behaviours, and the businesses started to implement different marketing practices and strategies with technological developments. At the beginning of these practices, businesses try to keep their communication with consumers continuously by using social media more actively and intensively. With social media marketing, businesses are successful in understanding consumers, determining needs, realizing market researches, communicating and advertising (Saritaş, Korkmaz&Tunca, 2017).

The most successful e-commerce sites in the service sector, where we meet the introduction of innovation, is *YemekSepeti*. *YemekSepeti* has made a difference with its service and ability to predict changing consumer behaviour and its ability to develop itself in this direction. *YemekSepeti* enabled its customers to order directly from itself instead of the restaurant, thereby improving their relationship with the customer with its various

promotions and discounts. The problem of not being able to decide what the customer needs is solved by offering more than one alternative. In addition, it has developed the site with its successful works at key points such as easy usage and easy ordering for customers, and as a result of this success, it was sold to Delivery Hero for \$ 589 million in 2015.

YemekSepeti is a giant player serving in the food industry without having any restaurant. The success of this company, which receives 30,000 orders per day, was achieved by keeping up with the changing demographic structure, developing a business model according to consumer behaviour, blending social cultural changes and technological innovations with the understanding of marketing. *YemekSepeti* developed processes for the customer and achieved success with its customer-faced marketing efforts by getting rid of the traditional marketing approach.

Due to the increasing competition, global trends and economic conditions, the companies that can remain successful are the companies that care about their customer needs and desires, keep up with technological developments and offer their customers more value than their competitors. There are as many as unsuccessful examples as the successful examples in the market. While the marketing activities that have been done correctly and which have worked through the whole process provide acceleration for the companies, the wrong studies cause the companies to go downhill with the same speed. Success comes with the right choice of money-buyer, well-defined customer expectations, correct positioning, and correct communication.

It is not enough to consider the marketing activities only in terms of customer behaviour. Environmental factors are factors that affect customer behaviour and thus, the marketing activities.

A very popular example. Walmart closing 269 stores. Walmart stated that the reason it closed retail stores is to be more effective in e-commerce activity. For this reason, it has decided to close its centres, whose performance is currently lower than other retail points. This behaviour of Walmart is an indication of the transition to service-oriented marketing activities considering the changing consumer behaviour. Walmart is changing to keep up with the changes in the market. The biggest factor behind Walmart's closure is the inability to eliminate Amazon, which is strong in those geographies. While Amazon is developing a business model that adapts to changing consumer behaviour, Walmart is late to follow this trend. The article titled *Walmart suffers worst sales performance in 35 years*, published in the Financial Times newspaper on February 19, 2016, confirms this assumption: Mr. Saunders stated "For the past 10 years, Walmart appeared to be on the back foot in terms of rethinking its business model for this new landscape. And, as the evidence

shows, the impact on it has been negative” and added “Given that online is where the growth is, Walmart needs to play far harder in that space if it is to retain its retail crown over the longer term. It is spending billions on competing with Amazon online and integrating its stores with e-commerce, such as its mobile pay app and click-and-collect pick-up service that is proving popular. Walmart is also expanding its online grocery service to more parts of the US. The rise of online shopping, especially at giant merchants like Amazon, has also threatened Walmart’s dominance of the retail industry.”

The rapid commercialization of the Internet, the globalization of business life, the appreciation of customer value, the need to create a customer database, the Internet and big data penetrating every area of our lives, its importance to increase even more for the foreseen future, the rise of young population and thus, change of consumption habits, the increase of culture and education levels, the ease of access to the internet have changed and will continue to change marketing. It should be considered that marketing is an ensemble. Marketing is the whole picture. Without a customer, there is no marketing, without marketing, a customer cannot be gained. Customer-oriented marketing is the future of companies. It will be possible to make a difference in competition, to stand out from competitors, to provide competitive advantage in the long run, to continue their lives with service-oriented marketing studies conducted with the right techniques.

3.6. BRAND-DRIVEN INNOVATION

The brand and innovation management has become an increasingly important priority for businesses over the past few decades. Businesses rely on strong brands and product innovations to gain competition advantage. The needs and benefits of brand and innovation management among each other suggest that a deeper integration is needed between the two.

If consumers are integrated into the value creation process, the negative impact of product innovation decreases, and this commitment then significantly influences the product when a brand is closely related to innovation.

There are three main results brought by brands and innovation, and these results seem to represent a productive circle. There are a number of events that constantly occur as a result of brands and innovations interacting to create value for an organization. These three stages are:

1. Brands providing strategic focus and guidance for innovations;

2. Brands supporting the promotion and adoption of innovations;
3. Successful innovations improving brand perception, attitude and use.

The logic of this efficient cycle is as follows. A rooted brand has a lot of meaning and expectations for consumers. This brand meaning and these expectations are central to the positioning of the brand and provide strategic focus and guidance to future innovations. Ultimately, consumers will decide what they think and feel about the brand, where the brand will go and how it believes, and will (or will not) allow any brand innovation. In addition, the correct transfer to consumers, management and maintenance of brand information plays an important role in the success of the brand by facilitating the introduction and adoption of innovations made regarding the brand. At the same time, the success of innovation also contributes to the meaning of the brand, strengthens the expectations about the brand, and increases the brand usage by improving the perception and preferability of the brand. Furthermore, thanks to the updated brand information, future innovations will be developed more easily and will be easier to be adopted by consumers. As a result, all these processes will continue in an efficient cycle (Brexendorf, Bayus& Keller: 2015).

Branding affects the market where business innovations will go and how they will go, and the success of the brand in the market as a result of consumers' reaction to innovations. In fact, branding supports the innovations in the short and long term and has an important role in influencing the old and new consumers in the market.

The interdependence of brand and innovation management is extremely effective in providing consumers with positive feedback on the brand and innovations (Page and Herr 2002). Innovations add strength to strong brands, but they are also an extremely important resource and tool for innovation to succeed in strong brands. Brands have a supportive and facilitative role in the interpretation, promotion and adoption of new products and services. Brands that support the ownership of innovation, increase awareness and communication with consumers also add credibility and legitimacy (Aaker 1997). Simultaneously, with the success of the product and service innovations supported and strengthened by the brand, the brand value is strengthened and the brand's revival, sustainability and profitability are increased. Businesses achieve a number of successes through innovation. When we consider especially in terms of marketing and brands, the benefits of innovation are listed as follows.

Businesses achieve a number of successes thanks to innovation. When we consider especially in terms of marketing and brands, the benefits of innovation are listed as follows.

1. Differentiation: the desire of each brand is to become a well-known brand, and this desire has revealed the necessity to have the ability to innovate. Creating brand differentiation is important, and one of the most effective tools for this is innovation. Some researches have shown that successful brands constantly strive to produce clear value proposals from ground-breaking ideas (Gronum et al, 2016). Over time, the tastes and demands of consumers change. Marketers must keep up with this change. Ideas that were popular and worked ten years ago may be blank, unprofitable and completely obsolete today. Innovation completes the brand-related strategy as marketers aim to maintain innovation to create a new category so the competition can be entirely eliminated.

2. Penetration into new markets: Innovation additionally provides a platform to grow in new markets. Emerging markets can prove to be much more profitable than existing markets. In addition, there is a lot of empirical evidence pointing out that there is a strong positive relationship between innovation and economic performance. Both product and user innovation increase labour productivity and this leads to an increase in productivity. (Lekovic and Maric, 2016)

3. Rumor - word of mouth communication - gossip: Products or services that can attract attention of consumers are a standard part of everyday conversations. New products and new ideas create headlines. It is not surprising that the word of mouth marketing re-emerged in an age characterized by innovation with a very focused focus. Innovation is a very effective tool for the business to progress. In addition, innovation adds a more personalized touch, making the message much more reliable compared to what comes from the advertisers.

4. Positive Reputation: One of the features that consumers want to see in their favourite brands is innovation. Firstly, it is an indicator of the quality of the product. As brands invest in R&D, consumers' trust in the business is maintained and this is used as a competitive advantage. Thus, it is considered that innovation is effective in brand loyalty. Innovation also supports corporate reputation. The customers and shareholders respond similarly to the company's efforts in innovation. It has been observed that the stock exchange rewards companies that invest heavily in R&D and in many cases also tends to punish companies that reduce R&D spending.

Innovation presents many advantages such as brand differentiation, growth in emerging markets, better profitability, word of mouth and positive reputation.

One of the most prominent conditions of innovation, which is called soft power in country branding, is considered as a "brand". It is only through innovation that brands can contribute to soft power. With the increasing interest in innovation, brands have used countless words of

innovation in their vision and missions, brand promise messages, and the most innovative product ads have also increased considerably (www.marketingturkiye.com.tr).

Product innovation is considered as the main factor in the success of most brands. Product innovation is both a profitable goal that aims to promote the quality and features of products resulting from creative designs throughout the production process, and new product design initiated by a brand (Ekinci, 2014; Hanaysha et al., 2014: 2). Today's businesses give importance to product innovation and quality and enable some consumers to prefer their products / brands more in this context (Ekinci, 2016). Thus, consumers' loyalty to products / brands increases and an awareness is created. These contribute to the image of the product/brand and increase the sales, market shares and profits of the business.

The studies revealed that product innovation and brand awareness, brand image and brand loyalty are related, and product innovation is influential on them (Aytakin & Ekinci, 2013; Ekinci, 2019a, Ekinci, 2019b, Hamid etc all., 2012; Hanaysha, 2016; Hanaysha&Hilman, 2015; Henard&Dacin, 2010; Hanaysha etc all , 2014; Wang etc all. , 2017; Shiau, 2014; Naveed etc all , 2012). In addition, trademarks are on the border between innovation protection and marketing strategy. This is closely related to the brand strategy. Therefore, brands also present information regarding marketing innovations. However, it is mostly considered that a company will protect new products or marketing innovations using brands (Millot, 2009; Gotsch&Hipp, 2012).

Innovation is an important locomotive for brand growth. The three requirements for sustainable brand-based innovation are as follows for the management: (Nedergaard&Gyrd-Jones, 2013; Ekinci, 2014).

- i. Brand focus; directing innovation and investments to the brand;
- ii. Customer orientation; thinking on a human scale to create unique customer insights (intuitive customer orientation);
- iii. Resource direction; Consideration of the current and future scope of firm resources needed to achieve and maintain competitive advantages.

3.7. NEW MARKETING MODELS IN THE WORLD

Changes and transformations experienced in marketing caused new insights in marketing. With the changes emerging with technology and innovation, the inadequacy of the current marketing methods, losing its effectiveness in ensuring and maintaining consumer loyalty and the fact that a creative and innovative understanding has prevailed in the marketing field led to new searches in marketing. A number of new marketing

approaches emerged as a result. We will only include five of these understandings in this section.

3.7.1. Content marketing

Content is defined as a whole of messages, ideas, emotions, thoughts and images that are intended to be told in a discourse, and content marketing is defined by Kotler (2017) as “A marketing approach for a clearly defined target audience, which includes creating interesting, relevant and useful content, hosting outsourced content, distributing and supporting content, and thus creating conversations about content”.

In this context, the production of content in accordance with our marketing strategies is extremely important. In particular, the digitalization of marketing has been instrumental in the extremely rapid spread of content production. The rapid consumption of digitally produced content has made it necessary to increase content production. Creating and disseminating content on digital platforms is done through tags (#). However, one of the most important issues that businesses must pay attention to is to produce content suitable for brand concepts at this point.

One of the successful examples of content marketing is Virgin America, which is one of the favourite brands of many people. The brand, which has managed to win the hearts of people with its original flight safety video, is now gaining appreciation from users with its Flyer Feed blog.



Picture 1. Virgin America Flyer Feed Blog

Some of the highlights of this content marketing center that managed to reflect the spirit of Virgin America (<https://toptalent.co>):

- The language containing humor
- Fun surveys enabling users to engage with the brand,

- Expert advice reinforcing the close relationship the brand has established with its users, (Ask Joe G.)
- Brand news and offers away from banality,
- The label's hashtag library belonging to the brand and that people can use on social media.

3.7.2. Influencer marketing

The concept of Influence is explained in the form of “impact, penetration, influence and being valid”, and influencer is defined as “the person who affects or changes the way people behave” (<https://dictionary.cambridge.org/en>).

Influencers, which are very effective today, seriously affect the purchasing tendency of the consumers and at the same time take the responsibility on the consumers (Brown and Hayes, 2008: 49-50). Influencer marketing based on social media is becoming increasingly popular for brands that want to get consumers online (Phua et al., 2017).

Nyx cosmetics started off in 1999 with a budget of 250,000 dollars. Brand owners, who monitor the power of Influencer marketing, applied this form of marketing to their brands, increasing the brand's social media interaction by 57%, thus increasing sales rates by 57% in just one year. The brand has managed to attract consumers' attention by combining both experience marketing and influencer marketing strategy by organizing various launches, influencer interaction events and influencer award ceremonies (creatorden.com).

A successful example of influencer for Mercedes-benz: (<https://crowdmedia.com/blog/2018/10/1/ten-american-brands-using-influencer-marketing-strategies>).



Picture 2. Influencer Marketing for Mercedes-Benz

In 2016, a model of Mercedes Benz, which was an off-road vehicle, allocated the Instagram phenomenon Loki and its owner to drive

in the snowy mountains. A 360-degree video was prepared, featuring the mega-impressive German shepherd Loki and its owner Kelly Lund. The video shows the view to the audience through Loki's eyes, watching Kelly Lund driving a Mercedes from Crested Butte in Colorado. In the campaign, influencer was used to tell the story and create more interesting advertisements.

3.7.3. Experiential marketing and virtual experiential marketing

Traditional marketing considers the consumers as rational decision makers who care about functional features and benefits. On the contrary, experiential marketers see consumers as rational and emotional people interested in obtaining pleasurable experiences. There are five different types of experience or strategic experiential modules that marketers can create for customers: sensory experiences; emotional experiences; creative cognitive experiences; physical experiences; behaviours and lifestyles; and social identity experiences that result from being related to a reference group or culture. These experiences are implemented through experience providers such as communication, visual and verbal identity, product presentation (Schmit, 1999).

Experiences are engaging and cheerful in real life. Therefore, brand experiences lead brand value, brand differentiation and business results. As we know, social media is everywhere. It has infiltrated our daily lives, snapping, tweeting, pinning and *instagraming* and sharing our daily life in social networks (Smilansky, 2017: 20). They have tended to provide consumer experiences in brands through social networks, in this case, they have revealed the concept of virtual experiential marketing in this context.

Virtual experiential marketing, together with the Internet and all channels (websites, social media, online games, internet advertisements), and all kinds of technologies (virtual reality) provide an environmental experience enriched with visual and audio tools and produce an immersive experience. product visualization technologies, mobile technologies). While experiences in the physical world appeal to the senses, virtual experiential marketing is based on interfaces that replace real-world experiences. Therefore, an electronic virtual environment can connect with consumers, provide them with unique experiences, stimulate their emotional responses and, as a result, enable businesses to gain competitive advantage and create consumer loyalty (Chen et al., 2008: 1).

We can show Oreo's first entry into virtual reality in 2016 as an example for one of the virtual experiential marketing examples: "Explore Oreo's 360° interactive world full of cocoa treats". This is a fun virtual experiential marketing campaign created by digital agency 360i. Curious confectioners take a strange journey through a "wonder vault" using visual

virtual reality. After passing through the Oreo cookie portal, you move into a magical area filled with real-size milk rivers and the brand's latest Filled cupcake-flavoured Oreos. The film describes the stages of making the brand's latest product, Filled Cupcake Aromatic Oreos. It attracts the attention of the audience in the fun graphics in this exploratory experience towards the world of Oreo (<https://mbryonic.com/best-vr-marketing/>).



Picture 3. Oreo – The World of a Flavoured Cookie 360

3.7.3.1. Storytelling-Storytelling in digital marketing

In today's fast-paced, excessively automated, and digitally driven society, the viability of businesses can be accomplished by connecting to the audience, attracting their hearts, and interacting with them at a much deeper level than ever before. At this point, brand storytelling comes into play.

Brand storytelling is a harmonious narrative that brings together the facts and emotions that your brand evokes. In addition to giving your customers reasons why they should buy a product or service, they need to start sharing the story behind the brands, why they exist and why it matters in all communications. Brand storytelling is no longer a plus. It is a need that you will have and ultimately maximize the visibility, profit and impact of your business. When used as a compass in marketing strategy, the result will be a profitable as well as profitable brand.

Storytelling has become effectively used in social media as well as traditional media. The most important difference between storytelling in traditional media and storytelling in social media is that stories in traditional media consist of introduction, development and conclusion, while stories in social media consist of beginning and ending (Alexander & Levine, 2008: 42). In other way, the subject is created and distributed by the brand owner, while consumers only participate as listeners in brand

stories obtained through traditional communication channels. Through social media, users have transformed the active role in storytelling from stationary participants to active users. The control is not entirely in the owner of the brand with regard to the identified audience and the brand (Singh and Sonnenburg, 2012: 189).

The reactions and networks of 2 different consumer groups who were exposed to the story about the brand that has not been released yet were compared in a study conducted by Lundqvist et al. (2013). The consumers exposed to the story told the brand in much more positive terms and were willing to pay more for the product. The research has demonstrated the power of story experience on consumer experiences, and it also being an indicator of how brand stories can be used to create and strengthen positive brand relationships.

3 reasons that brand storytelling is the future of marketing (www. Forbes.com):

1. Being memorable in the sea of similarity

The Internet is a crowded marketplace, where tens of millions of content are created every day, and more are shared. Businesses are spending billions of dollars worldwide to get the attention of the masses bombarded with similar messages for seconds. The Internet has democratized marketing by making it accessible, but in the middle of it, it has also made it very difficult for quality brands to stand out.

Nowadays, it is not only enough for the product or service to be of high quality, but also to appeal to the consumer in a way that differs from the competitors. Therefore, storytelling is very important for brands. Adapt to making your brand thoughtful, memorable, and real rather than telling the target audience facts, statistics, and testimonials. It is important to present your messages to the consumer with a story. No brand can imitate your story by telling the story of your brand and its challenges, achievements and value proposals. Storytelling contributes to the brand's unforgettable and positive image in the target audience. Brands can only provide the emotion they want to evoke with what and how they want to be remembered, what they want the consumer not to forget, and in every interaction they have with the consumer, so that consumers will remember these emotions they feel. At this point, it is important to know that consumers act with emotions rather than logic while exhibiting their purchasing behavior

2. Building a lineage more than just customers

When preparing your messages, consider what your audience really needs from you (in addition to a product or service). For example, even if Apple sells technology, from the very beginning, consumers needed

to feel brave and know that it is good to think differently from the crowd. Tesla's customers should consider it beneficial to support the environment and sustainable energy. The emergence of a brand has gone beyond just offering a product or service, and at this point, we encounter storytelling. You should focus on the emotions, values and ideas you will present to the target audience, think about how they should feel when communicating with the brand, what value you will offer them in every interaction, and what the brand means beyond product and service. In order to achieve all this, the brand's story should be used to start a conversation with the target audience, ensuring that they are also involved in the process. In this way, consumers will have an experience and the more they know, trust and like you, the more preferable the brand will be. As a result of this, one will create relationships with people who will be advocates in the coming years.

3. Being Profitable and Human

A brand story can do much more than connect one to its ideal audience, keep one informed of the noise of the messages and profit of its competitors in addition to having the potential to make a big impact. In today's competitive environment, marketing is not an important differentiation factor anymore. Consumers demand that companies demonstrate how their efforts have had an impact, what purpose they support and achieve results beyond profit alone.

Today's businesses now care about other things than profits to get consumers to buy more. This brings along important roles for brands. Even if only 10% of the existing organizations do so, the tendency of consumers towards these brands will increase should they continue their activities according to more human values. It is no coincidence that the top 10 most empathetic companies in the Global Empathy Index are among the most profitable and fastest growing companies in the world.

But, how can brands be led to act more human? Storytelling is one of the oldest and most powerful tools in this regard. Our genetic codes include loving and responding to stories; therefore, an unforgettable brand story is what people need to have a lasting positive impression to feel connected with one's business, identity and values and to feel loyal to one.

One must remember the bigger story when building its marketing strategy: what makes your brand humane? How does one touch and transform people's lives? How would one put a positive impact on society? In short, does your brand have a soul? People will feel your brand's soul and human aspect, and then they will consider your brand to be different than its competitors and lean towards it. In markets where competitors are extremely high in number and everyone focuses on doing business more efficiently and faster, brands that are humane and care about their customers will become a legacy.

One of the successful examples of brand storytelling is Spotify. Spotify uses data storytelling in its communication strategy by combining the cold data with a humane touch. Spotify started its famous Wrapped campaigns for the first time in 2017 and analysed all the listening habits of its customers and used the data creatively. Instead of presenting all their results in a press release, they obtained excellent information for billboard advertisements and used this creatively.



Picture 4. Brand Storytelling for Spotify

3.7.3.2. Electronic word of mouth marketing (eWOM)

The increase in the use of the internet along with the developments in innovation and technological fields has caused changes and developments in some marketing communication areas. The concept of word of mouth (WOM) in the marketing literature has turned into electronic / online word of mouth communication thanks to these developments. The consumers who applied to the opinions of the people around them to learn their thoughts about a certain brand, product or business in the past have turned into electronic mouth-to-mouth communication (e-WOM) by moving the shares to electronic media.

According to Hennig-Thurau et al. (2004), eWOM is consumers sharing their positive or negative opinions about products, services or brands with many institutions and people in a virtual environment. eWOM offers people the opportunity to have unlimited conversations with anyone who uses the Internet (Heyne, 2009: 19; Kiecker& Cowles, 2002: 72). The Internet has a global feature that provides a tight communication environment for consumers who cannot come together physically (Jalilvand et al., 2011: 42). Therefore, eWOM is also expressed as consumer communication on the internet (Heyne, 2009: 19). eWOM contains comments on product performance, service quality, product impressions and reliability that current or previous consumers transfer to each other (Arroyo & Pandey, 2010: 1230).

Today, internet is the medium where brands are discussed the most. In particular, the intense use of social media causes the spread of sharing to be very swift and to reach more people in a short time. The

comments written under the brands' social media accounts instantly reach millions of people following the brand. One of the most important issues in this context is to minimize negative comments.

The first example indicating the effect of eWOM is the Good boy discount; A social wave occurred when the photo of a voucher from an Italian restaurant in Washington spread from social media. There was a \$ 4 discount for the boy who looked well-behaved at the voucher. This situation caused many posts, blog posts, articles and comments on social media. The awareness of the restaurant on social media grew suddenly. Another example is Morton's Steakhouse: Peter Shankman is a writer, entrepreneur, speaker, and connected to many places around the world, and is a regular at the Morton restaurant. There is an extensive social media network and the restaurant owner knows this. One day, Peter Shankman teases a playful and tired joke at the airport and asks Morton's Steakhouse to meet him at the airport with a steak at the plane's landing. After a 2.5-hour flight, his routine menu from the Morton restaurant is delivered to Peter by a Waiter. This situation is widely echoed in social media and the story spread very much with viral effect.



Picture 5. Peter Shankman's Tweet About the Morton Steakhouse

CONCLUSION

Globalization, digitalization, increasing competition and imitation capabilities of businesses in products have put the innovation among the essential factors. Innovation, which is effective in every field, has caused some changes and developments in the field of marketing. These developments also had an impact on the brands and consumers, which are the cornerstones of marketing.

The changing structure of markets, consumers and brands has now shortened the success processes achieved by differentiating products and services. The sustainability of businesses is closely related to the success of marketing departments. The success of marketing depends on acquisition of customer loyalty by ensuring customer satisfaction. It is effective to understanding and meeting the ever-changing consumer demands and needs in the right way with characteristics of the product or the service, develop marketing strategies that will continue the success of the business and ensuring consumer satisfaction and ensure communication of the marketers in a global market where competition is experienced simultaneously not through a single channel but all channels for ensuring the customer satisfaction and maintain relations with consumers who want more than products and services and see the consumers as a value, and to continue activities in the market with new marketing approaches with the integrated marketing communication approach that transmits messages through channels.

Businesses also use innovation among many other strategies to ensure customer satisfaction in their products or services. Both technical and non-technical innovation capabilities of businesses have an impact on the intellectual and emotional experiences of consumers. In this case, it has a positive effect on customer loyalty. Businesses that understand the consumers by the perspective of consumers, offer fast solutions that meet their demands and needs, offer new values by differentiating and use innovation effectively are preferred compared to their competitors. In addition, consumers consider these innovative businesses more reliable and respected.

In conclusion, markets and consumers are in constant and rapid change and transformation. A driving force in keeping up with this change, adapting to the market and establishing a close communication channel with consumers, innovation has also taken its place in marketing as a force that marketers must use and are constantly exposed to.

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CHAPTER IV


COVIDINNOVATION (COVID-INNOVATION)

Gül Ekinci¹ & Burhan Akyılmaz²

¹(Asst. Prof. Dr.); Gaziantep University, e-mail: gulcex34@yandex.ru

 ORCID 0000-0001-5512-4789

²(Dr.); Silkroad Development Agency, e-mail: burhan.akyilmaz@hotmail.com

 ORCID 0000-0003-4039-9442

*“Never waste the opportunity
offered by a good crisis”*

Niccolo Machiavelli

*“Necessity is the mother of
invention”*

Platon

4.1. INTRODUCTION

Having the potential of creating deep collapses and new opportunities and also appearing suddenly and requiring change, crises are defined as shocking situations, in which the speed of creating an opinion, deciding and applying it increases strikingly (Clark, 2020). However, when it comes to innovations, they are known as formations ‘usually’ triggered by a shocking provocation or occurrence of an unexpected event and halts. Therefore, it is possible that crises can be seen as the basis of innovations.

Among the crises that have triggered innovation, there are many historical events, which have deeply affected health, economy and social life. Pandemics, which are sudden in terms of their beginning and deep in their effect, intensely unsettle all the aspects of life such as countries’ health systems and economies. Firstly seen in China’s Wuhan in December, 2009, the Covid-19 pandemic has taken its place among these crises. Individuals, societies, governing people or groups and leaders have had to make decisions under uncertainties by undergoing difficulties in these beforementioned areas (WEF, World Economics

Form, 2020a). Those who could manage the crisis well, have continued to survive but those who could not do it, have endured losses in their merciless fight to survive against difficulties.

In this regard, the Covid-19 pandemic has triggered innovations and it has exercised influence over the societies in the world by leading technological, industrial, sociological and psychological transformations and compulsory innovations.

In this chapter, the relation between innovation led by the Covid-19 pandemic and Covid-19 and also the results related to this relation have been studied. As once Plato said, if ‘necessity is the mother of invention’, then, crises can be thought to be ‘the father of innovation.’

4.2. INNOVATION AND CRISIS PERIODS

Innovation is defined as internalization of a new idea, knowledge, application or a product, and also it means taking part in creative processes or supporting them (Han, Kim ve Srivastava, 1998; Hurley ve Hult, 1998). Therefore, it is accepted that every innovation has a specific identity and every innovation is unique as long as it exists (Molloy, 2020). Thinking innovation as a notion that is only in relation with technology is not true. Innovation is accepted as ‘a way of solving problems and creating values in different ways’ (Clark, 2020). While this notion sometimes means changing an existing fact, rethinking about it and improving it, it also means adopting new approaches in order to find customer and retain them (Dietz, 2020).

Innovations are applications and processes that require configuration, regulation and encouragement (Jong ve d., 2015), factors that take enterprises further (V12, 2020a), changes that are formed by the whole of complex efforts. Accordingly, it can be said that the world needs a crisis in order to turn difficulties into opportunities and trigger innovations (Langan-Riekhof vd., 2017).

Crisis is defined as ‘an undecisive or crucial time or situation in the course of a determinative and decisive change’ (Merriam Webster Online Dictionary, 2020). However much the word crisis is associated with destruction, crises are known as factors that accelerate the birth of inventions and function as catalyzer for useful changes (Ritter & Pedersen, 2020) and finally events that inhold new opportunities. Generally, these crises come out in different ways mostly being wars, pandemics and disasters. Crises can necessarily create the settings called ‘innovation collider’ (Berkeley University, 2020), which are done in Berkeley University in order to create an innovative atmosphere by easing the collision of people and groups.

In history, it is seen that wars and pandemics have led to many inventions or improved existing ones. For instance, the First World War and the 1918 Spanish Flu pandemic contributed to innovational products such as electrical blender, toaster, sticking plaster, bulldozer, television, music box, bread slicer, sunglasses and frozen food (Dietz, 2020). The Second World War helped women to join the workforce and it advanced jet engine, flight cabin, helicopter, atom technology, computer and missilery (Reeves vd., 2020b).

Deepwater Horizon was developed in a few months in spite of the lack of a saving mechanism in the world when the largest marine oil spill in history happened in the Mexico Gulf in 2010 (Langan-Riekhof vd., 2017). The SARS pandemic that ravaged Asia in 2003 led Asia to be the epicenter of growth in e-trade and innovation centered around social trade (Am vd., 2020). During the Great Depression, supermarkets, shavers, car radios, laundries and cookies with chocolate chips were invented. According to Paul Romer, an economist at Stanford University, crises are accepted so important as not to be wasted (Ritter & Pedersen, 2020).

4.2.1. The Signs Showing Crises Can Turn Into Innovation

It is seen that crises such as Covid-19, by their nature, are the basis that brings the components of innovation together since they are consisted by a problem, a technology to solve it and a work model making money out of it.

There are, at least, 5 main principles showing that time of crisis can be a time of opportunity (Chisholm-Burns, 2010) :

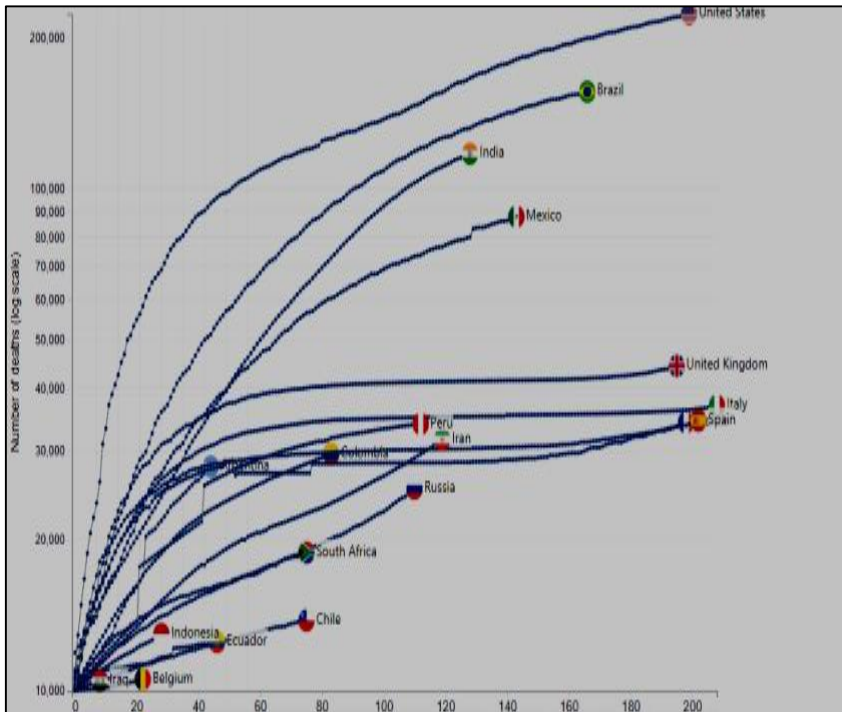
1. A crisis challenges the understanding of ‘the usual way of doing a work’ and creates an urgency for a change. For instance, the fear reasoned by climate change started with Clinton’s motto ‘Never waste a good crisis’ regarding energy safety and so, it referred to rebuilding economies in a greener and less energy-intensive model. Obama offered a big shift to a new trade system in terms of renewable energy and CO2 emission and he wanted to create a huge business by replacing the old system with green alternatives (Independent, 2010). During the Covid-19 pandemic, tendency to innovations regarding hygiene and health prevailed. For instance, while new technologies such as Artificial Intelligent (AI) are helping to accelerate the development of a vaccine, now they are also being used to predict what public health precautions will be the most efficient. Thanks to the AI, Public Health Mobile application has been activated in order to manage the Covid-19 pandemic process (UNESCO, 2020).

2. Crise increases people's talent of leaving their comfort zone and it gives the opportunity to discover the options that seem invulnerable, unrealistic or very difficult to apply before the crisis. For instance, UNESCO, IBM and SAP combined their forces in the CodeTheCurve-Hackathon organization. Therefore, it has brought young developers, innovators, data scientists and designers together to use their digital skills, creativity and entrepreneurial spirit to inspire and develop digital solutions to current and future pandemic challenges (UNESCO,2020).
3. A crisis forces people to study the history of the events causing that crisis and it forces to take steps in order to decrease its possibility of reoccurring. Disasters can not be stopped but their effects can be limited. For instance, during the Covid-19 pandemic, some initiatives that have the function to prevent the spread of the disease and also to change the ordinary course of things such as, technologies increasing customer and staff safety, risk-reducing technologies that involve business applications and strategies, culture industries (such as online platforms, museums and galleries, cinemas, concert halls) (Luo ve Galasso, 2020).
4. Crises are the driving power behind making tough decisions. For instance, the Covid-19 pandemic, which made school closures and online education for %89.4 of students compulsory in 185 countries, has taken as a leading part in making new decisions in such a pandemic process. UNESCO has offered licensed tools (Oer-Hub) that are open to everyone and also that can be used by governments, institutions and teachers around the world. A call for free access has been made all over the world. Many world-renowned universities have opened their data base to free access (UNESCO, 2020). On the other hand, in terms of economy, governments have delayed the taxes and debts that had to be paid by institutions, banks etc.
5. Crises force the removal of inefficient, extravagant, problematic or nonadvantageous actions: For instance, many politicians have stated that replacing the old high-carbon substructure with green alternatives to deal with the economic crisis, energy safety problems and climate change will create millions of new business areas. Therefore, they have opened up the way for new employment opportunities. They defend that this can be achieved by 'discussing the green new deal'(Independent, 2020). During the Covid-19 crisis, the ways to protect global citizens' right to information and to prevent information deformation by empowering their digital talent and literacy have been searched. By doing so, the aim is to end the harmful deformation activities and this has become obligatory. Increasing internet access has

brought the protection of personal data and cyber security issues into the forefront.

4.3. A GLOBAL CRISIS: THE COVID-19 PANDEMIC

Covid-19, as a pandemic that has spread to all over the world from Wuhan city of China, has entered the world history as an infectious respiratory tract disease. In the global scale, a death toll of more than 1.128.32 including 41.104.946 confirmed cases, all of which have been caused by Covid-19, has been reported to the World Health Organization (WHO, 2020a, 2020b, 2020c, 2020d). Humankind has had to struggle against many pandemics throughout the history. According to the World Health Organization (WHO), for a disease to be accepted as a pandemic, it has to fulfil the necessary conditions, which include that it has to cross international boundaries and it has to be a new virus and mutate, and also that it should be easily transmitted from person to person and quickly spread. Among the big pandemics met so far, there have been Plague (black death), Asian Flu, Spanish Flu, HIV/AIDS, Cholera, Typhus, Variola virus, Ebola and Sars. When the Covid-19 pandemic is perceived in this sense, it is accepted as a global pandemic caused by the coronavirus family (WEF, 2020b).



Graphic1. Covid-19 death cases until October 23rd, 2020

NOTE: Coronavirus worldwide evolution Growth curve per country since the country reached 10000 deaths until 23 Oct 2020. (Laval, 2020)

As a result of this bad situation in general, many sectors such as health, tourism and transportation have been effected by the pandemic and the need for stronger substructures and more qualified minds have intensely increased. New business models innovations that have emerged during the Covid-19 process are currently being tried. Together with new technologies, an increase in solidarity and sensitivity to environment has been observed in the global society. It is expected that this increase will be effective after the pandemic, too (TSKB Report, 2020).

While countries are under a global risk in terms of health, the World Economic Forum (WEF) has announced its post Covid-19 report stating that more than 300 million people in formal economy and 1.5 million people in informal economy have lost their jobs (WEF, 2020b). According to the United Nations (UN), unless urgent precautions are taken, humankind will face famine in 'primary level' (Tech & Science World at risk of 'multiple famines of biblical proportions' amid COVID-19 Pandemic, 2020). Additionally, it is said that consumption habits are delayed very quickly or they are accelerated or that disturbed consumption habits have started to emerge and finally that many things have changed from the ways of work to beliefs (Reeves vd., 2020).

4.4. THE STEPS OF INNOVATION AND APPLYING INNOVATION

There are factors that contribute to the existence of innovation and make it inevitable. At this point, crises come forward as a forcing mechanism that make innovation obligatory in technology, politics and all similar processes (Langan-Riekhof vd., 2017). There are some steps to be able to use innovation correctly in these forced mechanisms. These steps have been ordered by Molloy and his friends as below:

Taking the innovational opportunities: Innovations can be short or long term and as president j. Kennedy said the word 'crisis' in 'chinese' consists of two characters- one represents danger and the other opportunity. The important point here is to find out what problems these innovations will solve and where they lie.

Prioritizing the opportunities: since there is no unlimited source and unlimited time, some ideas need to be prioritized and some others be eliminated. This can come out of a good opinion laboratory. This laboratory is possible when the most meaningful ideas and those which are worth testing and have high feasibility are short-listed.

Testing potential innovations: testing what is useful and what is not is necessary for a healthy and sustainable process. The possible success of innovation can be tested with more users in every step. Finding support for innovations: enough fund can be found when the right story is shared with the right shareholders at the right time.

Learning from innovations efforts: as in the slogan fail fast, learn fast, starting fast can cause failure. However, the important thing is to derive lessons from mistakes and to contribute the process by integrating them with new innovations in the next steps (Molloy, 2020; Kose, 2020). The precautions taken and the lessons derived to survive during the crises can make people and institutions stronger and more resistant against the possible situations in the future (langan-riekhof et al., 2017).

4.5. THE NEED FOR MARKETING AND INNOVATION IN THE COVID-19 PANDEMIC: COVID-INNOVATION

Innovations are changes that come out suddenly at times of social crisis and improve as a result of intensive needs and finally that mostly result in renewals. It is known that being among these crises, the Second World War led to innovations such as flight cabins, helicopters, atomic technologies, computers, missiles, radar and penicillin; and the 2003 Sars pandemic in China led to digital increases, the 9/11 attack led to changes in safety politics (Reeves, 2020). This case hasn't changed during the Covid-19 process and innovation, technology and production are seen as the best solution tools. Innovation, technology and production contribute to the formation of products and ideas in the fight against Covid-19. The marketing world has remained insufficient especially in making marketing decisions, coordinating efficiently and having a sufficient content strategy and a good plan for customers during Covid-19. In the meantime, how data in marketing can be functional to survive before growing in the pandemic and also the importance of innovation have been understood. As a solution, there has been a shift to customer-centered communication, experiences, data collection and data activation and also there has been focus on what areas should be prioritized, thereby leading to solutions to be calibrated again (V12, 2020a). Companies have had to become more digital and innovative (Kost, 2020).

In this regard, innovation in the Covid-19 process is divided into three different types: creating market innovation, maintaining innovation and efficiency innovation. All over the world, different products of companies, which they produce in search of finding a new market (creating market innovation), making their existing products better (maintaining innovation) and making more with less (efficiency innovation), take attention. It is seen that during the Covid-19 pandemic, companies have

tended to keep innovations and increase efficiency but still they might avoid initiatives for the future (Dietz, 2020). In addition, it is seen that they have acted in solidarity (WEF, 2020b) in order to look for solutions (Georgiou, 2020) to the problem that has caused the biggest scarcity of goods, financial damage and potential business lockings in history at a time when the world is recalibrated.

Consequently, the Covid-19 pandemic makes the world come round such a bend that has never seen in history before. When the main changes among consumers are considered, it can be seen that spending more time at home, increasing importance of hygiene and health, working online and its natural results such as family and cyber security have been standing out. Seeking innovational solutions have been on the rise and there are expectations that future effects of the pandemic will be permanent (Reeves, 2020).

It is predicted that the world and nothing will be the same as before and Covid-led deep changes that are visible in every field, in other words *Covid-innovations (Covid-innovation)*, are happening. Covid-innovations show their reflections not only in health but also this revolutionary change process appears in economy and social life. It is thought that producing solutions that are practical in short and medium term, innovational and with high added value, will be beneficial for companies and consumers (TUBA Covid-19 Pandemic Evaluation Report, 2020a). On the other hand, it is expected that digital systems will mostly replace old systems and *Covidijinnovations (Covid-Digital Innovation: Covidijinnovation)* effects will continue.

4.6. THE CONSUMER BEHAVIOURS CHANGING WITH THE CORONAVIRUS

It might be incorrect to think that innovations and every change in habits in the Covid-19 process will continue after the pandemic crisis (Reeves, 2020). However, together with the Covid-19 pandemic, some changes and innovations have appeared in consumer behaviours and accordingly, e-trade and digital spending (USA:+18%) have started to increase extraordinarily (Accenture, 2020).

Consumers have started to spend more time on comparing products and prices, the downloading numbers of mobile applications have been rising more than twice as much as before and mostly technological, sports and hygiene products have been sold (Marketing Turkey, 2020b).

While online shopping has been increasing, groceries and pharmacy products have sold more than 50%, travel spendings have decreased 56% and live entertainment, clothing and accessories sectors have fallen more than 30% (Reeves, 2020).

When the Covid-19 pandemic is considered from a broad perspective, it has been noticed that changes towards the markets in business world, sectors and digital consumer behaviours are inevitable and the answers to them should be innovational. Marketing strategies have been updated and online buying has quickly increased by 53% (Pazarlamasyon, 2020).

Especially in contactless trade, there have been radical changes. McKinsey&Company prepared a survey report of 2500 consumers from the USA, England, France and Germany named 'Retail Reimagined' due to Covid-19. Free delivery and return options have come into prominence and it has been noticed that fast website and promotion of net products are preferred. According to the report, these aforementioned demands have increased by 10%-23%. In deciding to visit a store, it is thought that the store shouldn't be crowded and safety has been the reason for preference. Smart pay desk applications have increased 12% in terms of social distance (www.digitalage.com.tr).

4.7. THE NECESSITY OF INNOVATION AND ITS EFFECT ON BUSINESS ENTERPRISES IN THE PANDEMIC CRISIS

The Covid-19 pandemic has one more time revealed how important digital transformation and innovational solutions are for business enterprises and individuals. The Covid-19 pandemic process has presented an opportunity to examine how business enterprises made an accelerated shift to innovational and digital operations possible and also to examine the ways how they emerged (Narayandas vd., 2020). Changing dynamics have put forward that much stronger arguments are needed to reach customers (Innova, 2020) and they have showed that this process can be dealt with correct and innovational marketing strategies (Pirtini, 2020).

In the researches, it is seen that business enterprises are going through a very compelling process in the pandemic crisis. It has been stated that they delayed their plans or gave up on them and some enterprises expect a delay in the investments (59%), and finally, there will be negative effects on growth initiatives (70%) while some enterprises have an expectation of positive effect wind (21%) (Dietz, 2020). It is expected that possible positive effects will be seen in only business enterprises that quickly transfer to innovation and adaptation and give enough importance to these concepts. In this process, since the situations, in which business enterprises find themselves inadequate in the field of marketing, are attention grabbing, researches have been going on related to this issue. 989 CFOs from 23 countries have participated in the CFO Pulse study that was carried out by PwC and it has been noticed that 56 of them in Turkey expect decreases by

25% in their incomes or profits due to rising manufacturing costs while 28% expect an unusual profit and increase in sales (Ekonomik Forum, 2020:65).

In a different study of more than 350 senior executives in China, which experienced Covid-19 before the rest of the world (Narayandas vd., 2020), the results below have been found: Accordingly, in business enterprises:

- They need to take advantage of digital technologies to adapt and make innovations
- They need to try new business models
- They need to bring solutions together to meet the customer needs that haven't been recognized before
- They need to develop new business processes and applications
- They need to reidentify the models for cooperation and team work.

And it has been noticed that it is inevitable to turn towards Covid-led innovation (Covid-innovation) in business enterprises.

4.7.1. The Points That Business Enterprises Have Difficulty in the Covid-19 Process

In the Graphic2 below, the results of the study that was carried out by the Modern Marketing Platform V12 regarding the points that business enterprises have difficulty most.



Graphic2. The points that business enterprises have difficulty most
 NOTE: Customer marketing and martech innovation during Covid-19, (V12 The Modern Marketing Platform, 2020a)

According to the result of the study, business enterprises mostly have difficulty in making decisions in the process of Covid-19. However, it is seen that they generally have a plan.

4.8. SUSTAINABLE SOCIAL COVIDINNOVATION (COVID-INNOVATION)

While innovation is generally known as a producer-based concept, it is also socially considered important since there is sustainability in its root. In Covidinnovation process, turning towards system change synchronically in terms of human and business notions is necessary (Ova, 2020a). Additionally, it is predicted that innovations that have importance for the future should be introduced to public and also that a radical way of thinking is necessary to reach the goals in the UN's 2030 Action Plan. The precondition of this radical way of thinking is consisted by 'sustainable social innovations'. In other words, sustainable social innovations require solutions that ensure the sustainability of a social structure profitably for an indefinite period of time without disturbing the systems that it is connected to (Newton, 2003: 5).

Business enterprises can deal with the process by focusing on the concept of aid in terms of flexible and urgent marketing in order to create sustainable social innovations. Creating personalized digital strategies, creating digital activity strategies and virtual experience settings can be among these sustainable social innovations (Ova, 2020a).

In order to obtain success in covidinnovation, it is clearly seen that focusing only on small local regions and business enterprises will not be enough alone. For successful covidinnovation, including consumers that don't have tools, skills and resources in that innovation can be regarded as one of key points of social and sustainable innovation. This is simply because dealing with difficulties of sustainability requires a substructure that involves users and user innovation diffusion is based on a multi-player contribution (Trischler vd., 2020). Especially when those who can not have access in the pandemic process are considered, the importance of sustainable innovation increases more.

4.9. THE IMPACTS OF COVID-19 ON R&D AND INNOVATION

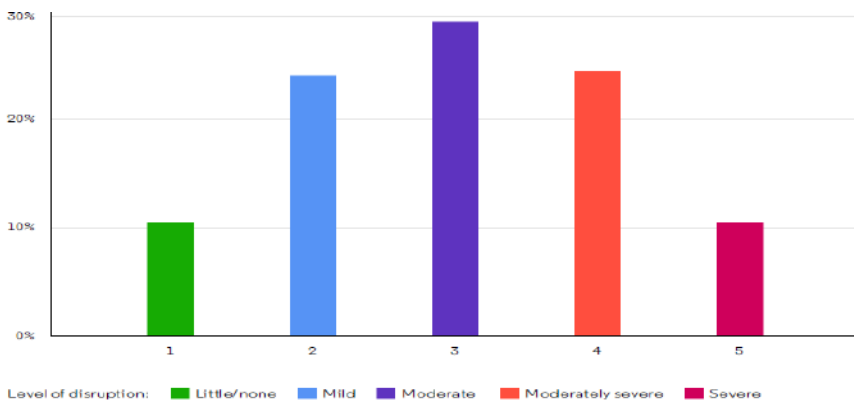
According to the Frascati Manual that was created by OECD countries in Italy's Frascati city and also that sets the validity standards of research, innovation and design activities and the related projects, R&D (research and development) is defined as creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge (Frascati Kılavuzu, 2002:30).

R&D activities are generally known as long term and high cost activities. Together with Covid-19, individuals and business enterprises have encountered big challenges that can sometimes be dramatic. The

pandemic has effected our lives and usual ways of working. All over the world, the need for disinfections and protective products, food supplements, protective clothes, fast diagnose kits, breathing machines technologies and medical equipments, medicine, vaccine, informatics applications has increased or in brief, individuals and business enterprises need innovative systems and methods more. R&D has gained much more importance for enterprises that create innovative solutions (Teknopark İstanbul, 2020a).

Bringing the world economies to standstill, Covid-19 has caused crisis in supply and demand chain and therefore, sectors have had to suspend production or limit it. Covid-19 has suddenly entered to business enterprises as a messenger of radical changes and it has set business world in motion in fear and panic or stopped it (Economist, 2020).

Coronavirus has forced senior decision makers to go into a change in strategies by arousing wonder about a global crisis and its financial effects. New ways of work and strategies have become necessary in order to maintain innovation and creativity (Economic Forum, 2020:70). It has caused almost %49 of CFOs to break their innovation strategies. Business enterprises think that little investment will be good and enough while they operate. Introduced with quarantine and different precautions together with Covid-19, the world has had to increase the speed of innovation, digitalization and traditional ways of work. This situation has effected innovation strategies and it has caused disruption in innovative strategies in some cases. The results of the study carried out by Clarivate over 245 business enterprises are shown in the Graphic 3 below:



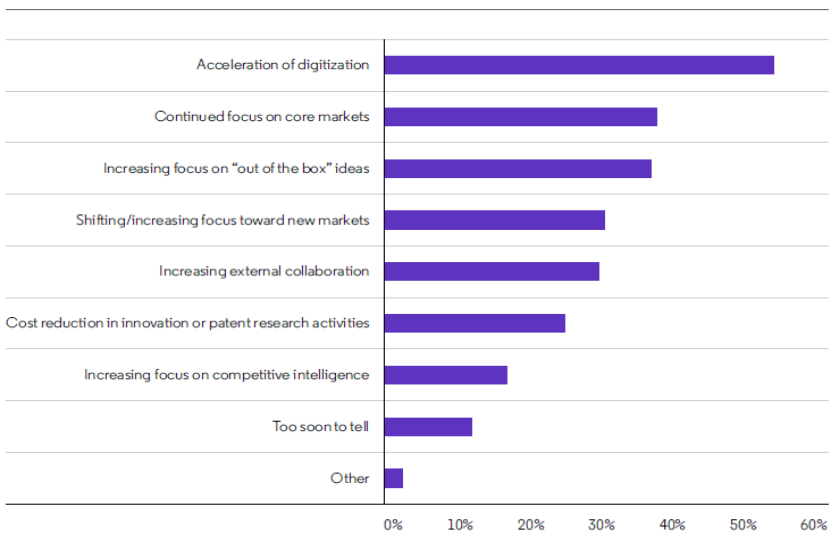
Graphic2. Level of disruption in innovation strategies of enterprises
 NOTE: Chasing change: Innovation and patent activity during COVID-19
 A report on the pandemic’s impact on the global R&D community and innovation lifecycle, (Clarivate Survey, 2020:5)

In a study carried out on global scale, serious levels of disruption in innovation strategies seem attention grabbing. In a study carried out by PWC,

while 56% of CFOs plan to delay or cancel their investments, this rate has been around %14 for those who say they will cancel or delay their R&D investments. In other words, it seems that the importance of R&D and innovation has been understood better and more. Furthermore, 94% of CFOs in Turkey have declared that they will maintain their investments on digital transformation. The only thing to keep success permanent after dealing with the crisis thanks to forward-looking strategies, new products, new service and business models is to focus on innovations (Economic Forum, 2020:71).

On the other hand, consumers that exhibit some pathological behaviours brought by globalization and technology need new incremental innovational solutions especially for access to information from mobile platform (Ova, 2019; Branstad & Solem, 2020; Saltan & Ozsaatci, 2020). Studies show that business enterprises join innovation activities in different speed and rates.

In the chart below, the changing innovation activity rates of enterprises according to Clavirate Survey study results can be seen:



Graphic3. Changing Innovation Activity Rates in Enterprises

NOTE: A report on the pandemic’s impact on the global R&D community and innovation lifecycle, (Clarivate Survey, 2020:6)

According to the Clavirate Survey study results, it is known that 37% of innovations are directed to main and primary markets and 23% of them are solutions regarding internet services, logistics and communication, preventive health products and online education and working. Additionally, turning towards markets out of primary ones has been speeding up. The main reason behind this speed is that business enterprises, which are aware of the fact that crises like wars will bring innovations with them, focus on innovative

and surprising ideas that will take them out of the crisis (Clarivate Survey, 2020:5-6). This understanding can be accepted as one of the best opportunities that can be learnt from a crisis. The Clarivate Survey study results show that considering Covid-19, business enterprises try to develop working styles that make distance working and learning possible except for traditional health services and types of work. In addition, they have increased their digitalization efforts and how they try to accelerate transformational innovation activities.

According to Derwent Top 100 Global Innovators 2020 Report, business enterprises have acted strategically although they are going through a changeable and risky period like Covid-19 and they have performed with an increasing speed. In the Figure 3, it is seen that there are efforts of patent searching and R&D communities on a global scale to turn towards different areas within innovational activities. Furthermore, while 25% of patent obtainers have been consisted by the first 1000 companies in the past, this rate has regressed to 18% today. It is stated that the rise of global thinking on the issues that require urgent solutions like Covid-19 has a great influence over the reasons lying behind it (Clarivate Derwent, 2020:28).

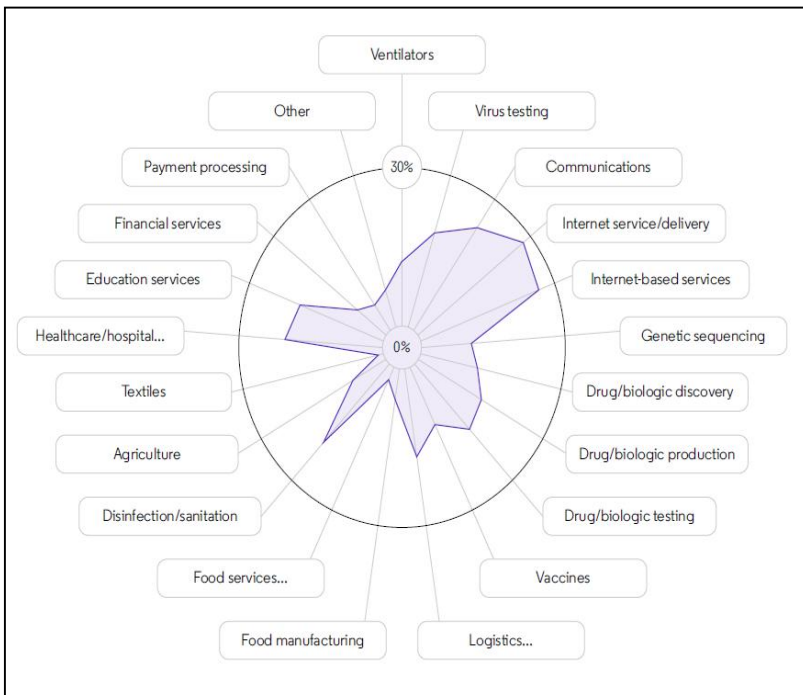


Figure1. New markets that primary innovations have been re-purposed
 NOTE: A report on the pandemic’s impact on the global R&D community and innovation lifecycle, Clarivate Survey, 2020:7

When the chart is examined generally, business enterprises worry about the effects of a global economic crisis (69%), the new wave of Covid-19 (67%), the decrease in consumption resulted by decrease in consumers' trust in economy (42%) and rising labor costs (31%)(PwC COVID-19 CFO Pulse Survey, 2020). Therefore, it has been noticed that they have been trying to develop their digital skills supporting consumer-wise innovation in the Covid-19 process and also that they are turning towards these fields of work.

4.9.1. Technological Innovation and R&D Based Examples of Entrepreneurship Becoming Prominent in the Covid-19 Pandemic Process

People have confronted many wars, pandemics and financial crises throughout the history. However; when old times are compared with the Covid-19 pandemic and its devastating effects, innovation is needed more and urgently ever than before in the process today (Economic Forum, 2020:71). The Covid-19 pandemic seems that it has damaged all the sectors all over the world based on restricting applications and fear. Moreover, it is supported by studies that Covid-19 has effected business enterprises that are in different sectors, in different rates in terms of personnel, operational activities, supply chain, revenue and total impact (Thinktech, 2020:5). Below, the results of a study, which was carried out in Turkey and supported these results, are shown.

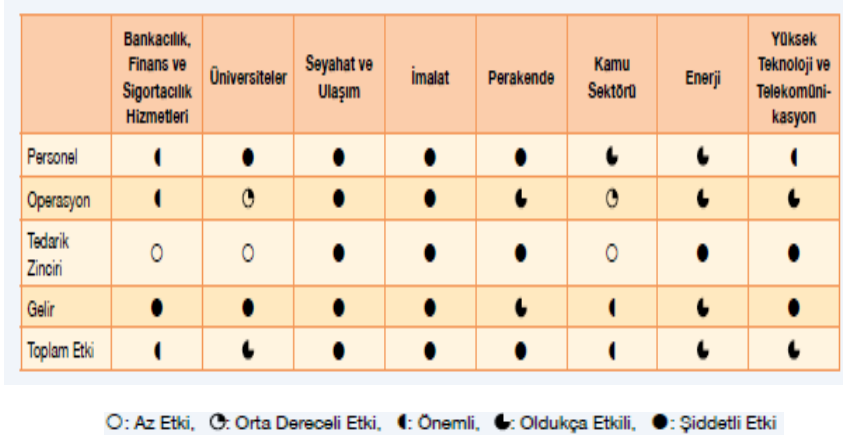


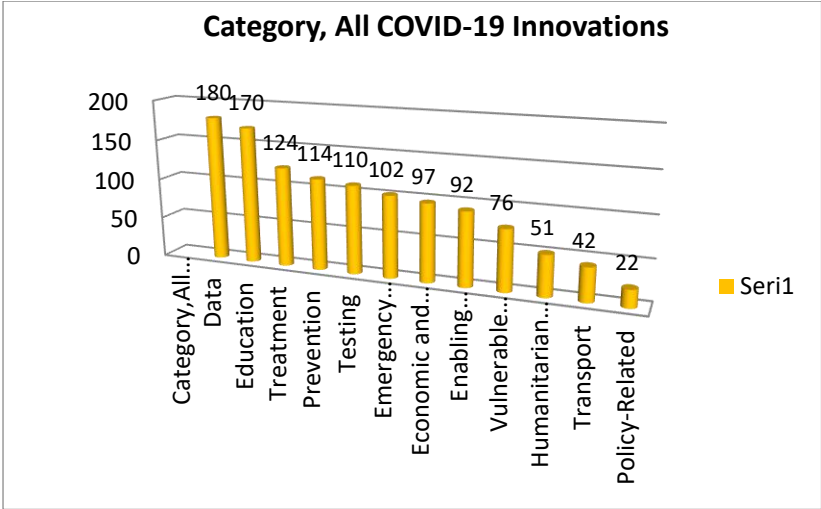
Figure2. The Covid-19 Impact on the Chosen Sectors
NOTE: Covid-19'un küresel tedarik zinciri ve sektörler etkisi, (Thinktech, 2020:5).

While 53% of CFOs around the world expect a 25% decrease in their incomes and/or profits, this rate corresponds to more than half of it for CFOs in Turkey (%56). The World Bank expects a 5,2% gross national product shrinkage in global economy and the European Commission expects 7,5% regression in the EU economy. Although the

rates of effect differ from region to region, escape from this effect for the whole world seems impossible (PWC Pulse Study, 2020). This can be resulted by the fact that the world hasn't had such a well-developed technology, information and logistics network that eases the spread of the disease before. Although everything from the supply of inputs to production, from social life to financial service and instruments, has come to a stopping point, individuals and business enterprises haven't given up their struggle for life in the pandemic process. The global struggle against Covid-19 of aforementioned individuals and business enterprises and also their increasing effort for finding innovations serving as an answer to economic activities that have globally come to a stopping point have proven it. Innovative spirits try to contribute to this struggle directly or indirectly with solution-oriented products and ideas (IASP, 2020).

While Covid-19 works as a catalytor of innovation, ecosystem are facing natural selection and innovation is going through a stress test. Technology and innovation, at this point, come out as a nonselective compulsory need that keeps people connected and helps them keep working and they turn into a compulsory tool (Accenture, 2020). On one hand, robots disinfect the environment, artificial intelligence systems and smart devices scan the patients, justify symptoms, determine patients, ensure the restructuring of supply chains quickly. On the other hand, the values of people change and they develop new strategies in order to keep up with digital era technology models (TECHVISION, 2020).

While such Covid-19 led contributions go on, simultaneously topics like distance working, digital cooperation and work place hygiene come to the forefront. Determining people's demands and needs, creating solutions and developing many innovations almost in every category is accepted as one of the key points in order to deal with the pandemic crisis durably. Moreover, R&D investments and also products and services based on R&D in these fields are supported. Accordingly, increases are observed in the number of patents taken.



Graphic4. The Covid-19 Impact on the Chosen Sectors
 NOTE: Global Innovation Exchange, A Tech Platform For Global Development. (Covid-19 Innovation Hub, 2020a)

While crises like pandemics and restrictions such as cleaning, social distancing and personnel inadequacy accelerate innovations, the excessive number of patents in the sectors developing innovation during the Covid-19 process is remarkable. It is seen that especially the region of Europe, the Middle East and Africa (EMEA) focuses on extraordinary innovations and also that in Asia Pacific (APAC) and North America (NA) regions, there is an increase mostly in innovations towards digitalization (Clarivate Survey, 2020). Among the very different innovations, there are glass houses, robot barmen, masks with transparent windows designed to make lip-reading possible (WEF, 2020e).



Picture1. Producing mask with transparent mouth panel
 NOTE: <https://worldtop.co/21-year-old-ashley-lawrence-has-designed-a-face-mask-for-the-deaf-and-hard-of-hearing/>, (Worldtop, 2020)

Additionally, autonomous robots, which offer food and medicine to isolated patients and also help to provide services such as self-care, cleaning, warning people about social distancing, and finally which patrol at the parks and make delivery to homes, can be considered among Covid-led innovations.



Picture2. Robots making delivery

NOTE: From dining pods to see-through masks: 6 ways innovations are helping in the pandemi, (WEF, 2020e).

Innovative devices that minimize contact have gained importance in terms of getting over the process with minimum loss and preventing infectiousness, which is in nature of the pandemic. For instance, the social distancing necklace warns the wearer vocally and visually through thermal sensors in times of getting closer more tan a certain distance.

In the pictures below, social distancing necklace named **sChoker**, which has been produced by using carbon fiber by designers, is shown.



Picture3. Social distancing necklace named sChoker

NOTE: Trendhunter, 2020 ; Springwise, 2020 distancing-necklace

In England, electrical buses helping to manage social distance and protect it have come into use.



Picture4. Electrical buses, handsfree

NOTE: UK startup Arrival launches electric buses that help maintain social distancing, (Covidinnovations, 2020).

In electrical buses that help to keep social distance, plexiglass screens and bells that don't require touch to request stop have come into use.

Contactless elevator panels named **Sparsless** have been developed by the Indian company 'Techmax Solution' to help prevent the spread of the disease.



Picture5. Contactless elevator panels

NOTE: (Covidinnovations, 2020)

Anti-Epidemic Robots scanning between 50 and 150 people in a minute by checking temperature changes and also making delivery of medicine or similar things and storing the data(Anti-Epidemic Robots)



Picture6. Anti-Epidemic Robots

NOTE: Anti-epidemic robots help Rwanda fight against COVID, (Covidinnovations, 2020b)

A soap solving after exactly 30 second intensive use has been developed by a famous soap brand.



Picture 7. The Self-Timing Soap

NOTE: Lush launches savvy new self-timing soap in collaboration with deliveroo to help fight covid-19, (Global Cosmetics News, 2020).

Portable hand washing basin technology has been developed by Project Process, a Purdue University initiative



Picture 1. Portable Hand Washing Technology, a Purdue University

NOTE: Purdue startup creates bedside hand-washing technology, (Purdue University, 2020).

Based on far distance principle in terms of health in the pandemic process, innovational designs have been developed to open doors without using their knobs and handles (WEF, 2020e).



Picture9. Door handles developed for opening doors with arm and elbow without using hands

Innovative solutions have been produced to help people become cautious and informed through the Covid-19 diagnosis kit developed by E25Bio, which can give result in half an hour and Coronavirus Innovation Map jointly created by StartupBlink and Health Innovation Exchange (UNAIDS, 2020). Below is the aforementioned coronavirus map.



Picture 2. Coronavirus Innovation Map

NOTE: New innovations map to strengthen the response to COVID-19, (UNIAIDS, 2020)

Business enterprises have done a lot of innovational work in many different fields from wearable technologies to smart devices and sensors in the global crisis, during which medical tools and software have come to the forefront. However, together with the lockdown in addition to long standing pandemic crisis and quarantine, people’s not only physical needs but also psychological needs have increased and their psychologies have been damaged. Business enterprises have replied to these Covid-19 led psychological needs with some innovative solutions and they have tried to meet people’s demands. Being among them, the two wearable bracelet brands “HEY Bracelet” and “Bond Touch” that are sold as couple, appeal to those who need to have realistic experiences and touch. These bracelet couples that can interact at a distance and can slightly shake hand and vibrate in order to virtualize human touch, are ideal products for the Covid-19 process. Moreover, it can be considered as an innovational and good opportunity for those who is need of touching and those who are in quarantine (TECHVISION, 2020).

Insilico Medicine designed a platform based on machine learning by using the data collected from projects to accelerate medicine invention. **Innowatts** is a leader supplier of artificial intelligence and prediction based analytical solutions for public services, energy retailers and smart energy communities (Businesswire, 2020). It helps to real-timely adapt to changing consumer behaviour. Innowatts had predicted that daily household energy consumption would increase by 8% during the coronavirus pandemic (Innowatts, 2020), and a 25% fall was observed in commercial buildings. It has been better understood during this process that the world needs renewable energy production and storing technologies more (Microgrid Knowledge, 2020).

Olam International, the world’s biggest cacao bean supplier, has developed a mobile application, with which farmers can prepare contracts and arrange sales documents online or offline by using phone.

Mass General Brigham developed a digital COVID Pass point, which frontline health workers need more and workers go through everyday, in order to track the spread of Covid-19 and digitally scan for a symptom. Furthermore, it offered the source code to all institutions and organizations freely on [GitHub](#).

Jacob's innovation programme Beyond If created workshops for both customers and Jacobs workers. They cover the topics such as Covid-19 customer challenges and opportunities in international defence, security and nuclear industries, applicable product designs and innovation transformation of a great science and technology customer. It won 2020 Best New Initiative award thanks to Beyond If programme (Milman, 2020).

Together with the Covid-19 pandemic, wearable technologies for health monitoring and location surveillance and also remote using and comprehensive IoB technologies due to the urgency of these activities have been brought to agenda. The main aim is to protect public health, predict the pandemics better in the future, to manage and prevent them. At this point, it can be seen that IoT (Internet of Things) turn into IoB (The Internet of Bodies) in the form of medical devices, various life styles, entertainment, business and fitness monitoring devices and other smart consumers devices that remain close to human body.

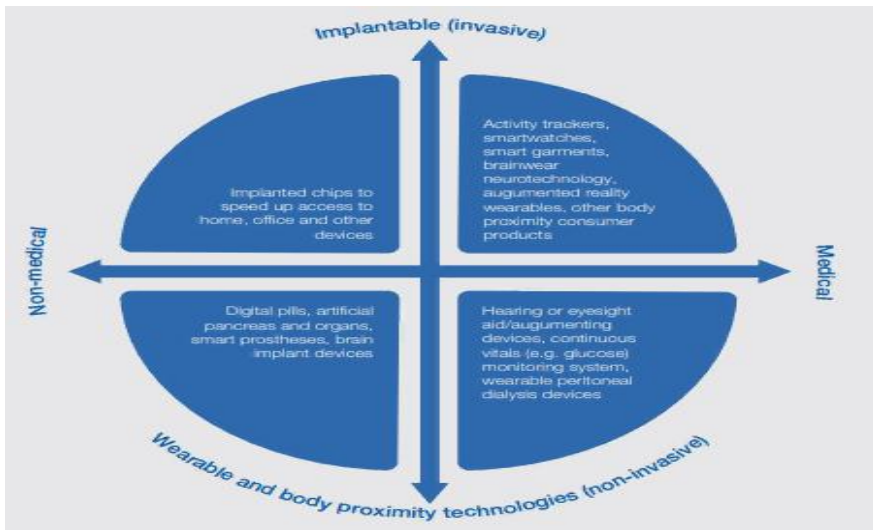


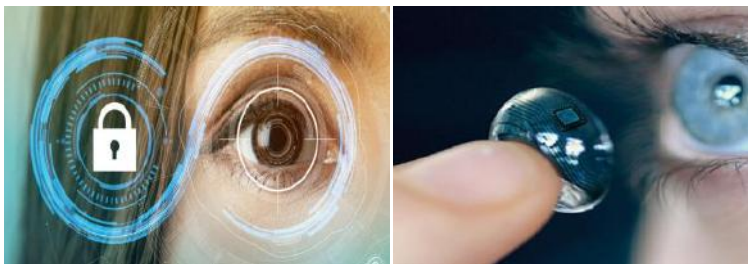
Figure 3. Examples of internet of bodies technologies

NOTE: Shaping the Future of the Internet of Bodies: New challenges of technology governance, (WEF, 2020d)

While a new IoB (The Internet of Bodies) period, in which devices and sensors are being installed and implanted to human body or these are

swallowed, it is expected that the pandemic will gradually increase these formations and inventions by functioning as a catalyzer (WEF, 2020d).

During the pandemic, ‘the Internet of Bodies’ means an embedded system or technology, which involves Apple Watches or Fitbits product technologies that can monitor health out of the bod, interbody cardiac pacemakers, implants and digital pills and finally bringing technology and human body together in order to real-time connect them to a remote device or machine. For instance, smart pills have eatable electronic sensors and computer chips, which collect data from our organs and save them after swallowing and thereby enabling us to monitor and treat diseases such as cancer, diabetes and many other ones by sending the data collected from the organs to a remote device that has internet connection. Therefore, they can be beneficially used for the situations, which require quarantine, social distancing and remote controlling like the Covid-19 pandemic. Additionally, the bioengineering company Biohax (for 4000 workers) and Three Square Market (for 50 workers) have implanted rice-sized microchips into the bodies of their workers and enabled them to enter through the doors without using keys, to use computers and even to pay at shopping. Although the use of them for business purposes out of health field is in question, contactless access to everything seems suitable when the infectiousness of the pandemic is considered. This influence is expected to become more in the following processes (Forbes, 2020).



Picture 11. Smart Contact Lenses

NOTE: The internet of bodies, (The Phantom, 2019).

On the other hand; instead of constantly monitoring blood glucose of those who have diabetes, smart contact lenses that will be implanted can serve the same purpose (The Phantom, 2020). At this point; among the most important and the biggest issues that keep minds busy, there are concerns on software bugs, what the updates will cause, physical damages, how the security of the recorded data will be ensured, the security of recorded sounds and similar data and how they will be protected (Forbes, 2020; The Phantom, 2020). Being able to produce products in smart house field in a way that enables software updates is also exciting and again the issues such as collecting the data and cyber security come to the forefront. According to the Consumers International and Internet

Society researches, 65% of consumers worry about data collection and data sharing, 75% of them don't trust the data sharing methods and 28% of them don't want a smart device due to their concerns over cyber security.

The Covid-19 pandemic process is making history as a period, in which the need for products such as contactless order and product delivery, voice-activated devices, contactless doors, soap dispensers, smart thermostats, smart lights, smart fridges and many others. Especially when the point that the time spent at home has increased 35% is considered, the increases in R&D activities and sales of the sectors in energy production, comfort and lightning, home entertainment, security, smart device and control engage prove it (WEF, 2020c; Kose et al, 2019).

4.10. THE SOCIAL INNOVATIONS THAT BECOME PROMINENT IN THE WORLD IN THE COVID-19 PROCESS

The pandemic processes are expected to have possible negative effects from economy to health, from international relations and psychology to socio-cultural behaviours. Generally, a pandemic process like this is in the nature of them. While the Covid-19 pandemic requires struggle and rescue efforts at a global scale, it increases the contributions of innovations in the struggle and it brings some focus innovation fields such as health, education, economy, trade, energy and artificial intelligence to the forefront (Global Innovation Exchange, 2020; Covid-19 Innovation Hub, 2020c). Therefore; the pandemic process, by its nature and seriousness, requires multidisciplinary working of very different science fields, accumulation of knowledge and unifying experiences. Emerged within the problem of the pandemic, the need for **technological innovation** constitutes only half of the equation that needs to be solved. While the sectors of transportation, education, service, agriculture and food safety are among the sectors that will be mostly effected (TUBA Report, 2020b:91,126), the need for **social innovations**, which will ensure the success of urgent actions and technological plans, constitutes the other half of the equation that needs to be solved. In this sense; the psychological needs of people as a social being are incontrovertibly important while the world is going through a heavy psychological period of time, during which people need to be in quarantine and keep social distancing. Some positive steps have been taken in order to meet such needs and some of the social innovations developed during the Covid-19 process are shown below.

The Covid-19 process, as the phrase is, has mutated the business enterprises and social life and it has changed the DNAs of enterprises and individuals. Together with this mutation, many big holdings and enterprises haven't been late to respond to Covid-19. The world's biggest brands (in different fields such as wine, clothing, leather, perfume, watch and jewellery) Christian Dior, Sephora, Donna Karan, Givenchy, Marc

Jacobs, Belvedere Vodka and also incorporating many similar brands, the French holding LVMH (Moët Hennessy Louis Vuitton) have used their production lines to produce free hand sanitizer for hospitals.

4.10.1. Some Brands That Create Social Innovation



Some fashion and textile brands like Hedley & Bennett and Hanes have produced preventive clothes against Covid-19 and some brands like Tesla and General Motors (GM) have produced vitally important health equipments such as ventilators. Some hotels have hosted homeless people, medical staffs and similar groups freely in order to help prevent the spread of the disease and support medical staffs (Accenture, 2020).

A platform called **NeedsMap--İhtiyaç Haritası** (www.ihtiyacharitasi.org) was established to connect people with those who can help them throughout the country when necessary, thereby enabling them to communicate. The aim is that people's needs can be met by the others through a non-monetary contribution system by making *map-based* data matching. Similarly, **Festtogether AtHome**, Turkey's first sustainable digital festival, was broadcasted live for 15,5 hours through Netd Music and Youtube Turkey with the participation of many celebrities in order to support people psychologically and to meet their need for music. The digital festival organized by Inogarart, Heymo the Experience Design Company, Tbwa for Good and Zenger Brand Experience Agency was viewed almost 13 million times and it helped to meet people's need for music (Özgür, 2020).

CareMother (www.caremother.in) created a mobile care programme that provides prenatal tests at home or at the center and conveys the data simultaneously to doctors and also that identifies cases. The Covid-19 scanning has been updated together with the analysis of the symptoms through artificial intelligence (Kulkarni, 2020).

GAIA Mobile Health Clinics (www.thegaia.org/) was founded jointly with the Malawi Health Ministry in order to provide access to critical health services in the rural parts of South Africa and offer preventive education and services and more than 2 million visits to the clinics have been observed. The aim for the foundation of these mobile clinics is to bring main health services and public health staffs to wherever the society urgently needs them against the health problems like Covid-19 and the environmental problems like climate change (Bouchelle, 2020).

Inokyo: COVID-19 Contact-Tracing (www.act.inokyo.com) is a formational innovation for the purpose of communication tracking. It has been developed only to test those who are under risk and keep them at home, keep them healthy and also to prevent the uncontrolled spread of the disease (Innovation Hub, 2020b).

Being the communication of social and behavior change in the localized rural parts, **Audiopedia**, (www.audiopedia.org), is an online project that combines the audio content with easily usable softwares, that can work in both smart and specific telephones and also that is solar-powered and finally that aims access to open information. Generally, it was founded to provide health education and life skills in rural parts. As a response to Covid-19, 'Corona WhatsApp audio campaign' and Audiopedia messaging platform were used to provide vital information (Heyne, 2020).

Gram Vaani Community Media, (www.gramvaani.org), was founded as a voice-based media platform. Generally, socio-cultural factors such as the lack of communicational channels, literacy obstacles, digital division and richness prevent the individual to make his/her voice heard. This situation has become clearer during the Covid-19 crisis. Therefore, the project aims to prevent the spread of misinformation and provide fair communication, communicate efficiently with a simple telephone that doesn't need internet and finally support communities (Seth, 2020).

POKET, (www.poketapp.com), aimed to map unofficial merchants and with this mobile application they created, they also aimed to map 70% of hospitals, chemists and pharmacies that were offline, unmatched and remaining invisible (Shafiq, 2020).

AppliedVR, the therapeutic virtual reality company, and **Red one Medical** tried jointly to offer VR stress managing programmes to their workers (Accenture, 2020).

Furthermore, Covid-19 caused some interesting innovations in addition to all these aforementioned ones. Researches that make dogs useful allies to identify people with Covid-19 at a war instead of Covid-19 test have been done. Dogs were used in the Covid tests done in Durham

University, London School of Hygiene & Tropical Medicine (LSHTM) and England based Medical Detection Dogs, Pennsylvania University and in France and they reached success. Accordingly, the dogs correctly managed to differentiate those with positive Covid-19 by %83 and those with negative Covid-19 ones by %96. It is accepted as a serious rate and a first innovation in this field especially when it is thought that fast antigen tests have sensitivity rates between 84% and 98% (TIME, 2020a).

The Covid-led innovations have reflected on jobs, as well and it led jobs like 'Superforecaster' to come to the fore. Superforecasters are identified as people, who generally estimate the results of events happening all around the world more truly than intelligence agencies by using modern statistical methodologies and who perform the art of estimation that is deep and objective-based and also who is called by the name 'superforecaster' due to their personal traits. For instance, the great data explained by senior CIA officer Joseph Gartin in the 63rd edition of Studies in Intelligence magazine in 2019 emphasizes that the effects of machine learning and the improvements based on information process on the intelligence agencies will be inevitable and enormous from investment partnership to tensions, from political violence to early warning systems regarding disasters (TIME, 2020b and Bobby, 2019). Super forecaster teams like Metaculus and Open Judgment have correctly forecasted the number of Covid-19 cases until March (2020), and also many other happenings in the world. Furthermore, mass protests and Brexit results are among these forecasts (TIME, 2020b). In summary; such people with high level of reasoning, pattern recognition and cognitive flexibility have started to enter social life and gain importance again together with Covid-19.



Picture 3. Illustration by Katie Kalupson for TIME

NOTE: Superforecasters' are making eerily accurate predictions about COVID-19. Our leaders could learn from their approach, (TIME, 2020b)

In a study carried out on the reports analysing the accuracy of more than 150.000 forecasts of 743 participants in 199 cases during two years, it has been noticed that the skills of super forecasters have been

impressively consistent and Covid-19 has brought them to agenda back (Mellers et al., 2015).

However, it shouldn't be forgotten that while putting both technological and social innovations forward, starting a lot of innovative projects and work at the same time can come out as an obstacle preventing business enterprises and individuals from giving reactions in the desired level. Focusing on a lot of innovations at the same time can retard fast and strategic reactions that are expected to be given. This situation can cause battles on the resources that are difficult to control and that go off the rails. Therefore, it is not only in critical periods like Covid-19 but always crucial to make decisions on the right innovation topics, the right time and the right level. A decision on a right innovation topic, the right time and the right level can be considered as the cornerstone of the factors that will help to be fast, resistant and also hold on to life (Accenture, 2020).

4.11. THE INNOVATIONS OF THE FIRMS IN TURKEY IN THE COVID-19 PROCESS

According to the data of the Association of Technology Development Zones (TGGB) that is one of the members of International Technoparks Union that gathers all the Technology Development Zones around the world under a single roof, some products developed within the scope of fight against Covid-19 can be seen (Teknoloji Geliştirme Bölgeleri Derneği, 2020).

Table1. Some products developed as part of the fight against Covid-19

TGB NAME	PRODUCT NAME	PRODUCT INTRODUCTION
ATAP	Developing Industrial Autonomous Transporter (OTA)	Autonomous transporter that will be the next generation of unmanned transporters and also that can decide itself is being developed. There will be UV-C type Germicidal & Virucide Lamps on OTA.
ANTALYA TECHNOCITY	Ergonomically designed Mask with Medical Face Shield	3D Printers have been produced with Antalya Technocity Entrepreneurship and Business Incubator in Prototype Workshop
ANTALYA TECHNOCITY	Laryn goscope	It ensures the patients to breathe and also examining of the respiratory tract
ANKARA UNIVERSITY TECHNOCITY	Thermal Camera Design with High Definition for the diagnosis of Covid-19	The output of this project, thermal camera will be available to use in many fields, in which temperature measurement is needed

TGB NAME	PRODUCT NAME	PRODUCT INTRODUCTION
ANKARA UNIVERSITY TECHNOCITY	Domestic and National and also SARS-CoV-2 Molecular Basic Diagnosis Kit	SARS-CoV-2 diagnosis kit is being developed.
ATA TECHNOCITY	Laryngoscope 3D Print	Disposable laryngoscope is being developed.
ATA TECHNOCITY	Robotic Hospital Service Car	Robotic car for medicine delivery is being designed.
BILKENT CYBERPARK	A2-VCA Person Tracking and Mask Control	Video Analysis application controls the legal precautions that prevent the spread of the coronavirus. Person determination, tracking and counting, mask control, social distancing control and capacity control in shops, street markets and factories are possible with it.
BILKENT CYBERPARK	A2-VCA Person Tracking and Mask Control	Video Analysis application controls the legal precautions that prevent the spread of the coronavirus. Person determination, tracking and counting, mask control, social distancing control and capacity control in shops, street markets and factories are possible with it.
BILKENT CYBERPARK	Doruk/Dolunay Aerostat Systems	It functions as a base station to prevent communication and internet outage during this process.
Bilkent CYBERPARK	WordTest	It is the most comprehensive online system that offers all the educational contents especially in English, which people can use in their home comfort without feeling a need for another source. Additionally, it lets institutional firms use its education infrastructure
Bilkent CYBERPARK	Covid-19 Prediagnosis with Cough Voice Analysis	It aims to determine if the citizens, who suspect that they have Covid-19 disease, carry risk or not via artificial intelligence and machine learning by recording the cough voice over the application, thereby leaving no reason to apply to health institutions. It will prevent unnecessary applications in health institutions and help to determine the citizens who primarily need to be tested.

TGB NAME	PRODUCT NAME	PRODUCT INTRODUCTION
DEPARK	PAN-PASS – Global Trackable Health Data Passport	It is a mobile health passport that helps track the personal health data through identity determination (SSI) in BlockChain with the individual’s control and also that will enable the data to be tracked in a trustable structure.
DEPARK	Mobile EKG	.EKG recording T-shirt shows the condition of heart and rhythm disturbances by measuring them via mobile phone
DEPARK	Household Type Ventilator	Mechanic ventilator device is being developed so that patients, whose treatment continues at home, can use alone in case of a respiratory insufficiency.
GAZI TECHNOPARK	Smart Face and Body Temperature Sensing System in Mass in Social Sphere	It records the information of the face together with the body temperature.
GAZIANTEP TECHNOPARK	Automatic Breathing Device	There are efforts going on to develop the device that works with the pressure power of the non-electrical O2 tube.
GAZIANTEP TECHNOPARK	Domestic and National Bioequivalent Medicine Study for the treatment of Covid-19.	The first bioequivalency studies for the medicines used in the treatment of Covid-19 in Turkey started with the partnership of Gaziantep University Technopark, Farmagen IKU Center and Novagenix Bioanalytic Medicine R&D Center
ITU ARI TECHNOCITY	SentroPlex	Covid-19 test that can give result in 90 minutes is being produced.
ITU ARI TECHNOCITY	Thing Shower	Portable and pocket-sized electronic sanitizer is being produced.
ITU ARI TECHNOCITY	Corona Tracking Application	It is an application that will track people who are suspicious of carrying coronavirus over the mobile phones.
ITU ARI TECHNOCITY	eConnect	Instant dataflow is obtained from the bedside equipments (monitor and ventilator) with the technology set in isolation and quarantine rooms.
ITU ARI TECHNOCITY	Thermometer	An automatic and contactless thermometer system that can be practically hung to buildings, mass

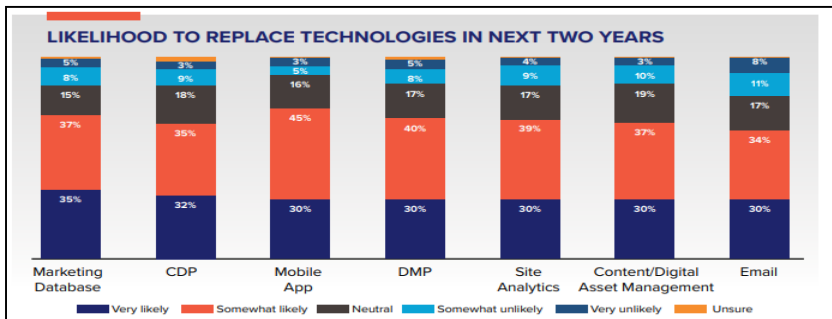
TGB NAME	PRODUCT NAME	PRODUCT INTRODUCTION
		transport vehicles and shopping malls (AVM) has been developed.
ITU ARI TECHNOCITY	Production of Reusable Preventive Coveralls	Liquidproof apron that is made of PVC and resistant to heat and tearing has been developed.
ITU ARI TECHNOCITY	N95Mask	100% domestically produced including filter materials N95 face masks that are conforming to international standards.
KAHRAMANMA RAŞ TECHNOCITY	SCIRads-Corona	Covid-19 pulmonary infections can be determined quickly with artificial intelligence.
MERSIN TECHNOPARK	Urban Express; Same-day Inner city Delivery	Accelerating product flow between enterprises and consumers via the newly developed algoritma and delivery model by offering same-day delivery service to natioanl e-trade sites and local enterprises is targeted in the project.
NIGDE TECHNOPARK	CES	It is a thermally controlled contactless pass system against the coronavirus
ODTU TECHNOCITY	CoroWarner	It is a mobile application that warns those who have had contacted with someone with a positive Covid-19 test.
ODTU TECHNOCITY	Labris UTM Series	The system of new generation network security devices
TUBITAK MARMARA TECHNOCITY	Bormask	Boron doped mask that is preventive against antibacterial and antiviral agents is being produced
YILDIZ TECHNOPARK	Automat Payment and Remote Managing System	The remote managing system of automats and payments with credit cards, in direct contact or contactless ways are being developed.
YILDIZ TECHNOPARK	Meeting Point	Production of an alternative to Zoom and other foreign-based video conference programmes has been aimed in order to use it in our country with open source software and domestic codes
YILDIZ TECHNOPARK	Meeting Point	Production of an alternative to Zoom and other foreign-based video conference programmes has been aimed in order to use it in our country with open source software and domestic codes

NOTE: Covid-19, (Association of Technology Development Zones, TGBD, 2020)

4.12. THE INNOVATIONS THAT WILL COME THE FORE IN MARKETING INNOVATION AND BUSINESS APPLICATIONS IN THE FOLLOWING YEARS

Three quarters of administrators in business enterprises state that the Covid-19 process will create industrial diversity and it carries great opportunities for growth and also that it has led to new innovations. Accordingly, 90% of administrators think that the ways of work will radically change in the next 5 years and similarly 85% of them think that it will effect demand and needs of consumers in the next 5 years. It is seen that administrators have problems in new growing opportunities and innovations and only less than 39% of them are ready to deal with the future changes as an opportunity and also they have worry for their carriers (Am vd., 2020).

Generally, marketing people have faced problems regarding these ways of working during the Covid-19 pandemic (Ozsaatci, 2020a:127-130). The main problems are that making marketing decisions takes very long time (46%), the data are in so many different places that they can't be useful (43%) and also they can't make use of the data (V12, 2020a). Below, the distribution of these problems are given.

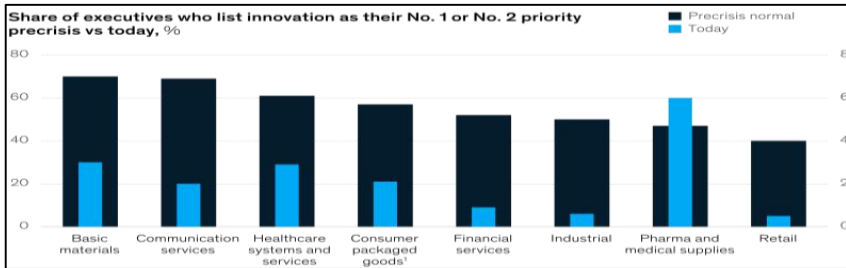


Graphic5. The Possibility of Relocation of Technologies

NOTE: Customer marketing and martech innovation during Covid-19, (V12 The Modern Marketing Platform, 2020a)

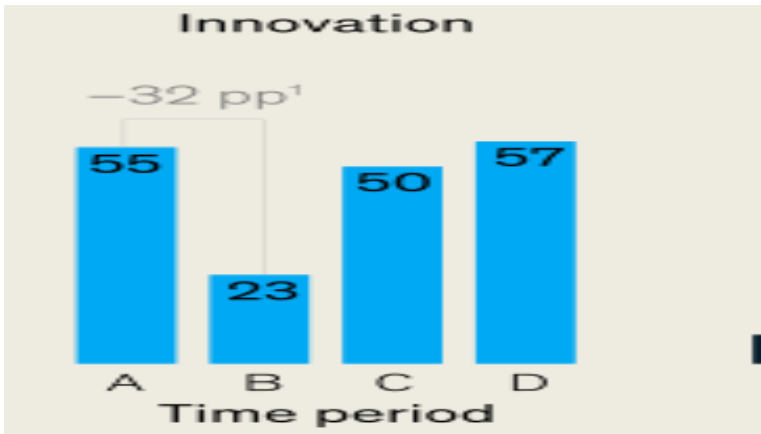
In the above the Chart what kind of changes these problems will lead in the following processes and what they will bring can be seen. Therefore, marketing people from many different sectors are expected to increase technological investments on site/mobile chat, mobile applications, e-post, video and marketind data. How a crisis period forces marketing to change and how it has started the winds of change can be clearly seen. The wind of change initiated by the Covid-19 pandemic causes innovation storms in marketing (V12, 2020a).The devotion to innovation of business enterprises

that have been in storms in the Covid-19 process has generally decreased and they have focused on short term topics.



Graphic 6. Innovation Time Period in All the Different Sectors
 NOTE: Innovation in a crisis: Why it is more critical than ever, (McKinsey, April 2020)

In the Graphic 8. it is seen that there are serious decreases in innovations almost in all the different sectors.



Graphic 7. Time Period Innovation through Crisis Survey
 NOTE: Innovation in a crisis: Why it is more critical than ever, (McKinsey, 2020)

However, there has been a 30% increase in pharmaceuticals of enterprises regarding health and medical products sector in terms of innovation.

From a general perspective, the crisis of Covid-19 and course of innovations after it and their percentage changes show that there will be tendency towards innovation until economic recovery is provided. In fact, the innovation combinations that have come out in the current chaotic setting, in which big misfortunes are experienced, can open new horizons for business enterprises. Because the risk perception of consumers has increased and although there has been a tendency towards security

technologies, consumers have become volunteer to pay more. This case provides business enterprises with an opportunity to create innovations by turning towards this field and make profit (Luo ve Alberto, 2020).

4.13. LESSONS TO DERIVE FROM THE ANSWERS OF ENTERPRISES TO COVID-19

The pandemic has radically effected economy and behaviors in business as well, together with social behaviours all around the world. Covid-19 caused great business difficulties, collapse in demand, various legal changes, interruption of raw material and product supply chain, job loses and finally the inevitable ending recession all around the world. Prioritizing the initiatives that will let the enterprises exist in the future and coordinating them have become the main problems in organizations. It has been noticed that the main distinguishing point between successful and unsuccessful speed and quality of decision making processes are criteria (Pedersen ve Ritter, 2020).

It has been noticed that business enterprises, which have strong reserves against the storm, make investmens actively in the short term, increase their digitization strategies aggressively and create systems, through which they can integrate new skills and applications to their organizations, are succeeding. In this period, according to Narayands and his friends, the Covid-19 pandemic is expected to bring the gaininings below to an enterprise (Narayandas vd., 2020).

Be transparent about your difficulties: It is inevitable that constantinformation updateregarding what is going on around the enterprise is required and inevitable. It has also been clearly noticed that interpreting complex and changeable information, knowing the weak sidesand using them in solutions are really important (Ozsaatçi-Bilginer, 2020b:167).

Internalize new communication modes: Digital platforms, remote access and video/conference systems are accepted as new communication ways to use in crisis periods like Covid-19 (TSKB, 2020). In this process, obligatory communication models such as telemedicine, teleconference, distance education have been used. Additionally, online forums and social media forums can be accepted among platfrom that can be used for customer feedback, exchange of views and omni channel (Ova, 2019).

Accelerate the digital transformation: Covid-19, which we can be named '**Digital Darwinism**' (Goodwin, 2020), is seen a process, in which things are being evolved quickly and which causes devastations. The importance of the automation of production processes and digital transformation for Industry 4.0 for all the sectors has been understood and

furthermore, enterprises themselves have had to experience it. For instance, the level of industry in Turkey is thought to be between Industry 2.0 and 3.0 (Şahbaz, 2020). However; this situation can be accepted as a disadvantage during the pandemic process, in a world, in which online sales have increased by two thousand percent and analog world has been decreasing. Improving the connection problems happening in videoconferences that have become compulsory in the Covid-19 process and also recording and protecting the speeches through right VPN and antivirus programmes have been required, thereby forcing companies to use innovational Technologies at this point. In this way, the way to investments on future-forwarding digital transformation has been opened (Marketing Turkey, 2020).

Rearranging to improve decision making: *The data's acting in the light of the company instead of companies acting in the light of the data* are seen as the factors that prevent or delay decision making and rearranging. Rearranging things by bringing simple solutions to complex problems and establishing empathy is the key stone to the way going to innovation (ESCARUS, 2020). The Coca-Cola company has stated that it has had to rearrange its decisions and plans in the direction of the news from the government and it also stated how important and necessary rearranging is (Marketing Türkiye, 2020).

Find new ways to cooperate: The pioneer and successful companies will be the ones, which don't confine themselves to only adaptation in terms of Covid-19 needs and demands and also which will be able to shape the results proactively (Reeves vd., 2020b). For this, they shouldn't avoid cooperation and trying new ways.

Officialize remote working and make it effective: Different ways can be found in order to make the new way of work efficient by looking at how health conditions and social attitudes are changing especially in the Covid-19 process. Regulations are being made by looking at trends and working with target groups and specialists in order to achieve it. For instance; Douglas Laney, the Caserta Data and Analytic Manager and Infonomics Writer, has stated that many workers of brands have tried to internalize remote working but companies that haven't applied this model before, didn't know what to do because their workers didn't have laptops. Therefore, they bought or rented laptops. In this way, a complex problem has been solved by a simple and efficient solution (Marketing Turkey, 2020).

In summary, it is necessary to understand the main principles such as supporting lifelong learning, rethinking how to evaluate staff performance, identifying volunteer opportunities, helping workers gain flexibility and

encouraging a more connected organization during the chaotic Covid-19 setting.

CONCLUSION

Not only people but also many fields such as business enterprises, social and private life, economy and tourism have been introduced with innovations that are based on mutation in a world, which has entered a very different and unique period of time. Additionally, the pandemic culture has had to give suitable answers to this new life style. Radical changes have happened in all the sectors, health being the first, and others such as education, transportation and service and also remote working type has been applied and finally there have been extraordinary experiences such as staying in quarantine. It is essential to carefully analyze the social life effects and possibilities of events happening in a process, in which the pandemic functions as a catalyzator,

Changes in many fields before and after the pandemic has led to innovations for business enterprises and consumers. Being able to respond to these demands and needs quickly and responsibly has gained more importance than ever for all parties and new trends have started to set new routes. People have had to lock themselves in the house, homes and work places have become common and finally the number of those who work at home has increased. The needs of the world that spends almost the whole day on digital platforms have differentiated and changes have become inevitable. Approximately 120% increase has been observed in categories such as online book, online education, health and sports products, petshop products and home and garden products. It is seen that the benefits of jointly working of people and artificial intelligence are promising as it has never been before and also it is considered necessary that people's trust to technology as well as their need for it should be increased.

In this sense, it can be easily said that business enterprises, which offer realistic and practical solutions and focus on making their customer happy and keeping their ties warm and strong with their right marketing strategies, will be able to get over this process successfully when the experiences in the previous pandemics are considered. Therefore, enterprises need to talk to their customers and understand their needs and demands to go beyond the estimations and also they need to apply truer technologies in order to create innovations by using an open and efficient communication way. Being swift and triggered in spendings for marketing in addition to innovation will contribute to their productivity and profit. While doing this, ideas and sources can be shared through different channels (LinkedIn, Twitter, Instagram and Facebook etc.) to receive feedbacks and by this way, they can benefit from the experiences of the rivals.

While humanity is rapidly proceeding towards an unknown future, it is seen that the pandemic brings the future to today farsightedly and instructively. In this time of pandemic crisis, it is inevitable that obligations determine innovations, innovations determine trends and trends determine new routes. While performing all these activities, treating people as a potential customer dedector just like Geiger counter and also thinking only in terms of sales and profits can damage the reputation of the company in such a way that it is difficult and sometimes impossible to fix.

In the global sense, being able to locate human resources and all sectors correctly according to the needs during and after the pandemic by creating fast, resistant and forward accounting innovation DNAs requires gaining productivity and integrating them into life in order to deal with the Covid-19 based issues.

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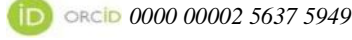
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CHAPTER V

THE IMPORTANCE OF INNOVATION AND HUMAN CAPITAL

Eda Dineri¹

¹(Dr.); Hasan Kalyoncu University, e-mail:eda.dineri@hku.edu.tr



5. 1. INTRODUCTION

At the present day, innovation plays an important role both from a micro and macro perspective. The main goal of all countries is to increase the welfare level of the country by taking individuals to the top level of the hierarchy of needs. In addition, countries desire to be a pioneer in the world by increasing their competitiveness against other countries. Today, one of the best ways countries that achieve these goals are achieved by innovation. One of the main keys to the growth and development of countries is innovation. Innovation activities provide added value by ensuring the commercialization of knowledge and inventions produced within the country, and make significant contributions to economic development by increasing the productivity of physical and human capital and labor force, and improving intellectual property (Işık and Kılınc, 2012: 32). One of the other fundamental keys of growth and development is human capital. Countries' productivity depends on machinery and vehicle investments as well as education and training on human resources (Helms, 1996:5). OECD (1997) states that the national innovation systems approach is the key to the innovative process between people, businesses and organizations and it is the transfer of technology and knowledge to these units. The factor that plays role in creating such condition is human capital. It is seen that developed countries in terms of human capital are leading countries in terms of technology adoption and innovation. The transformation of ideas and new technologies into productive output depends on the technical and human capital of the labor force, the ability of the economy's physical and information infrastructure to benefit from new technologies, and the company's industrial organization's adoption of the sectors (Porter and Stern, 2000: 29).

In recent years, there have been an increasing number of studies examining the relationship between innovation and human capital. For example Teixeira and Fortuna (2004), reveal in their study that human capital and indigenous innovation efforts were very important for the economic growth process in Portugal from 1960 to 2001. Danquah and

Amankwah-Amoah(2017) investigate the effect of human capital on technology and innovation for 45 Sub- Saharan Africa countries using the Malmquist productivity index approach for theperiod from 1960 to 2010. Danquah and Amoah (2017) found that human capital has a positive and statistically significant impact on technology but they didn't find the same result for innovation in Sub – Saharan countries. Maradana et al., (2017) in their study investigate the relationship between innovation and economic growth in 19 European countries for the period from 1989 to 2014. In the research, they use six determinants to understand the relationship between variables: This determinant consists of the followings: patents-residents, patents-nonresidents, research and development expenditure, researchers in research and development activities, high-technology exports, and scientific and technical journal articles. Analysis results show that each indicator affects each country economic growth differently.

In this section, human capital and R&D investments, which are the inputs of innovation that play a role in the economic growth and development of countries, will be explained.It will be emphasized that developed countries leading in terms of human capital and innovation are also high in per capita income, which is one of the indicators of living standards.

5.2. THEORIES OF GROWTH

The main objective of all countries is to achieve the economic growth and development of their nations. However, some countries grow fast while some countries grow slowly (Grossman and Helpman; 1991; Maradana et al. 2017, Mishkin, 2018; Goldin, 2019). Then what is the reason for differences? After the Second World War, countries began to focus on growth and development issues. However, in modern growth theories, human capital accumulation is expressed more clearly only in growth theories after the 1980s. The most important of the growth theories is the Solow Growth Model. In the Solow growth model (1956), the relationship between consumption, capital, labor, investment, savings and economic growth is analyzed. Population and technology are accepted as variables that affect economic growth externally.In the Solow growth theory, there is an unexplained part of the economic growth, except for labor and capital increase. There are parts of the production function that can't be explained (Mishkin, 2018: 166-167). The increase in productivity is due to technological developments. This inaccountable part of growth is called Solow residual.Solow residual sparked the need to look for other factors in accounting foreconomic growth. Kenneth J. Arrow's 1962 article titled "The Economic Effects of Learning by Doing" contributes to the growth model with the "Learning by Doing" model. "Learning by Doing Model" has shown the source of technical development and increased returns as learning and experiences are gained. It states that the increase in

the capital productivity of firms increases the knowledge continuously with experience and technological development. In this model technology innovations take place as an internal factor.

In 1980, the determinants of growth began to be explained by participating in technological change and human capital endogenous growth models. Romer (1986), Lucas (1998), Barro (1990) has been emphasized by economists that economic growth is not the result of external forces, but an internal result of the economic system. The growth model includes factors such as knowledge accumulation, human capital, R&D, technological developments, financial innovations, the new role of the state and market structures (Berber, 2011: 143). Economists, particularly Nelson and Phelps (1966), Romer (1990), Aghion and Howitt (1992), point out that human capital is the cornerstone of growth through technology and innovation. Human capital is the sum of the knowledge, skills and abilities of the individual in general terms. Human capital is as important as physical capital in explaining the development differences between countries. Increasing R&D as a result of investments made in human capital in a country constitutes technological development. Technological development causes new goods and services to be produced or to improve existing goods and services. Increasing productivity in production with technological innovations and increasing R&D investments that enable technological innovations to emerge directly affect economic growth (Erdoğan & Canbay, 2016:29).

5.3. HUMAN CAPITAL AND HUMAN CAPITAL INDICATORS

OECD is defined that human capital as the development or acquirement of knowledge, skills and capabilities to ensure personal, social and economic welfare. In order to gain individual qualifications, countries should make investments to improve these qualities. Aksu (2016) defines human capital as a concept that is intertwined with many disciplines or subjects such as economy, politics, industry, sociology, demography, law, biology, psychology, health, education, history, geography, military, technological development, R&D and innovation (Aksu, 2016:71). Developed countries in terms of human capital have higher economic growth rates and more advanced science and technology. At present day, human capital has three components. Survival, education and health are among cornerstones of human capital indicators (Dehnen, 2018). These indicators are named human capital index (HCI). “*Human capital index measures the amount of human capital that a child born today can expect to attain by age 18*”. Table 1 shows the human capital index ranking of the top 12 countries.

Table 1. Human Capital Index Ranking (Top 12 Countries), 2018

Singapore	0.88
South Korea	0.88
Japan	0.84
Hong Kong	0.82
Finland	0.81
Ireland	0.81
Australia	0.80
Sweden	0.80
Netherlands	0.80
Canada	0.79
Germany	0.79
Austria	0.79

Source: <https://data.worldbank.org>.

Table 3 shows that the top 12 countries in human capital index. The human capital index ranking highlights that mostly European countries take place among the first 12 countries but Asian countries are at the top of the human capital index ranking. According to the Worldbank Report, 50 years ago, Singapore was confronted with severe unemployment, poor infrastructure, and a housing shortage. Today Singapore is ranked as one of the most livable cities, boasting one of the highest levels of human capital development in the world. According to the human capital index, child born will be 80 percent productive when the child grows up in full education and full health in South Korea. When we observe these countries, it is seen that these countries are also at the top of the world's economies and have high per capita income. We can say that countries with high per capita growth rates in global competition are the countries that lead the human capital accumulation.

Human capital index, which was prepared in October 2018, is a report prepared by the World Bank. Human capital index ranges from 0 to 1. The aim of the human capital ranking is to observe the progress of countries in education and health and further accelerating them. Human capital indicators are composed of:

- Probability of Survival to Age 5
- Expected Years of School
- Harmonized Test Scores.
- Learning-adjusted Years of School.
- Adult Survival Rate.
- Healthy Growth

One of the ways to improve human capital is through education (Dakhli and De Clerq, 2007:108). The success of society can be achieved with education and training that can improve the knowledge, skills and

abilities of the person. The following criteria are followed to determine the relationship between economic development and the education levels of countries. Educational records, education levels, financial and physical indicators and literacy rates are monitored for changes in education. Educational investments increase the knowledge, skills and abilities of individuals. Knowledge, skills and abilities cause productivity differences between those with and without education (Oxaal, 1997:3). Countries consider increasing enrollment rates in education, improving education and increasing practice as one of the basic principles of development (Osiebo,2020). Education and tertiary education elements are included in the input of the global innovation index. Another factor affecting human capital along with education is health. Becker (1964), Grosmann(1999)emphasized the importance of health in human capital.According to the Human Development Report, the human development index is defined as an average of a long and healthy life, being knowledgeable and having a standard of living. One of the contributions of human capital is the development of skills and increasing productivity. The others are to contribute to the formation, implementation and spread of technological changes and new ideas. (Awan, 2012: 2199; Fuente et al., 2002:4). In order to accumulation human capital, governments should make regulations in education, health and technology policies.

CASE STUDY: JAPANESE ECONOMIC MIRACLE

After the devastation of the Second World War, the economy of Japan was hit hard. In the 1950s, the Japanese economy started to grow. The average rate of economic growth from 1955 through1973 was 9.3 percent. The country, which had rapid economic growth until the 1990s, entered the recession period called “The Lost Decade” since 1990. After the Lost Decade in the 2000s, the Japanese economy continued to grow. By 2020, Japan is the third largest economy in the world. Human capital investments, science, technology and innovation activities are the factors that play a role in the growth of Japan. Japanese companies understand the vital importance of research and product development. In 2000, Japan's global patents increased to 25% and Japan maintains its patent- leadership position in semiconductor technology in 2020 (Chokki et.al, 2020). Japan has applied its science, technology and innovation activities to industrial policies. It has been successful both in the development of the country and in creating a knowledge society through its policies (Erbil et al., 2016).Today it has become one of the high-income country economies in the world.

5.4. INNOVATION

Innovation has become an indispensable element in every field of change, development and enrichment. The establishment of innovative approaches as a culture in the society will contribute positively to the economies of the country (Dam and Yıldız, 2016:221). Innovation and knowledge are aimed to be transformed into economic and social benefits. In this context, innovation helps to establish the culture of innovative approaches in society and contribute to the country's economy, as it prepares the ground for the development and use of new methods to meet social, economic and cultural needs (Aytekin & Ekinci, 2013, 2016.; Ekinci, 2019a)

According to Schumpeter, one of the effective ways innovation contributes to society is “Creative destruction”. Schumpeter (1934), one of the pioneers of innovation, has broadly defined the concept of creative destruction. “Creative destruction” refers to the process that contributes to economic development and new technologies replace old ones as innovation. Schumpeter innovation is evaluated as follows:

- the introduction of a new good.
- the introduction of a new method of production.
- the opening of a new market.
- exploration a new source of supply of raw materials.
- the implementation of an organization of any industry (Croitoru, 2008:139).

Romer (1990), Grossman and Helpman (1991) brought a new perspective with the process of technological progress in endogenous growth theories. Their models emphasize a technological advance, the discovery of a new type of product, as in today's general definition of innovation, an improvement in the quality, productivity of an existing product (Barro, 2006; Ekinci, 2019b). Grossman and Helpman (1991) mention two changes occurring in the world economy, first is an innovation that ensures economic prosperity and the other is an increasingly open and dependent economy. They explain economic growth by relating innovation with trade. As technology transfer alone will not be sufficient, underdeveloped countries emphasize that R&D incentives should increase and multinational companies should increase their activities (Grossman and Helpman, 1991: 43). In this way, these countries will be able to increase their openness to trade by transferring technology from developed countries and provide a rapid economic growth acceleration with innovation. Therefore, these countries will be able to increase their openness rates by transferring technology from developed countries. Innovation provides the country with economic growth by affecting variables such as global competitiveness, financial systems,

quality of life, infrastructure development, employment, and trade openness (Maradana et al., 2017:2; Ekinici, 2016).

The global innovation index ranks countries' economies by observing their innovation capabilities. The global innovation index is designed to reveal the strengths and weaknesses of a country through its policies and practices related to innovation, focusing on both developing ways to measure innovation and understanding innovation (Taş, 2017:99). The global innovation index includes many dimensions of innovation.

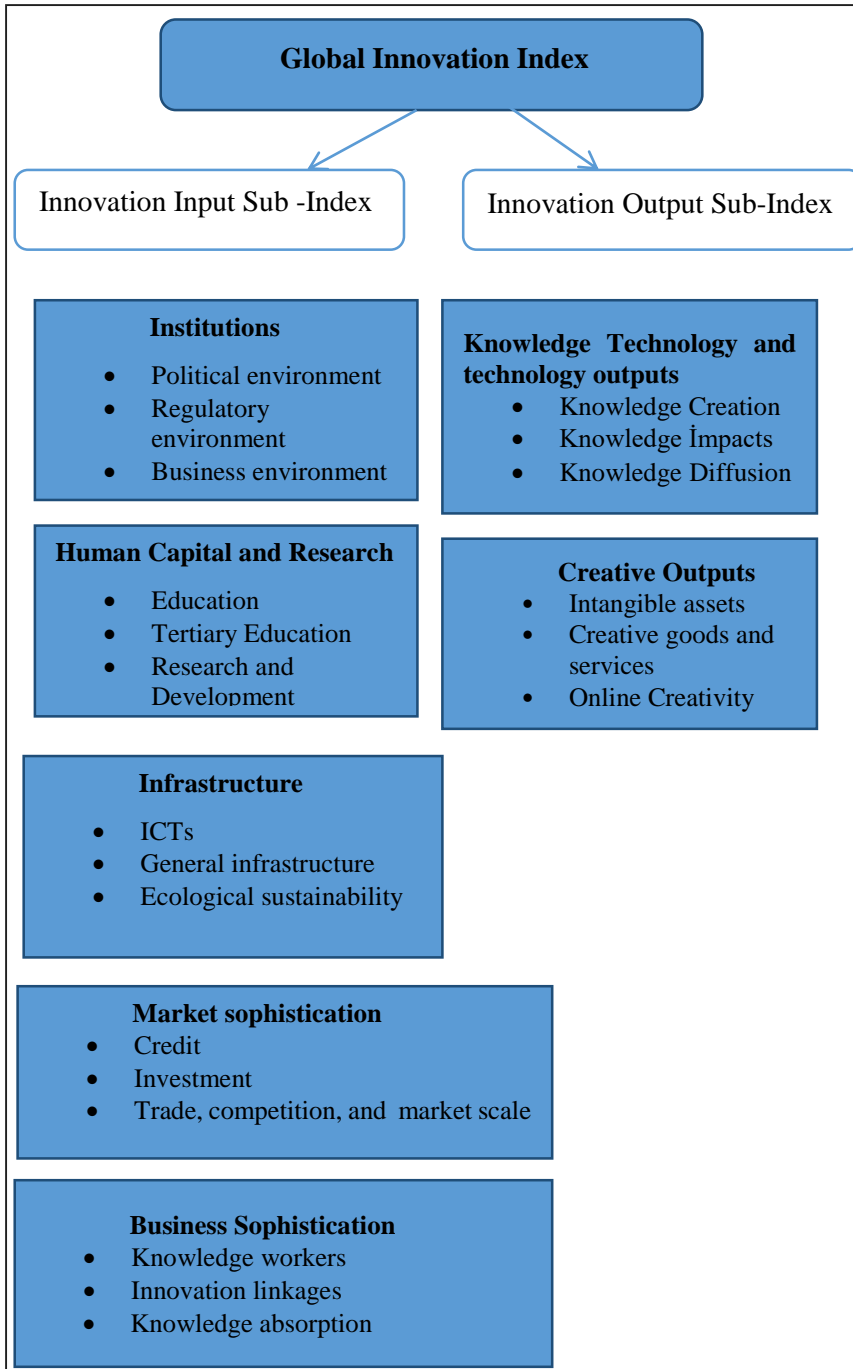


Figure 1. Global Innovation Index
Source: www.wipo.int

5.5. HUMAN CAPITAL AND RESEARCH INDEX

Human capital and R&D included in the global innovation index are the basic indicators supporting innovation. Education, one of the cornerstones of human capital, plays a key role in the economic growth and development of countries. Increasing investments in education, which is one of the basic inputs of human capital, disseminating education and increasing its quality are necessary conditions for economic growth and development. Teixeira and Fortuna (2004), state that with human capital accumulation a country can reap the benefits of a country's indigenous innovation efforts. There are five important stages of human capital accumulation in the realization of innovation. Human capital accumulation is distributed within individual to firm, from firm to industry, from industry to country (Munalj and Kundi, 2017). By contributing to the development of qualified a workforce, creative thinking and advanced techniques that adapt to the needs of the economy that adapts to change, social cohesion, the continuity of economic growth and preparing the appropriate infrastructure for positive change can only be achieved through education (KarataşveÇankaya, 2010: 41). In addition to providing high earnings and income to individuals, education also improves the living standards and quality of individuals. As the level of education increases, the risk of being unemployed in the labor market decreases (Mincer, 1991:22). In addition to the added value it creates for the individual, the total return it delivers in the society also increases. Increasing schooling in higher education is the highest level in education where the individual will contribute both to himself and to the society. Table 2 shows that school enrollment rates in tertiary education for the period from 2002 to 2019.

Table 2. School Enrollment Rates in Tertiary Education (% GDP).

Years	World	OECD Members	Middle East & North Africa	Europe & Central Asia	East Asia&Pasific
2002	21.5	54.92	20.76	46.34	14.78
2003	21.5	56.87	20.83	49.39	16.79
2004	22.7	58.17	22.19	50.50	18.46
2005	23.5	59.25	23.37	52.58	19.62
2006	24.2	60.95	24.33	54.41	20.47
2007	25.9	61.80	26.11	55.74	21.00
2008	26.9	62.71	28.37	56.78	21.58
2009	28.0	64.47	28.95	57.83	23.21
2010	29.4	67.38	30.66	59.12	24.85
2011	31.2	69.06	30.94	59.82	26.37
2012	32.4	69.99	33.10	60.62	28.97
2013	33.1	69.77	34.46	62.44	31.66
2014	35.5	70.72	36.74	63.76	38.48
2015	36.6	71.68	38.02	64.82	40.98

2016	37.4	73.69	38.34	67.10	42.44
2017	37.8	74.69	38.65	69.62	43.17
2018	38.3	75.65	38.11	71.92	44.14
2019	38.4	74.39	38.4	73.18	46.03

Source: <https://data.worldbank.org/>

As seen in Table 4, gross schooling rates are increasing over the years. Countries with high human capital index have higher gross school enrollment rates than the world school enrollment rate. In 2019, gross schooling rates are listed as follows: Singapore 88.8%, Finland 90.26%, Germany 70.4%, Canada 70.1%, Ireland 77.2%, Australia 107%, Austria 86.6%, Netherlands 87%, Sweden 72.4. In addition, the countries in the top 10 economies of the world except for China - America 88%, China 53%, England 61.8% France 67.62%, Italy 64.29%, Russian Federation 84.5% - have very high schooling rates. However, China is implementing programs to train highly skilled workforce in order to move to the innovation - based economy (chinapower.csis.org). China started to grow rapidly with the great economic reforms implemented after 1978. Reforms such as liberalization of investment and trade, promoting the creation of private and rural enterprises, relaxed state control over some prices, industrial production, and increased education investments contributed to the growth of the country's economy (Hu and Khan, 1997). According to a 2016 National Science Foundation Report, in China, which has implemented policies based on an innovative knowledge economy, science and technology (S&E) degrees are approaching those in the United States. In addition to the increase in schooling rates, its share in the expenditures allocated to education is also important. Table 5 shows the share of government expenditure on education in GDP.

Table 3. Government Expenditure on Education (%GDP) 2018

Singapore (2013)	2.89
South Korea	5.25
Japan	3.46
Hong Kong	3.30
Finland	7.09
Ireland	3.76
Australia	5.32
Sweden	7.55
Netherlands	5.36
Germany	4.81
Austria	5.45

Source: <https://data.worldbank.org/>

As seen in Table 5, government expenditure on education is increasing over the years. The share of government spending for human capital investments is gradually increasing. In Singapore, which ranks first in the human capital index, government spending on education may be lower than other. However, efficient results are obtained in human capital in line with the principles of prudence and accountability (www.singaporebudget.gov.sg). The government expenditure on education share of the countries in the top 10 economies of the world is as follows. USA 4.98%, UK 5.54%, France 5.54%, Italy 4.08%. There is no data on China in the World Bank database. However, according to the Ministry of Education, China increased education spending in 2018. According to reports, China's education spending increased by 8.39 percent annually to 4.6 trillion Yuan (approximately US \$ 685 billion). It shows that approximately half of the expenditures are higher education ranked second after compulsory education (www.globaltimes.cn).

Along with education, which is one of the inputs of innovation, research and development investments are also important parameters for countries that adopt an innovative approach. Sustainable economic growth is provided by the increasing return of human capital working in the R&D sector to innovation (Ulku, 2004:4). The most important input of research and development is human capital. It plays an important role in increasing labor productivity by helping it accelerate technological change (Cinnirella and Strab, 2017: 193). Research sectors use the human capital and existing the stock of knowledge (Romer, 1990: 79). The human capital and the stock of knowledge uses the production of final goods and leads to an increase in the growth rate of output (Ulku, 2004:4). Therefore, countries increase their research and development investments day by day. Research and development is the creative work to innovate and design new product, services. R&D is organized efforts towards product and process innovation

or increased scientific knowledge. According to the OECD, it is defined as the realization of creative activities that increase the human, social and cultural information stock and the use of the new information stock for new applications (Manual, 2002:30).

There are three types of research: basic type, research type and development type. Basic research is also called pure research and experimental research. Basic research is research with the aim of gaining, advancing and expanding new knowledge about the facts about the universe, society and the nature of its organisms (Baimyrzaeva, 2018:6, Manual, 2002:30). We can define applied research as the development of technology and techniques by acquiring new knowledge. In other words, it is original research for a specific practical purpose or goal. Development research is a systematic project work that uses existing knowledge from research or practical experience to produce new materials / products / tools, create new processes / systems / services. It is seen that the economic growth rates and per capita income of the countries that support research and development increase and there is an increase in their welfare level. Table 6 shows the research and development expenditure to GDP.

Table 4. Research and Development Expenditure (%GDP) 2018

Singapore	1.94
South Korea	4.53
Japan	3.28
Hong Kong	0.86
Finland	2.77
Ireland	1.14
Australia	1.87
Sweden	3.32
Netherlands	2.16
Germany	3.09
Austria	3.14

Source: <https://data.worldbank.org/>, <https://ec.europa.eu/>

Research and development expenditure is increasing over the years in the world. Table 6 shows the share of research and development in countries with a high human capital index. In 2018, China spent 2.18 percent of its gross domestic product, 1.96 trillion Yuan (US\$ 284 billion) on R&D. Despite the Hong Kong government's efforts to increase funding in recent years to promote innovation and technology, R&D spending is still low (Chu, 2020). But the human capital index score is very high. This achievement of Hong Kong is based on success in local, public schools (Allan, 2018).

5.6. GENERAL ASSESSMENT AND RECOMMENDATIONS

Human capital has been included in endogenous growth theories as the internal variable of economic growth since the 1980s. Increasing the human capital of a country means new technologies, as well as efficient and effective means of production. New technologies and the development of efficient and effective means of production will provide economic growth (Liberto, 2019). Human capital investments, which play a role in the development of new technologies, are one of the main inputs of innovation-based growth. The contribution of qualified human capital stands out in transforming innovative creativity into an economic benefit (Orhan, 2018:311). Today, human capital accumulation, technology and innovation are factors that play a major role in increasing per capita income. Globalization, development of information and communication technologies, R&D investments increases the need of countries for highly skilled workers in terms of productivity, innovation and quality. The increase in the human capital stock in the country also enables R&D activities and technological progress, and the production of high value-added goods and services. It is observed that countries with a high human capital index have very high R&D investments and per capita income. In order for other countries to catch up with the developed country level, they should increase their investments in human capital and R&D investments. Only in this way can they become an innovation-based economy. Developments in science and technology cause social and economic changes. In order to create an innovation-based economy, human capital policies, which are one of the elements of innovation, must be implemented well.

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CHAPTER VI

ECONOMIC DEVELOPMENT AND INNOVATION SYSTEMS

Zeynep Köse¹

¹(Dr.); *Hasan Kalvoncu University, zeynep.kose@hku.edu.tr*

 ORCID 0000-0002-9494-3098

INTRODUCTION

The world economy has recently witnessed tough competition and countries have entered into a fierce competition with each other. Countries resort to different strategies and try to achieve economic growth in such an environment. In this case, there are ways to encourage economic growth. R&D investments and innovation should be prioritized for countries to compete in an environment where technologies are being developed and globalization is increasing.

6.1. RELATION OF ECONOMIC GROWTH AND INNOVATION RELATIONSHIP IN ECONOMIC THOUGHT

Economic growth always had a special place and importance through the history of economic thought. Economic growth has been a strategic policy goal for countries and numerous studies have been carried out in this direction. What economic growth is and what its determinants are have been investigated in almost all economic thought trends.

Economic growth is the increase in the amount of output as the simplest definition. Economic growth is achieved in two ways in an economy. While the first is achieved through the efficient and effective use of all production factors used under full employment conditions, the second is achieved via economic growth by adding new production factors under full employment conditions. The issue that economists are working on most is the second way (Kaynak, 2007: 51-53). While economic growth has been achieved, much work has been done on what its determinants are. As a result, it is understood that the determinants of economic growth in a society are capital accumulation, population growth and technological development, including physical and human capital (Berber, 2011: 21).

The determinants of economic growth in classical growth models are division of labour and specialization. According to Keynesian growth models, determinants of growth are savings and investments. According to internal growth models, the determinants of economic growth are human capital and technological developments. This has included technology, education and human capital in the production function. Technological

developments, R&D investments and innovation accelerate the process by providing the opportunity to produce goods with high added value to achieve economic growth.

Innovation and technology have an important place in production in the development process in terms of being in the age of information communication. Innovation has an important place in economic and social development in both developed and developing countries. Additionally, while competition among countries has increased as a natural result of globalization, consumer demands have also diversified (Ekinçi 2019a, 2019b). As a result of making sufficient use of information and communication technologies in the economy, flexible production systems are established, innovation activities are carried out and employment is increasing (Işık & Kılınç, 2013: 23).

The innovation is one of the most significant factors for ensuring economic growth as a strategic importance in the competition in and between countries. It plays a key role in ensuring the economic growth and employment, increasing innovation and improving the quality of life (Aytekin and Ekinçi, 2014; Elçi, 2007: 31;).

R&D and innovation can be considered as two complementary elements. R&D is a method used to produce information. It may be the production of information that has never existed before or the development of existing information in this process. R&D level and efficiency, human capital structure, innovation activities carried out and incentives provided in this matter influence the production process of information in both companies and countries. Factors influencing information acquisition are current R&D capacity, human capital, technology import. The use of accumulated knowledge in the production of a good or service is also the application of knowledge (Blakeley et al., 2005: 8).

It is a fact that the countries that attach importance to R&D and innovation activities are successful in ensuring economic growth and sustaining growth (Ekinçi, 2019a, 2019b). It is observed that, higher value-added goods are produced and more high technology products are exported in countries with high R&D and innovation investments. In today's world, countries have turned their faces to technology-intensive development.

6.1.2. Mercantilist and Physiocratic

It is a system of thought developed between Medieval economic thought and Physiocrat thought periods in Western Europe between 1450-1750. It was born more as a reaction to the medieval thought system. This thought system has caused the development of political economy as a result of the awakening created by the renaissance and reform movements that emerged in Western Europe (Kök, 2000: 40).

The problems of everyday life, how individuals and nations will be rich have been dealt with within the Mercantilist thought system. National goals such as the ability of a state to withstand long wars, conquer new land and establish colonies are also the symbols of being a strong state. When the feudal lords collected war materials with their own means, the government had mercenaries in the modern state concept and the state would need money to win the war in the Middle Ages. Therefore, the primary purpose of the rulers is to increase the treasury by giving surplus of trade. This situation has seen the state administration as the main principle in the mercantilist thought system. Economic policy was used as a tool for the growth and development of the economy and the state (Savaş, 2007: 138).

The first written source of the Mercantilist period, written in 1613 by Antonio Serra, *A Brief Study on the Reasons that Gold and Silver are Abundant in Countries with No Mineral Resources*, contains the basic principles of mercantilism. The way to increase the wealth of a country is to collect precious metals in the country, and this is only possible with the export of more industrial goods. Because the return of industrial goods is higher and these goods both provide more returns and the production of these goods is more stable compared to agricultural goods. For this reason, the unemployed population in the country should be employed in the industrial sector. Another Mercantilist thinker, J. Steurat, argues that the government should intervene in the development of exports to increase the amount of precious metals (Küçükkalay, 2015: 171).

According to the Mercantilists, the factors affecting economic growth are rapid population growth, low wage policies and low interest rates, export growth and colonialism. Montaigne (1523-1592), Bodin (1530-1596), Jean Thomas Mun (1571-1641), Sir Colbert (1616-1683), William Petty (1628-1687) are the significant mercantilist thinkers (Berber, 2011: 45).

Mines are the source of wealth in mercantilist thinking, making it possible to reach precious metals by countries and people. The only problem was to have precious metals. In this period, the trade sector was seen as the leading sector. Agricultural areas have remained idle, especially in countries with large and fertile lands such as France. Recently, serious economic problems such as unemployment and high price increases have started to appear in many countries due to population growth and diversification of demands. The failure of France in the seven-year wars between France and England during this period was the signal of the conflict in France. In this period, the exploitation of the agricultural population of aristocrats and clergy in the society made the revolution inevitable. With the French Revolution in 1789, reforms arose on land use, taxation and protection of individual rights. Guilds have been lifted, entrepreneurship has been opened and individuals have been given

freedom to do business and barriers to trade have been removed. It also prepared an environment for transition to mechanization in agricultural product production in order to meet the demands of the rapid population growth accompanying this situation (Küçükcalay, 2015: 193-196).

It is seen that agriculture has always been pushed to the second plan in the Mercantilist thought system. The physiocracy emerged in France after three centuries of Mercantilism's rule. According to physiocrats, the source of economic growth is the production. The agricultural sector gives more than what we give, so production must be based on agricultural products. While agriculture takes more than we give, industry and trade can not only change the shape of matter. While the agricultural sector is efficient, other sectors are inefficient, the tax is collected only from the agricultural sector (Zarakolu, 1981: 10). The source of wealth is sought, just like mercantilists in this system of thought, and it is argued that wealth will be through production rather than exchange. Production should be based on the production of agricultural goods. According to these, farmers are capitalist agricultural producers (Kazgan, 1980: 57-59).

Physiocratic thought is also based on the idea of natural order. Accordingly, the rights of individuals are in the foreground and the principle of individual interests should be found in the economic order. *With the motto 'Let them do, let them pass'*, they argue that people will not do anything bad for them, and that cooperation will be beneficial. They also reject state intervention (Erim, 2007: 17).

This system of thought has found wide application in the developed countries of Germany, England, Holland, France and Spain when examined in detail. Generally, technology was important even though it was not named that at the time, considering the reasons such as encouraging foreign trade and industrial goods production, overseas trips due to colonialism since the state took over the industry and encouraged the establishment of large enterprises with many industrial policies in this period. In addition, it has included a number of practices to increase competition.

It is seen that the foundations of the classical thought system were laid in the physiocrat thought system. In the physiocratic thought system, there have been serious developments in education, science and art as a result of an enlightenment period in France and the introduction of mechanization to increase productivity in agricultural production, the individual interests being at the forefront, and. Although it is not explicitly stated, it would not be wrong to say that technology and mechanization have an important role in both the mercantilist thought system and the Physiocrat thought system.

6.1.3. Classical Economics

Economic growth has accelerated in many countries and reference has been made to the phenomenon of growth with the industrial revolution. The common point of classical growth theories developed by A. Smith, T.R Malthus and D. Ricardo is the division of labour and long-term capital accumulation.

The source of economic growth is division of labour and specialization according to A. Smith. There are two things meant with division of labour: The first is specialization and the second is a useful job. Thanks to specialization, the skill of labour will increase and as a result, labour will become more productive. There must be an exchange economy for realization of the division of labour. Another important factor is that if the exchange economy is valid, it is necessary to follow the innovations in production. Another important issue that A. Smith emphasizes is to increase the productivity of labour. Capital accumulation will emerge, and investment and savings will increase as a result of increasing capital accumulation as a result of increasing productivity in capital. As a result, economic growth will be achieved (Erim, 2007: 42-44).

According to Smith, the locomotive of economic growth is capital accumulation, and this is sourced from savings and profit. Savings and increase in profits increase the investments and capital stock, which initiates the growth process. Economic growth is achieved with the transformation of savings into investments. According to Smith, division of labour will be useful only if the accumulation of capital is sufficient and the market is large enough. Current capital accumulation should be able to purchase technology that can increase the productivity of the workforce and the market should be large enough to allow for increased production. The power to mobilize the division of labour leading to increased economic growth is the ability to exchange, and the source of this power is sufficient market width. For the expansion of the markets, good management and developed transportation networks and money should be used as a means of exchange (Berber, 2011: 50).

Finally, Smith emphasizes that there is a need for division of labour, specialization and accumulation of capital, as well as human capital and mechanization to achieve economic growth. With the mechanization in the sectors, per capita national income will increase. Capital accumulation is a result of the division of labour, and constant capital accumulation hinders economic growth. According to Smith, there should be division of labour and specialization in foreign trade. According to the absolute advantage theory, the international division of labour accelerates growth. As a result of increasing demand as a result of foreign trade, it triggers specialization, which provides efficiency in the economy and as a result, free trade will increase economic growth (Pehlivan & Utkulu, 2015:

16).

According to Smith, knowledge and technology depend on capital stock in achieving economic growth and the distribution of income between free trade and countries reduces differences. Although mechanization is very important for economic growth, technology is not included in the production factor (Smith, 1776: 272).

D. Ricardo, another classical economist, argues that increasing wealth in one country is possible through industrialization. According to him, the only sector to increase productivity resulting from technological developments is the industry sector. In the agricultural sector, productivity can be increased by mechanization, but there is a sector where the productivity will be increased more because the law of decreasing yields is valid and there is a land constraint (Yılmaz, 2010: 24).

According to Ricardo, in times of high economic growth, high profit rates will increase capital accumulation and encourage savings. In addition, increasing the production of profit rates will increase wages by increasing labour demand, and the increase in income will bring population growth with it. As a result of the increase in the population, the demand for food will increase, as a result of this, previously only in fertile lands, while unproductive lands will be opened to agriculture. In accordance with the law of decreasing yields, costs and profit will be equalized and entered a period of stagnation (Berber, 2011: 63).

It is seen that economic growth and distribution are intertwined in Ricardo model. Food prices will increase, and profits will decrease as a result of the increase in production despite the increasing population. As a result, the economy will go into recession. Although decreasing efficiency in the economy is valid, fixed capital increase and technological development will delay the stagnation but will not be able to stop it completely (Dülgeroğlu, 1997: 33, Taban, 2008: 33). The machines are the concrete form of technology according to Ricardo (Ricardo, 1817: 9).

While Smith focuses on how to increase economic growth, Ricardo's priority is how to divide the resulting output. Therefore, while Smith was trying to grow his current income pie, Ricardo was interested in the distribution of his income pie. Ricardo described the economy as a giant farm and divided the society into three classes: workers, capitalists and landowners. Agricultural production is shared between these three classes as wages, profits and rent, respectively. Wage, profit and rent vary depending on soil productivity, population growth, level of specialization, agricultural mechanization and capital accumulation. According to Ricardo, the rate of profit earned by capital owners has a special importance since it has a driving force in industrial capitalism. Economic growth accelerates as a result of increased profit rates (Bocutoğlu, 2012: 94-96).

Malthus, who entered the growth literature with his ‘*An Experiment on Population Principle*’ study, written in 1798, revealed the relationship between population growth and food growth. Accordingly, while the population increases geometrically, food increases arithmetically. It is expected that population growth will not be brought under control and there will be a shortage in the long run (Malthus, 1998: 6). It is required to restrict the marriage and stop the social aids according to *Population Law* prepared to control the population increase.

Malthus’s assumption that the population will increase as a result of increasing wages with relation between population and wages has given dynamism to Ricardo model. But there is a situation that Malthus cannot foresee that the only reason for the population increase is that there are no marriages or wage increases. With the Industrial Revolution, the death rate decreased, the life span extended, the developments in medicine, the improvement of living conditions caused an increase in natural population. Even with the increase in industrialization and urban population, the income level increased, birth rates decreased (Berber, 2011: 59).

The general evaluation of classical growth theories indicates that it is possible to say that it is the first systematic theories in the growth literature. In such theories, it is seen that the law of decreasing efficiency is valid, the speed of technological development is low, and the *population law* is valid. In addition, when new inventions are revealed, growth will be achieved automatically without the need for government intervention by creating a suitable environment for economic growth (Kazgan, 1980: 97). High amounts of savings turn into economic growth by stimulating investments according to the classics. The main thing is that the priority of high savings is economic growth (Dipendra, 1999: 80).

6.1.3.1. Karl Marx Growth Model

K. Marx has tried to explain the economic problems of the period he was in and the change process of the economy such as the Communist Declaration (1847) and Capital (1867). These works, published by Engel after Marx died, describe how to achieve economic growth (Hunt, 2005: 265).

Marx lived in the period of transition from the agricultural social order to the capitalist social order. In this period, new factories established as a requirement of being an industrial society were producing with steam machines. While all these developments were taking place, unions to defend the rights of workers were not established and laws to protect workers were not yet established. The political tendency in Marx’s works arises from the exploitation of workers during the period. Marx targeted the capitalist system where labour was exploited (Demirel, 2006: 38).

According to Marx, capital accumulation is an important

determinant of economic growth. Although technological development is at the forefront, production must be sustainable in capital accumulation. As a result of converting residual values into investments, the accumulation of capital will increase and economic growth will be achieved as a result (Kazgan, 1980: 387). According to Marx, technological development is needed to create a new product (Marx, 2003: 314).

6.1.3.2. Harrod-Domar Growth Model

This growth model, developed by R.F. Harrod and E.D. Domar, is based on the Keynesian model. The model is referred to as the Harrod-Domar model because of the slight difference between the studies conducted by Harrod and Domar (Pehlivan and Utkulu, 2015: 20).

The Keynesian model is made dynamic by using the theory of reproducing and accelerating, and how to achieve stable growth in the long term is explained in the study titled *An Essay on Dynamic Theory* prepared by Harrod in 1939. In a society, income determines the desire for savings. The demand for savings depends on the increase in income and supply is equal to the demand in the model (Harrod, 1939: 14).

Published by E.D. Domar in 1946, *Capital Spread, Growth Rate and Employment* discusses effect of investment and employment on economic growth. The analysis of the relationship between variables is based on assumptions such as the general level of prices, no time lag between events, the productive capacity of the economy, the savings and investments in the model are dependent on the income of the same period, investment, savings and income are net size (Domar, 1946 : 137).

Investment is the main determinant of economic growth in both Harrod and Domar models. But the perspective of investment is different. According to Domar, an investment made in the current period will only increase its production capacity in the future periods. Harrod analysis is a retrospective analysis. Investments made according to the income of the previous period are equal to the savings in the current period. In the Harrod model, how the entrepreneurs will react to the increase in income and in case of satisfaction with the income increase in the previous period, economic growth will be attempted the year after (Berber, 2011: 111).

6.1.4. Neo-Classical Economics

The representatives of the Neoclassical growth model that emerged in the 1960s are F.P. Ramsey (1928), R. T.W. Swan (1956), M. Solow (1956), D. Cass (1965) and T.C. Koopmans (1967). Solow and Swan are the names that have contributed most to this growth model, and the theory is analysed by the Solow Model developed by them. In the Solow Model, the Harrod-Domar model is criticized for the fact that its coefficient is considered constant, it tries to solve long-term problems with

short-term analysis tools and is an unstable growth model (Pehlivan and Utkulu, 2015: 27).

In the neoclassical growth model, capital accumulation is accepted as an internal variable. Unexpected changes in capital accumulation are left-over residual. According to Solow, productivity in production is the result of an increase in capital accumulation. Due to the decreasing returns in capital accumulation, it is not possible to achieve an economic growth above technological development (Tang, Hu and Lin, 2005: 3; Solow, 1956: 70).

While the expansionary fiscal policies implemented in the neoclassical growth model increase the per capita national income in the long term, it does not appear to have any effect on the real product. In this model, the decrease in the marginal productivity of capital does not precisely prevent it as the technology is considered external (Günsöy, 2001: 165).

The Solow Model consists of two different equations based on the production function and the capital accumulation function. The model's assumptions are that there is a closed economy, full competition conditions are valid, individuals are rational, factors that decrease in scale according to the scale are valid, and production function is based on scale based on constant income. In the Solow model, population, labour, savings and technological development are external variables (Jones, 2001: 20).

The Solow Model is the first theory to investigate the impact of technological innovation on economic growth. While researching how labour and capital affect production, technology has been considered external. Although the inexplicable part of the change in economic growth with labour and capital is explained by technological development, there is no information about the production of technology in the model. The technology in the Solow model is now considered as a balance for this reason. Although technology and population are accepted externally, they are the source of economic growth in this model (Gülmez & Yardımoğlu, 2012: 336; Pehlivan & Utkulu, 2015: 30).

6.1.4.1. Schumpeterian Opinion

Schumpeter has predicted that capitalist ideas would collapse over time and felt close to socialism. According to Schumpeter, the biggest economist is Walras. For this reason, it is not clear which school Schumpeter is included in. Schumpeter adopted the thoughts of the Austrian School but did not agree with all of them. Schumpeter mostly focused on the method. He made horizontal and vertical investigations and most importantly added the time factor to his analysis (Küçükkalaycı, 2015: 469-70).

According to Schumpeter, the main determinant of economic

growth are innovations and innovations are an endless source of growth. Innovation, a new product and the renewal of the existing product; producing a product by a new method or inventing a product that has never existed is defined as innovation (Schumpeter, 1934: 66; Brouwer, 2000: 149). Schumpeter stated how important innovation is for economic growth as “a growth without innovation is similar to Hamlet without a Danish prince” (Gülmez and Yardımoğlu, 2012: 336).

6.2. NEW ECONOMIC THOUGHT / EVOLUTIONARY ECONOMICS

Since the neoclassical growth models were insufficient in explaining the technology, which has an important role in achieving economic growth, the neoclassical growth model left its place to the internal growth models after the 1980s. Lucas (1978), Romer (1986), Grossman and Helpman (1991), Barro (1991), Aghion and Howit (1992) are the significant representatives of internal growth models. Unlike the Solow model, technology is included in the model as an internal variable. Internal growth models focus on the impact of information, education, technology and overflows on economic growth (Wong, Ho, Autio, 2005: 336).

According to intrinsic growth models, economic growth is the result of a power coming from within the system and this is the most important difference that distinguishes these intrinsic growth models from Neoclassical growth models. While economic growth and per capita national income increased in some countries as a result of the industrial revolution, the fact that this is not the case in some countries shows the importance of technology in economic growth. Accordingly, the reason for the difference in growth is not independent of technology. Internal growth theorists think that economic growth differences between countries are also related to public and private sector choices. These theories complement the neoclassical growth theories with their analysis considering the differences in efficiency and R&D (Romer, 1994: 3).

Education, health and technology policies, regional and demographic factors are the main factors affecting economic growth in internal growth models (Aytekin and Ekinçi, 2013). An investment in education, health or technology reveals human capital, resulting in increased R&D and innovation activities. Either a new product is created, or the design / process of the existing product is developed as a result of R&D activities in a country. As a result, the innovations mentioned by Schumpeter appear and economic growth increases (Berber, 2011: 148; Ekinçi, 2018).

It is possible to classify the internal growth models according to the variable that it prioritizes the main determinant of economic growth. Accordingly, internal growth models are divided into groups as Romer

Model, Lucas Model, Barro Model and AK Model.

6.2.1. Romer Model

According to the Romer Model, technology is the main determinant of economic growth. From this aspect, Romer Model is the technology incorporated into the Solow Model. As a result of technological development, capital accumulation increases, and increasing capital accumulation causes an increase in the amount of output. Technological also encourages entrepreneurs and causes economic growth (Romer, 1990: 72).

According to Romer, low-cost high-quality production is carried out with the new production methods resulting from the increase in capital accumulation. Investments increase the physical capital stock and cause the stock of information to increase. From this point of view, it is possible to say that knowledge is a result of production and investment (Barro and Martin, 2004: 232).

The activities carried out in the Romer Model are carried out by dividing into sectors. Accordingly, there are three different sectors as intermediate goods sector, final goods sector and R&D sector. While mostly investment and consumer goods are produced in the intermediate and final goods sector; New ideas are generated in the R&D sector. These new ideas create economic capital by creating information capital (Romer, 1990: 79).

Innovation emerges as a result of increasing R&D activities due to technological development. While innovations increased economic growth at the macro level; It also increases the profits of companies at micro level. As companies invest more in R&D activities, externality and overflow of information result in increased returns in the long run, resulting in increased economic growth (Jones, 1998: 73).

Innovation increases the competence and efficiency of both countries and companies. According to Schumpeter, innovation has a role in removing inefficiency from there and has a positive effect on economic growth with this role (Gault, 2010: 72; Amidon, 1995: 2).

According to Romer, the seeds of economic growth and technological development were planted in R&D laboratories. Two situations that arise in these laboratories increase economic growth. Accordingly, it is not possible to store any new information obtained, and everyone will be able to access the information at no cost. Productivity will increase due to the positive externality that this situation will reveal. Another situation is that the inventions produced in these laboratories will both increase the variety of investment goods and increase productivity in production (Berber, 2011: 155; Aytekin and Ekinici, 2016).

6.2.2. Grossman and Helpman Model

Unlike the Romer model, Grossman and Helpman Model, a model based on technological innovations, also linked economic growth to foreign trade. Due to the insufficient R&D investments in underdeveloped countries, the rate of openness is very low. Therefore, these countries will be able to increase their openness rates by transferring technology from developed countries. Since technology transfer will not be sufficient alone, underdeveloped countries must increase their R&D incentives and increase their multinational company activities (Grossman and Helpman, 1991: 43).

In this model, the R&D sector benefits from the opportunities brought by foreign trade. The R&D sector will be the driving force of economic growth with the comparative advantage it will bring to the country. Underdeveloped countries will provide technology transfer with free trade and they will be easier to access information (Ercan, 2000: 133).

The resources required for innovation are limited despite the unlimited potential for developing new goods in the Grossman and Helpman Model. Decreasing returns in information production are not valid. Product prices are a function of wages. The number of firms in the market is determined by the firms' profit expectations (Arnold, 2005: 3).

According to Grossman and Helpman, technological development depends on available resource stock and market incentives. For this reason, a model has been introduced in which economic growth is internalized through vertical product development. According to this model, innovations that are the source of economic growth are the result of R&D activities carried out and increase both product quality and product diversity (Aytekin and Ekinçi, 2016). In order to maximize profit, a firm should conduct R&D activities to the point where marginal benefit equals marginal cost (Bayraktutan and Kethudaoğlu, 681).

6.2.3. Aghion and Howitt Model

According to the Aghion and Howitt model, externalities created by R&D activities increase economic growth. This is why governments often use this policy. R&D incentives given by the governments and the market regulations they provide give monopoly power to the inventor firm (Berber, 2011: 155).

Aghion and Howitt model Schumpeter is the development of the 'creative destruction' model. The most important point in creative demolition is that technological developments and innovations change the quality of the products, as well as destroy the patent competition (Aghion and Howitt, 1992: 323). In this model, innovations as a result of R&D activities and a continuous increase in the quality of goods produced with this technique are observed. Every emerging innovation/discovery wear off the previous products and technologies (Aghion and Howitt, 1998: 53,

Cheng and Dinopoulos, 1992: 409).

6.2.4. Lucas Model

It is emphasized that the source of economic growth in the long run is human capital in the model developed by R. Lucas. There is a system that has no external factor and has a certain population increase in the Lucas model; thus, there are two different capitals: physical capital and human capital in this system (Lucas, 1988: 39).

Romer previously mentioned positive externalities. The externalities are a result of human capital accumulation according to Lucas (1998). Economic growth will increase as a result of investments made in human capital by both the public and private sectors. Human capital investments not only increase economic growth but also increase productivity in other sectors and increase the economic growth rate (Berber, 2011: 152).

6.2.5. Barro Model

According to this model, which is referred to as public policy, goods or services produced by the public are included in the model as production factors instead of labour in the production function. According to this model, the only income of the government is income tax, while the only expense is public goods production. Public income and expenditure are always equivalent, so there is an equivalent budget (Yülek, 1997: 90).

The importance of R&D is also emphasized in the Barro Model. Because technological development affects productivity and causes economic growth to increase. Countries where R&D activities are excluded from tax, incentives are given and supported, have made significant progress in this regard. Barro argues that tax policies affect the mobility of R&D activities. High tax practices have a deterrent effect on R&D activities. The fact that R&D activities are higher in countries with low tax burden also confirms this situation (Zinc, 2006: 144).

According to the Barro Model, the state should facilitate the exchange of goods and services with its free trade infrastructure. In addition, the state should provide an environment for new knowledge production to ensure pareto optimum. In addition, the state should invest enough in education, but these ways people will be able to use new knowledge. Accordingly, there are three duties that fall on the state. Providing public goods input in productive sectors, increasing education investments and increasing the R&D incentives to provide information production and dissemination (Berber, 2011: 156).

6.2.6. Arrow Model

Human capital, the sum of knowledge and skills, increases

economic growth. Although it is accepted that education investments increase human capital, human capital is formed by learning through working process (Berber, 2011: 152).

It accepts learning by doing arrows as an internal parameter. The decrease in costs over time is explained by learning by increasing the quality and output in some sectors. According to Arrow, firms learn the business better as they make production, which leads to a decrease in costs and an increase in the quality of the goods, and economic growth is provided (Arrow, 1971: 130-135).

6.2.7. AK Type Models

Much work has been done on the determinants of economic growth in developed countries for many years. It is the first and simplest AK model from the studies. According to the EC model, while capital stock increases in an economy, the return of capital does not decrease. It causes economic growth by stimulating high capital investments in the economy since there are no decreasing yields (Berber, 2011: 157).

According to another EC Model, the Rebelo Model, the economy has a steady return on scale and the economy is stagnant. Although there are no externalities in the model, human capital is produced using physical capital. In addition, there are two sectors in the economy as well as reproducible factors such as physical and human capital and non-reproducible factors such as land. According to Rebelo, the reason for the economic growth differences in the countries is the economic policies implemented (Rebelo, 1991: 510-520).

6.3. OVERALL EVALUATION

Achieving economic growth, one of the most important macroeconomic variables, is an issue emphasized in the economic literature. The determinants of economic growth have also changed, especially due to the globalization, the development of information and communication technologies, and commercial liberalization. Growth theories have been introduced to explain what the determinants of economic growth are. The determinants of economic growth are division of labour and specialization in traditional growth theories. The production function also consists of labour and capital. Additionally, there is limited growth in the economy due to reasons such as the declining efficiency law in the economy and the existence of the population law.

The determinant of economic growth is population and technological development according to neoclassical growth theories. But the technology variable is external in the production function. Since the technology is external in the model, there is a temporary growth in the economy.

New growth theories have emerged over time with the effect of technological developments. According to these theories, which are referred to as modern growth theories, the determinant of economic growth is R&D, technological development, education, human capital, public expenditures. The main thing is that the R&D investments made by both the public and the private sector will increase productivity by causing technological development. The increase in production resulting from the increase in productivity shows that economic growth will be achieved. In addition to the increase in the amount of output, the increase in product quality, the production of added value goods and their export will also encourage economic growth. Labour, which is an important production factor, will become qualified labour with what they have learned in the training and process they have received. This situation, which is defined as human capital, is an important factor that encourages economic growth.

Today, economic growth has many determinants such as climate, intellectual property rights, savings, R&D investments, education, entrepreneurship activities, foreign trade. These factors must be emphasized for economic development. In the empirical literature, it reveals the impact of technology and innovation on economic growth in recent years. The impact of technology and innovation on economic growth has been proven both theoretically and empirically with theories and analysis. It is generally accepted that technology and innovation are the main determinants of economic growth (Stel et al. 2005: 311).

In countries that produce new products and services, sell them in international markets and have a certain influence in these markets, they are actually the most important proof of innovation and technological development. Because innovation is a fundamental value in today's world (Geyik & Yıldız, 2017: 86).

Looking at many developed countries today, it is seen that the basis of economic growth is knowledge and technology. Now service commerce rather than commodity commerce has started. Service production is only an output of training and R&D investments. Countries need to increase their share of R&D investments in national income and prepare an innovation-oriented education program by reviewing their education policies.

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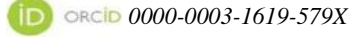
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CHAPTER VII

DIGITAL INNOVATION HUBS WITHIN THE SCOPE OF THE EUROPEAN UNION INNOVATION POLICY

Oğuz Güner¹

¹(Assist. Prof. Dr.); Amasya University, e-mail: oguz.guner@amasya.edu.tr



7.1. INTRODUCTION

On the occasion of the developments in science and technology, substantial transformations have begun to take place in numerous industries. Particularly with the structural transformation and innovation activities experienced in the economy in the last two decades, certain industries have grown and developed while some industries have started to weaken and even disappear.

In the European Council summit in Lisbon in 2000, the European Union (EU) adopted its will to transform its economy into the most competitive and dynamic economy in the world, based upon knowledge and sustainability (European Commission, 2000). Lisbon Summit was a confession that the EU lags behind the United States of America (US), Japan and South Korea in terms of knowledge production and innovation and it has been observed that the EU's knowledge-based economy ambitions and knowledge creation capabilities require re-assessment since capital investments in information and communication technologies are lower (Karagiannis, 2007: 67).

Although quite a lot of academic and scientific studies have been conducted on innovation and innovation production, few subjects regarding digitalization and digital innovation have been discussed in academia. As innovations concerning digital products are not only related to technology companies but also universities, local authorities, government and even international institutions discuss, design and implement policy sets concerning digital innovation.

The EU designs and implements various policies in order to increase innovation development capability and strengthen knowledge generation capacity for a long time. In this context, the EU has established Digital Innovation Hubs (DIHs) in Digital Europe Program. DIHs are targeted at ensuring that every business, small or large, high-tech or not, can use digital opportunities. DIHs are one-stop shops in terms of their business/production

operations, products or facilities leveraging digital technologies that enable corporations to become more competitive.

This chapter discusses Digital Innovation Hubs in the EU presenting various indicators such as innovation systems of the EU countries by European Innovation Scoreboard, Digital Economy and Society Index and Digital Competitiveness Index. The study concludes that DHIs must have different roles and instruments to improve digital innovation eco-systems as regions and countries have different and specific needs.

7.2. INNOVATION

Since the second half of the 21st century, traditional industrial society approach has been abandoned and a transition towards an information society has commenced. This society in which knowledge is directed and shaped, the number of personnel working in the production of knowledge has increased, and new employment areas and economies have been formed where knowledge is the main source as well as production and service economy. The key to growth and development in this society is the production and strengthening of new knowledge with creativity, and its emergence as "innovation" by gaining commercial value. Innovation derives from knowledge. It is the revealing of something new by enriching the knowledge. This can be a new product, a new service or a new method (Karlsson, Stough, & Johansson, 2009: 2-4). It is actually defined as "the successful exploitation of a new product, service, organization or process" by European Innovation Management Academy (EIMA, 2019). It is also defined as "a new or improved product or process (or a combination) which differs significantly from the previous products or processes and has been made available to potential users". Innovation has four types; product innovation, process innovation, marketing innovation and organisational innovation (OECD, 2018).

According to the Oslo Manual, innovation is the realization of a new or significantly improved product, service or process, new marketing method, new organizational method in-house, workplace organization or an external transaction. The minimum requirement for innovation is that new or significant improvements have been made in the processes or products. Innovation activities are all scientific, technological, organizational, financial and commercial steps that lead to a new application or aim to introduce an innovation application. Its main feature is that it can be applied as new or improved when it is put on the stage or released to the market (Oslo Manual, 2018).

Innovation emerges with a system in which more than one actor takes part in a network, from the production of raw materials to the sales process, arising from cooperation with a labor or job distribution. Innovation occurs when various groups and actors with different economic resources (physical

capital, knowledge, manpower) establish new partnerships in order to create a new cooperation network. In this context, the innovation process should not be explained in simple terms such as putting new scientific and technological knowledge into practice (Takeishi & Numagami, 2010: 33). Innovation is the transformation of new ideas into products and services to be launched or shared with the public. At the same time, it is the provision of resources needed in this process. The beginning of the process for new ideas to become innovation may be full of economic and technological uncertainties. Whether the idea will produce a successful innovation output may not be clear at the first stage of the process. The important thing is that the output that comes into being at the end of the process can be commercialized and take place in the market by gaining value (Takeishi, Aoshima & Karube, 2010: 165-167). The main source of innovation and creativity has always been knowledge. Processes such as accessibility to the source of information and rapid dissemination of information enable the production of innovation to become widespread (Braun & Herstatt, 2010: 139).

Innovation has a strong link to economic growth. A new business can be established with a new idea, or a company can gain a competitive advantage with this idea. Innovation reveals important differences between firms of various sectors and sizes. As a matter of fact, companies that do not produce innovation have the risk of being annihilated from the market by other companies. History is full of examples of these. In this context, the task of individuals, companies and actors is to follow the advances in technology, to establish connections and to reveal something new by evaluating the opportunities they have with their ideas. For this to happen, two basic components are needed. The first is resources such as human capital, equipment, information and money, and the second is the institutions and organizations that can manage them (Bessant & Tidd, 2008: 10-19).

Innovation is an important engine of economic growth and social development and should not be explained in new or improved products, processes or services. The development of new systems, new functions and new organizations is also considered as innovation. In addition to being scientific or technological, innovation can also be new services to meet the demands of society. Developments with the aim of contributing to economic growth, creating employment, reducing poverty, increasing security, providing a better quality of life and ensuring sustainable development can also be considered as innovation as these developments provide social benefits. In order to achieve these benefits, information, human capital, budget and infrastructure elements must be developed. The country that claims to create innovation must be able to use the fundamental parameters such as financial environment, design capacity, organizational flexibility, networking ability and entrepreneurship effectively. In this context, innovation policies

should be in close relationship with other policy areas (Conceição & Heitor, 2005: 1-3).

The concept of innovation is closely related to science, technology and R&D. In fact, the thing that governments or states call science or research policy has begun to be called or perceived as innovation policy after the 1960s. It would not be correct to say that every study in the field of science or research at the moment produces innovation, but most of the current policy tools aim to produce scientific, applied or technological knowledge. In this context, it would not be wrong to use the concept of innovation for policy tools aiming to generate new knowledge. Especially in regions with advanced integration such as the European Union, countries' policy designs are getting closer to each other and increasingly similar. In this age when information and communication technologies are stronger than ever, when the policy sets of countries in the world are examined, especially the European Union countries, such as science, research and innovation, it is quite common to find many similarities (Akçomak, 2016: 510-525). Similarities and competitiveness in innovation is basically dependent on the investments on knowledge infrastructure and human capital. Additionally, technological infrastructure matters a lot for the competitiveness of nations as it may provide an absolute advantage (Lundvall, 2016: 353-354). Competitiveness means the capacity to grow and the productivity of employed sources. The productivity of employed sources is the value of outputs produced by labour and capital. In this regard, competitiveness depends on the quality of product and efficiency of production in innovation (Jantón-Drozdowska & Majewska, 2013).

7.3. INNOVATIVE INFRASTRUCTURE AND CAPABILITIES OF THE EUROPEAN UNION

Policies designed and implemented in research and innovation area at European level has necessarily been a part of the integration process of the EU. Following World War II, establishment and spread of peace were essential. Aim to establish political unity in the continent stopped unending wars and increased cooperation in the fields of internal affairs as well as foreign and security policies. Convergence in various policy areas has started to be inherited to research and innovation policy areas since the mid-1980s. The Single European Act introduced a new title concerning research and technological developments in 1987. The article defined the objective “to strengthen the scientific and technological bases of European industry and to favour the development of its international competitiveness” and the Community’s actions in the area. This was the first step in European integration in research and innovation policy. Following the article in the Single European Act, the EU treaties, decisions by the Council and the Parliament and policies by the Commission have strengthened the area (Caracostas & Muldur, 2001).

Table 1. Innovation Policy Objectives of the European Union Commission

Objectives	Policy Instruments at EU level
Coherence of innovation policies	<ul style="list-style-type: none"> • Benchmarking and coordination of national innovation policies
An innovation-friendly regulatory framework	<ul style="list-style-type: none"> • Intellectual property rights • Standardization • European accounting standards
Creation and growth of innovative enterprises	<ul style="list-style-type: none"> • Networking activities and directories • Support services with a European dimension • Encourage participation of SMEs in public tendering
Improve interfaces in the innovation system	<ul style="list-style-type: none"> • European networks of research institutions and universities • Diffusion of good practice of local networking • Transnational technology partnership
A society open to innovation	<ul style="list-style-type: none"> • Technology foresight at EU level

Source: Susanna Borrás, The Innovation Policy of the European Union: From Government to Governance, p.18

Initiatives and instruments specified in Table 11 indicate that policy domains converged and innovation processes started to step up to supranational/transnational level. EU innovation policy was transformed to an inclusive dimension where different policy areas in the EU come together and contribute to innovation processes in Europe, which would be seen in the aim of the Lisbon Strategy- “the most competitive and dynamic knowledge-based economy in the world”. The EU has actualised regulatory field with respect to innovation, which refers to deregulation, regulation and inspection. The deregulation in the EU was implemented to ICT markets under the information society and provided an important move for innovation. Additionally, EU regulations in intellectual property rights and controls in competition policy have had an impact on the innovation process and ecosystem (Borrás, 2003; 18-20).

There are huge disparities among the EU countries like the monthly minimum wage in Luxembourg is € 2071 while it is € 286 in Bulgaria (Eurostat, 2019). This difference can be considered as one of the replies of the questions regarding ‘how can some European countries produce more

knowledge?’ in the continent where productivity and economic growth differ (Hoareau, Ritzen, & Marconi, 2013: 2-5).

The major objective of innovation has always been economic growth and competitiveness. However, in the EU’s discourse, these objectives are combined with “social cohesion and equality”. The EU has seen the innovation as a way not only to create economic wealth but also to solve crucial problems related to pollution, energy, poverty and urbanism (Lundvall & Borrás, 2005). The EU’s target on innovation is essentially based on the idea of building an eco-system at European level through diffusing knowledge, sharing experiences and borrowing policies as quite a heterogenic environment exist in the EU (Güner, 2019: 2-20). The EU realized the fact that there must be a uniform and institutional dimension of innovation in Europe. In this frame, a government has had a crucial role in shaping the innovation systems through designing and implementing policy sets in various related areas. Governments are supposed to encourage investments in human skills as well as physical assets as innovation is not only related to physical assets (Porter, 1990: 89-90). As the world is moving towards a knowledge economy, there is a consensus that intellectual capital, in particular human capital, is strategic in the knowledge-based economic era (Yusliza & Hazman, 2008: 178-183). In this term, wherein competitiveness is highly crucial, countries’ innovative capability has more dependency on intellectual capital than fixed assets (Cabello-Medina, Lopez-Cabrales, & Valle-Cabrera, 2011). Today, human capital is considered as an intangible asset for the innovation process and a valuable key for knowledge production, competency (Soleh, 2014: 80-93) and innovation capability.

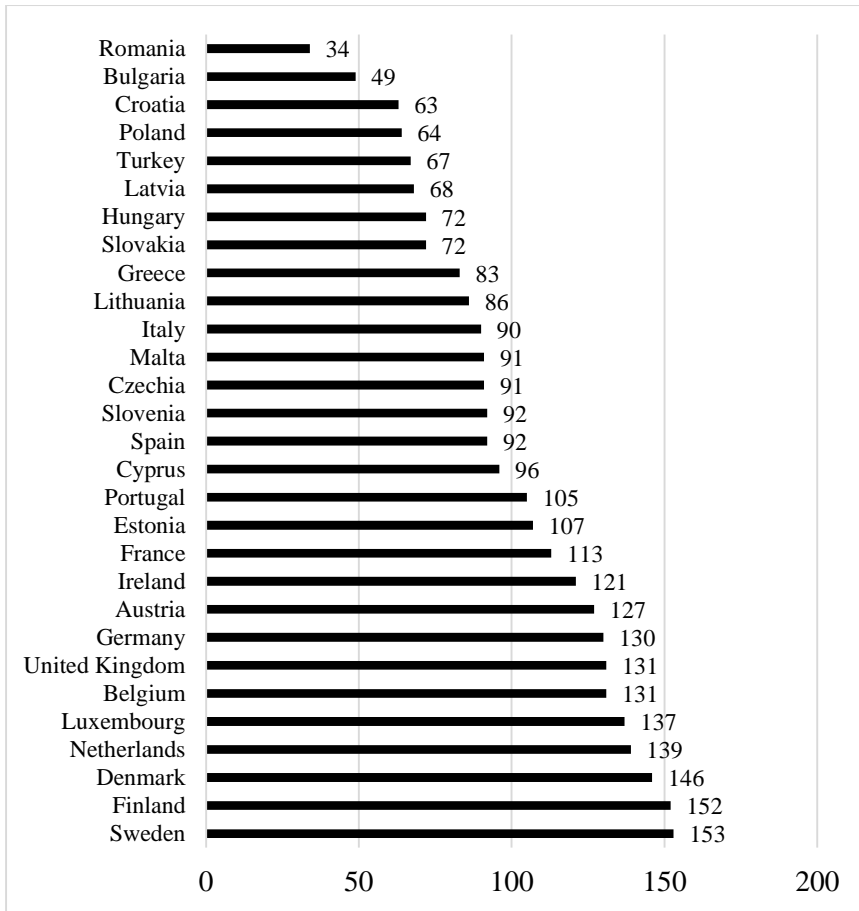


Figure 1. Performances of the EU Countries' Innovation Systems

Source: European Innovation Scoreboard, 2020.

Figure 8 indicates the innovation performance of EU member countries (including the United Kingdom and Turkey). Sweden ranks the first among the European countries, Finland and Denmark follow Sweden. As a founding member of the EU, The Netherlands ranks 4th, Luxembourg ranks 5th, Belgium ranks 6th, Germany ranks 8th, France ranks 11th and Italy ranks 19th in the EU. The countries with the lowest performances in the EU are Romania, Bulgaria and Croatia respectively. The figure represents huge gaps and discrepancies in EU countries' innovation performances.

According to European Innovation Scoreboard, innovation performances of the countries are classified into four different categories; Innovation Leaders, Strong Innovators, Moderate Innovators and Modest Innovators. According to the scoreboard, Innovation Leaders are Sweden, Finland, Denmark, Netherlands and Luxembourg. Performances of these countries are above the EU average. Strong innovator countries are Belgium,

the United Kingdom, Germany, Austria, Ireland, France, Estonia and Portugal. Moderate innovators are Cyprus, Spain, Slovenia, Czechia, Malta, Italy, Lithuania, Greece, Slovakia, Hungary, Latvia, Turkey, Poland and Croatia. Modest innovators are Bulgaria and Romania with lower performance than the EU average

7.4. DIGITAL INNOVATION

As digital tools and instruments have developed, the world has changed. The way people communicate, shop, manufacture and govern has been transformed thanks to digitalization which has been transforming the business landscape and upgrading to new models using numerous innovations such as machine-to-machine communications, mobile payment and distance retailing systems (Hargan, 2016). Applying new technologies into businesses, benefiting from digital tools for problems is called as digital innovation. Digitalization is not only related to the adoption of technology in a defined system, institution or company, but is a method of strategy requiring to upgrade information technologies infrastructure (Rogers, 2016).

Digital innovation is a key component in most of the products, processes or services and means innovating using digital technologies. Digital innovation has three different characteristics; initially, it can be stored, transformed and traced when it is digitized. Secondly, it can be re-edited through means of re-programming and lastly, it can be self-referential. Digital innovation emerges from the opportunities which are available in a digital ecosystem (Ciriello, Richter, & Schwabe, 2018: 563-569) and is defined as “carrying out of new combinations of digital and physical components to produce novel products” (Youngjin, Henfridsson, & Lyytinen, 2010: 724-735) Indeed, the concept of digitalization and digital innovation has changed all industries and sectors stemming from characteristics of digital materials which enable people to use new ways and methods and trigger new opportunities (Hylving & Koutsikouri, 2020: 2-3).

Numerous indicators and indexes have been developed for the measurement of innovation capabilities of countries, however, there are not many indicators concerning the measurement of digital innovation. The European Commission prepares and publishes “The Digital Economy and Society Index” annually. The Index covers 5 main parameters such as connectivity, human capital, use of the internet, integration of digital technology and digital public services. The parameter of connectivity is measured through fixed broadband take-up, fixed broadband coverage, mobile broadband and broadband prices; human capital is measured through inter-user skills and advanced skills; use of the internet is measured through citizens’ use of the internet services and online transactions; integration of digital technology is measured through business digitisation and e-commerce and digital public services is measured through e-government services (DESI,

2020a). These parameters¹ play a crucial role in comprehending the level of European countries' digital economies and societies.

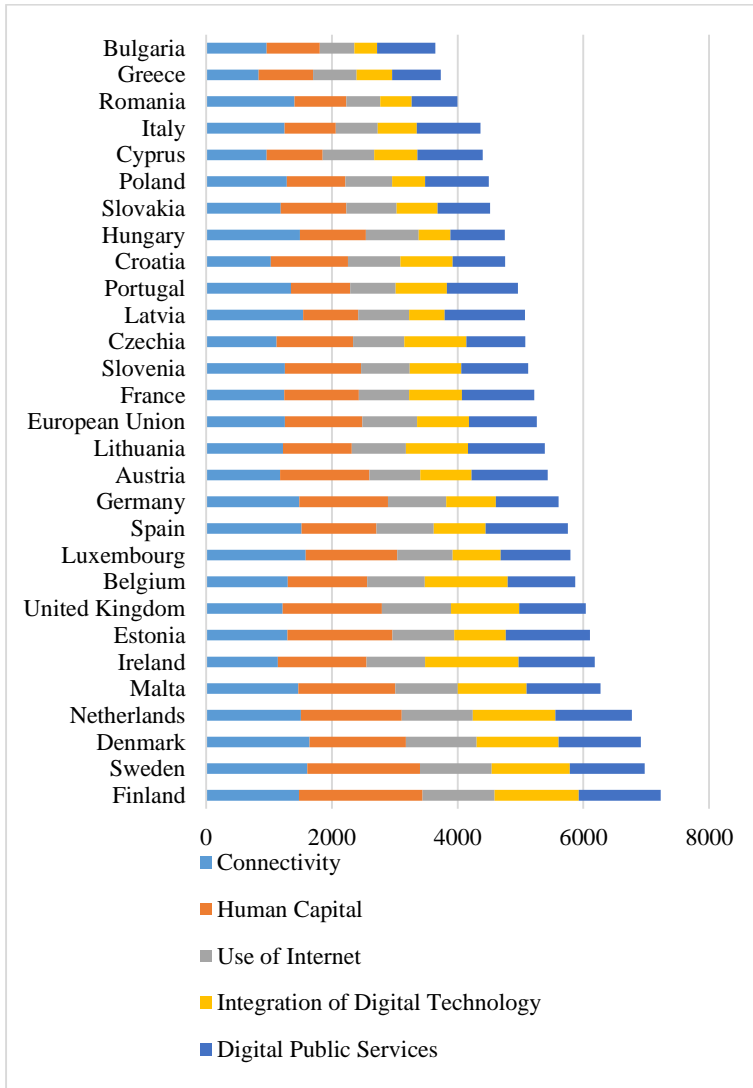


Figure 2. Digital Economy and Society Index-2020
Source: DESI, 2020

¹ Methodology: The Commission experts provided a particular weighting to each collection and subset of metrics in order to measure a country's total ranking. Each contributes 25 percent of the overall score to networking and digital capabilities ('human capital'). Digital media integration accounts for 20 percent, as one of the most significant factors of growth is the use of ICT by firms. Finally, residents' use of internet resources and the dimensions of automated public services lead to 15 percent each (DESI, 2020b).

In the EU, Finland, Sweden, Denmark and the Netherlands, led by Malta, Ireland and Estonia, have the most developed digital economies. On the other hand; Bulgaria, Greece, Romania and Italy have the lowest ratings.

IMD World Digital Competitiveness Index, analyzing the extent to which countries adopt digital technologies in government practices, business models and society, defines digital competitiveness in three main factors: knowledge, technology and future-readiness. Knowledge, the first element, refers to the intangible infrastructure that underlines the digital transformation process through the discovery, understanding and learning of new technology. The technology factor assesses the ultimate framework in which emerging technologies are allowed to evolve. Finally, the possible preparation element that explores an economy's degree of preparedness to expect the digital transition (IMD, 2019).

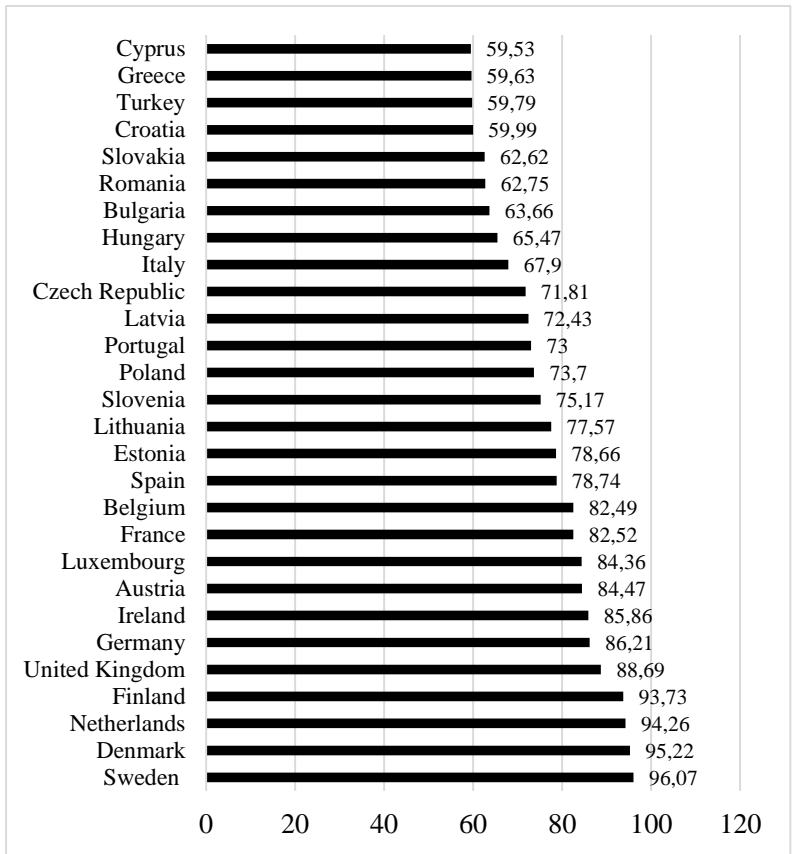


Figure 3. : IMD World Digital Competitiveness Ranking 2019 (EU Countries)
 Source: IMD World Digital Competitiveness Ranking

Sweden ranks the 1st overall in the EU, Denmark, The Netherlands, Finland and the United Kingdom are placed respectively. Germany is placed

6th while France ranks 10th. The least successful country in the EU is Cyprus and Greece ranks as the 2nd among the least successful countries.

7.4. EUROPEAN DIGITAL INNOVATION HUBS

The EU aims to keep its all economic sectors competitive internationally. To help companies develop their services and products via digital and technological tools, the European network of Digital Innovation Hubs was founded. Nearly 20 percent of businesses in the EU is highly digitalized. Likewise, in digital innovation, about 60 percent of large industries and more than 90 percent of SMEs lag behind. The digital revolution provides opportunities for large and small enterprises, but it is still difficult for many of them to know what technology to invest in and how to obtain funding for their digitalization targets. In this context, Digital Innovation Hubs aim to ensure that digital opportunities can be used by any business, small or big, high-tech or not. In terms of their business/production processes, goods or services using digital technology, DIHs are one-stop shops that help businesses become more competitive. DIHs provide access to technological knowledge and experimentation to allow businesses to "test before they invest." They also provide resources for innovation, such as guidance on funding, training and the creation of skills required for a successful digital transformation(European Commission, 2020a).

The first industry-related proposal of the Digital Single Market package was introduced by the European Commission on April 19 2016. Building on and complementing the numerous national digitisation industry initiatives, the Commission will act to cause more investment in the digitisation of industry and to encourage the development of a better structure for the digital industrial revolution. The establishment of a network of DIHs is one of the most significant pillars of the Digitise European Industry initiative(European Commission, 2020a).

DIHs are new concepts which have various origins and purposes, thus, configuration and governance of which are heterogeneous. The main purpose of these hubs is to support the digitisation of European industry and contribute to the development of regional innovation ecosystem and the business growth and supporting local suppliers. The hubs have started to set up a collaboration with the stakeholders focusing on digitalisation issues and provide services to small and medium-size entrepreneurs and companies which are not yet in the network. Several DIHs have been clustered to lead priority areas of regional innovation strategies aiming to identify needs and opportunities in the industry in the region as well as developing competence and internationalization of companies. Business models, sectors, services and geographical scopes may vary across DIHs as specialisation needs of regions vary as well. The European Commission, in this respect, aims at supporting DIHs to adjust their local needs, collaborate with other stakeholders and more advanced DIHs and

build up a network at European scale to engage in EU-wide activities and establish links (Rissola & Sörvik, 2018: 23-24).

DIHs are based on the infrastructure of technology and provide access to the latest information, skills and technology to help their customers pilot, test and experiment with digital technologies. DIHs also provide business and funding resources, where appropriate across the value chain, to incorporate these technologies. They serve as the first regional point of touch, a gateway, and reinforce the eco-system of innovation, as proximity is considered crucial. A DIH is a multi-partner regional partnership (including organizations such as universities, business groups, chambers of commerce, incubators/accelerators, regional development agencies and even governments) and may also have close connections with service providers outside their area to help companies access their services. The rationale behind this initiative is to help European enterprises, big or small, high-tech or not, take advantage of digital possibilities. Over the next five years, the Commission will allocate €500 million from the Horizon 2020 budget to help the growth of DIHs. It is the Commission's ambition that within their area, all companies should have DIH through which they should be able to access competencies in order to digitize their organizations and their goods and services. In addition, by creating a pan-European network of DIHs, the provisions of services through existing hubs are aimed to be improved (European Commission, 2020c).

It is believed that DIHs have an important role in the Digital Europe Program in order for strengthening European eco-system in Artificial Intelligence, High-Performance Computing, Cybersecurity and other digital technologies both for public and private sectors. Digital Europe Program, aimed to invest around €9.2 billion against digital challenges was proposed by the European Commission. DIHs have both local and European functions. EU funding will be made available for hubs that are already (or will be) supported by their Member States (or regions), in order to increase the impact of public funding. The Digital Europe Program will increase the capacities of the selected hubs to cover activities with a clear European added value, based on networking the hubs and promoting the transfer of expertise. Member States have an essential role in the selection process of the DIHs; the initial network of DIHs will be established from a list of hubs designated by the Member States (European Commission, 2020a).

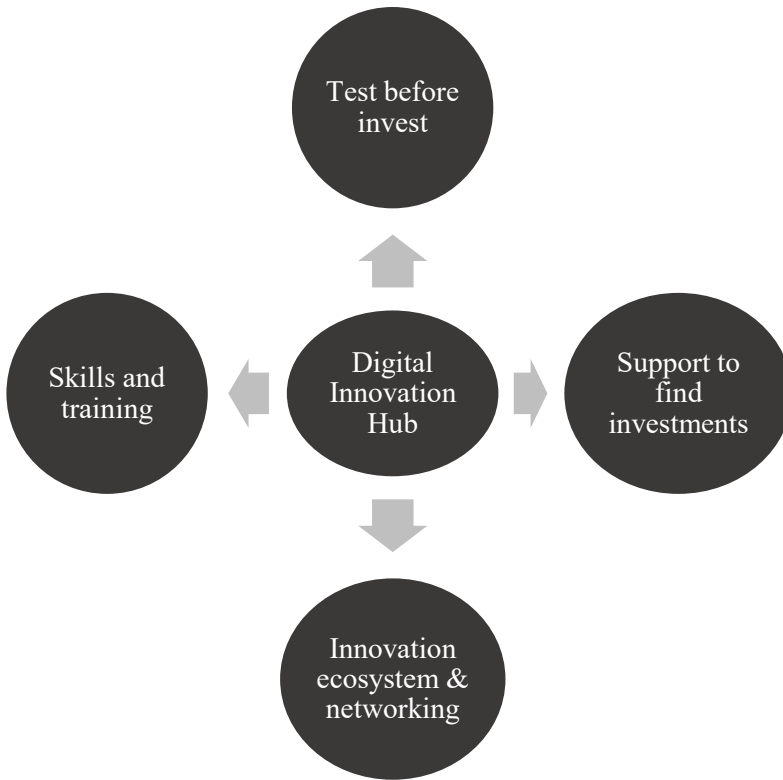


Figure 4. Main functions of European Digital Innovation Hubs
 Source: (European Commission, 2020b)

DIHs are single, coordinated, non-profit organizations aiming to support companies particularly SMEs in digital transformation. DIHs provide services such as “test before invest, skills and training, support to find investments, innovation eco-system and networking”. With test before invest, DIHs contribute to testing and experimentation facilities and raise awareness in digital transformation. Test before invest services include digital maturity assessment, demonstration activities, digital transformation, adaptation and customization, knowledge transfer and etc. With skills and training, providing support in the area of advanced digital skills is aimed. DIHs services include advertising, hosting, training and traineeships and job placements. Additionally, to find investments; DIHs will help start-ups and public authorities become more competitive through digital technologies supported by the Program. In this context, this service will provide instruments to catalyse access to financial sources and investors while supporting the use of InvestEU and Enterprise Europe Network (EEN). DIHs are supposed to act as catalyser to bring industry, businesses and public authorities together and support companies -particularly start-ups and SMEs- to have innovative solutions for market. That is why the DIHs have taken responsibility of

strengthening innovative ecosystem and networking via providing contact among companies, innovators, clients and authorities. The services of the EDIHs are supposed to be complementary and not replace existing services(European Commission, 2020b).

CONCLUSION

Digital innovation is at the centre of every business and organization even though driving digital innovation or digitizing operations within the organization in order to bring new products and services is not easy. Just as in innovation, developing digital innovation necessitates a well-established ecosystem bringing relevant components together.

The EU, which is in intensifying competition with the US, China and South Korea in innovation production, has established Digital Innovation Hubs in order to strengthen European industry's competitiveness at the global level. These hubs aim at contributing to digitalisation at a national and international level providing instruments to boost eco-system in EU countries.

As overall innovation performances, digital competitiveness and DESI indicators of member countries are presented in the study, digital innovation eco-systems vary in member countries. Levels and scopes of member countries differ particularly in terms of connectivity, human capital, use of internet, integration of digital technology and digital public services, in this context, DIHs should consider these parameters and address tailor-made, specific solutions while boosting the innovation eco-system in the region such as focusing on skills development in Portugal, investing in digital technologies integration in Romania and use of internet in Slovenia.

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CHAPTER VIII

COVID-19: THE GOOD THINGS IT BROUGHT ALONG FOR EDUCATION

Nilufer Evisen¹

¹(Öğr. Gör.Dr.); Gaziantep Üniversitesi, e-mail: niluferevisen@gmail.com

 ORCID 0000-0001-8661-5249

8.1. INTRODUCTION

The world had long been split into two in a debate about whether online teaching could replace traditional face-to-face teaching when the Covid-19 virus struck every single educational institution as of the beginning of 2020. Although some research puts forward that e-learning will not necessarily replace the actual teaching environment (Feenberg, 1999; “Will Online Education Replace Classroom Education Anytime Soon,” 2018; Solak, & Cakir, 2014) there are many others, such as Appana (2008), Chaney (2010), Gilbert (2015), Richardson, and Swan (2003), who defend the benefits that online learning is believed to provide.

It seems plausible that many researchers would agree on the lack of a single model of online education which fits all teaching contexts (Cook, & Grant-Davis, 2020). In line with this concern, there are some dilemmas that the literature documents. To illustrate, Dumford, and Miller (2018), and James (2002) claim that there are some disadvantages of online learning as well as numerous advantages. As for the disadvantages, fewer opportunities for student collaboration, unfavorable stakeholder interactions, its being more time-demanding on the teachers’ side (Dumford, & Miller, 2018), technical problems, limited student assessment and feedback, lack or deficiency of interaction, lack of human contact, and its being costly (James, 2002) could be among the most remarkable points to be mentioned. However, there are also researchers who focus on the bright side of online learning. Harasim (2000), for example, states that online learning paved the way for “new modes of educational delivery, new learning domains, new principles of learning, new learning processes and outcomes, new educational roles and entities” (p.45). Moreover, the speed that online learning offers students in order to share information, the opportunity it creates for autonomous learning, the feature of students’ becoming able to self-monitor their performances, and the fast online feedback from instructors (Paechter, & Maier, 2010) are some other advantages that e-learning equips students with.

Regardless of whether they are in favor of or against online learning, schools and programs were forced to switch to online learning

almost overnight due to the Covid-19 pandemic (Dhawan, 2020). The shift might have been comfortable for some schools, but it has been difficult for some others due to some cultural and technological issues (Sandars et al., 2020). However, it cannot be denied that the massive transition to online learning has brought along some changes (Burgess, & Sievertsen, 2020).

8.2. LITERATURE REVIEW

Keegan's (1995) definition of online learning in which he frees the learner from going to a certain place at a certain time and meet certain people to receive some knowledge transfer and become educated seems finally to have come true partly. Covid-19 has turned traditional schooling upside down mandating nearly all schools to lock down on a global scale (Dhawan, 2020). Aiming to prevent the spread of the disease and in order to make up for the lost times, numerous governments have decided to move education online (Dhawan, 2020; Verawardina et al, 2020). Although the majority of the nations were not prepared for such a shift, they had no other option, and thus, moved their contents immediately to the online modules — forgetting or ignoring the skills and expertise necessary for online teaching (Adnan, & Anwar, 2020). In fact, what was taking place was more of emergency e-learning rather than online learning according to Murphy (2020). It could be concluded that this specific mass migration to distance education, or emergency e-learning, required specific regulations different from the so-called online learning episodes (Zhang, 2020).

As foreshadowed by various researchers such as Avgerou, and Madon (2005), Pekari (2005), and Sasvari (2012), the information society has taken the driver's seat. ICT has opened new pathways for the society and knowledge to flow along (Avgerou, & Madon, 2005), the reflections of which have been observed in unprecedented forms of social, organizational and educational relationships during Covid-19 (Murphy, 2020). Along with social distancing and physical school closures, a huge movement to online environments looked like a remedy; however, there might be some negative effects as well mainly because of the time students spend online, the emotional burden they might feel, the changing style of interaction among students themselves and between students and teachers, and the drop in students' motivation levels (Di Pietro, Biagi, Costa, Karpinski, & Mazza, 2020). Unlike Di Pietro et al (2020), Kohn (2020) proffers that Covid-19 brought along some serendipitous benefits, such as the change in the traditional grading systems and admissions testing. Similarly, Dhawan (2020) asserts that online learning provided the teachers and students with the flexibility of time, the flexibility of location, the feature of catering to huge audiences, wide choice among courses and content, and immediate feedback as the strong sides of online learning during Covid-19.

Various other researchers, such as Dhawan (2020), Dikmen, and Bahçeci (2020), Harasim, Hiltz, Teles, & Turoff (1995), James (2002), Richardson, and Swan (2003) emphasize the “anywhere, anytime” feature of online learning as one of the most remarkable advantages it offers. In addition, Richardson, and Swan (2003), and Serdyukov (2015) claim that the roles of both the teachers and the students have changed throughout the online mode of teaching and learning, which might necessitate a new kind of pedagogy, namely, e-pedagogy. Still, taking into account that the pandemic was unprecedented, the majority of the educational institutions’ infrastructures and the administrations of those institutions were unprepared, most of the teaching staff were not very competent in digital skills and online course delivery, and finally, most students were frustrated at the beginning of this long journey (Ahmed, & Ikram Khan, 2020; Black, Ferdig, Thompson, 2020; Demuyakor, 2020; Morgan, 2020; Yılmaz, 2020), the way most institutions, their staff, students and parents responded to it was worth praising.

8. 3. INNOVATIONS COVID-19 BROUGHT FOR EDUCATION

In an attempt to depict the changes and new approaches that the pandemic brought along both for education and sub-systems from the researcher’s perspective, the following classification will be used:

- Innovations in learning management systems and learning environments
- Innovations in teaching styles
- Innovations in school curricula and grading policies
- Innovations in learning styles
- Innovations in stakeholders’ roles

8 3.1. Innovations in Learning Systems and Learning Environments

The pandemic forced all stakeholders of education to change their traditional courses into virtual courses on platforms like Adobe Connect, Blackboard, Google Classroom, Microsoft Teams, and Zoom. Although schools, teachers and students were not fully ready for this new medium of education, the platforms still served well for crisis learning to some extent (Pace, Pettit, & Barker, 2020). The online learning systems normally have features which allow the course instructors to deliver their courses online, have interaction with their students and track students’ progress (Keis, Grab, Schneider, & Ochsner, 2017); yet, during the quick movement to 100% online classes, some features might have been left out. Nevertheless, it has been observed that virtual classes and network systems have been contributing to students’ learning during the extraordinary time of school closures (Keskin, & Özer Kaya, 2020; Wargadinata, Maimunah, Dewi,

&Rofiq, 2020). The tangible technologies, such as computers, smart phones, tablet PCs, and learning management systems were made immense use of during the crisis learning process (Bozkurt, 2020), and various free digital applications were recommended by UNESCO (2020) as the sustainability of quality education, access to reliable information, and feeling together are important for the presence and future of the human race.

In order to prevent the pandemic from spreading even more, school activities were paused and students were sent home; additionally, travel restrictions were implemented, and the safest place after schools was found to be the homes of students for effective learning (Badr et al., 2020). The Covid-era classrooms are now the students' and the teachers' living rooms (Salim, Rathor, &Desikan, 2020; UNICEF, 2020; "Uzaktan Eđitim başladı, Evler Sınıf oldu," 2020). Students and teachers have blended their time and space outside of their normal school vicinities, which is another innovation that emerged as a consequence of the pandemic (Hawkins, 2020); there is no limit and boundary to learning nowadays.

8.3.2. Innovations in Teaching Styles

The teachers were among the group of employees who had to cushion the disease and enclose it there before it could reach their students in their old classrooms. The learning styles of teachers have been under scrutiny for many years, but the new coronavirus has diverted all levels of education to revisit their teaching styles, adapt them to remote learning, and help increase effective learning on behalf of the suspended students (Motala, &Menon, 2020). Teachers had to promote online learning, and they had to learn about ways of how to deliver emergency online classes (Albaadani, & Abbas, 2020). Expectations from the teachers did not vanish, but enlarged during this exceptional time, mainly because students are in different places each, and the teachers have to address each one more carefully (Reimers, & Schleicher, 2020). Namely, teachers all around the globe have had to conduct lessons that are more student-centered, more homework and/ or task-based, sometimes via TV, e-mails, free open content resources both synchronously and asynchronously (Reimers, & Schleicher, 2020). Teacher collaboration, professional learning communities, digital competencies, and networked leadership approaches (Azorin, 2020), which used to be available at low rates, reached their peak during the new coronavirus lockdown. Teachers learned from each other as a result of these co-operations regardless of whether they were carried out online or not during the pandemic (Zuo, Dillman&Juve, 2020), and some could apply them in their own virtual classes.

8.4. INNOVATIONS IN SCHOOL CURRICULA AND GRADING POLICIES

The lockdown also brought along the necessity to reframe the already existing curricula the schools had. As the skills that were expected from students in an online learning environment could not be totally the same with face-to-face classrooms' learners' skills and objectives, it was inevitable for the administrations and curriculum development units of schools to tailor online curricula for the while-phase of the pandemic (Averinou, & Moros, 2020). As Wang, and Torrisi-Steele (2015) assert, online teaching has made a lot of progress since the days of its first drill and practice strategies; however, there still seems to be some kind of top-down approach in some teachers' lesson delivery. Even though a teacher-centered understanding still prevails, the learners and the requirements of the 21st century reveal the necessity of moving away from this approach (Motala, & Menon, 2020). Hence, the curricula of most schools had to be changed in line with those demands, the physical distance between the learners and their schools, and the possible disruptions that might not be foreseen in the learning management systems (Reimers, & Schleicher, 2020). The "what, how, and where of learning" (Zhao, 2020, p.1) were revised and necessary changes and adaptations were made, for which the changes that the Ministry of National Education made in secondary institutions in Turkey could be shown as an example (Özer, 2020). The Turkish MoNE even set up a psychosocial support unit to guide students academically and socially throughout the unprecedented time (Özer, 2020). This same need was also recommended by the OECD framework (Reimers, & Schleicher, 2020), and it was taken into account by lots of countries. Admission exams and their contents were also revised in the Turkish context due to the new situation that arose (Ozer, 2020) and some American colleges ("Admissions Testing Policy Updates in Response to Covid-19," 2020).

The grading systems of secondary and tertiary institutions were also revised during the shutdown days of schools, which was inevitable during the time of the crisis (Reimers, & Schleicher, 2020). Teachers opted more for projects and assignments to evaluate their students' performances (Verawardina et al., 2020). Summative assessments were suspended until the end of the term in most institutions, and formative assessments were foregrounded (Motala, & Menon, 2020). Institutions which applied modular systems merged the remaining modules and changed the percentages of the components of their overall grading system in accordance with the new curriculum requirements, examples of which can be seen via university website announcements such as Boğaziçi University, Gaziantep University, Middle East Technical University, Özyeğin University from Turkey, and Bowdoin College, Qatar Georgetown

University, Saint Louis University, Technical University of Munich, and Universitat de Barcelona from various parts of the world.

5. INNOVATIONS IN LEARNING STYLES

Due to some inequalities and technical issues encountered, the majority of students had to become autonomous learners, and they needed to decide how to scaffold their learning on their own by making use of their prior knowledge, by thinking critically, and by evaluating and analyzing the materials that they could find themselves (Xie, & Yang, 2020). The student-centered nature and the flexibility of online learning provided students to choose when, where and how they would like to learn a subject (Dhawan, 2020; Zhao, 2020). In addition, the collaboration that took place between students over Microsoft OneNote (Reimers, & Schleicher, 2020), WhatsApp (Edelhauser, & Lupu- Dima, 2020; Motala, & Menon, 2020, Sandars et al., 2020), and Zoom groups (Dhawan, 2020) equipped them with immediate feedback and the chance to interact and socialize both with their peers and teachers (Sandars et al., 2020). Students were also observed to watch online videos at times different from their actual online lessons and make the connection between them and their synchronous learning experiences, which is an instance of blended learning taking place (Shank, 2020).

8.6. INNOVATIONS IN STAKEHOLDERS' ROLES

Well-known to everyone is the fact that the pandemic Covid-19 caused a huge change in the roles and responsibilities of the stakeholders of education. To start with, besides teaching online, the teachers had extra responsibilities such as becoming the course facilitator, the technician and the mentor. They were the ones who felt it vital that their students could log in, follow the lesson, solve technical issues if any and that their students were in good health both physically and mentally (Aliyyah et al, 2020). The students, on the other hand, were the ones who grew more independent in the blink of an eye and became the conscious individuals following the lessons, researching answers to their questions and doing homework in the form of projects and tasks (Xie, & Yang, 2020); thus, as Fullan (2019) suggests, predicting less but experimenting more. In addition, there were the parents, who suddenly became teachers, guardians and caregivers of their children. While in the past, it was the parents who were the teachers' assistants (Christenson, Rounds, & Franklin, 1992), during the confinement days the roles were reversed. Parents became the important actors of the period, trying to make sure that their children were learning in a healthy and safe environment. It would have been impossible to continue with education if it was not for the contributions of all the three stakeholders of the cycle of education.

CONCLUSION

It is a well-known fact that Covid-19 broke all routines, turned all systems upside down, and brought the world to its knees. It taught everyone its lessons just like a highly skillful teacher: it first administered the exam, then gave the lesson. The lesson to be learnt is that we are all tied to one another with some invisible ties, and that we can be born from our ashes if we realize the importance of solidarity, compassion, agility, conscience and decent education. Just like the Persian poet and Sufi master Rumi says: “Do not worry that your life is turning upside down. How do you know the side you are used to is better than the one to come?” Many events that seem disastrous to us actually bring some beauties with them depending on which angle you see them from.

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