THE IMPORTANCE OF HIGH TECHNOLOGY FOR ECONOMIC DEVELOPMENT: A COMPARATIVE ANALYSIS OF TURKEY AND SOUTH KOREA

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IŞIK UNIVERSITY
2018

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B.S., Department of International Relations (IR), 2013

M.S., Executive Master of Business Administration (MBA),2018

Submitted to the Graduate School of Işık University
in partial fulfillment of the requirements for the degree of
Master of Business Administration

IŞIK UNIVERSITY

2018

IŞIK UNIVERSITY

GRADUATE SCHOOL OF SCIENCE AND ENGINEERING

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APPROVAL DATE: 01/09/2019

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Abstract

The purpose of this study is to examine and better understand the effects of high technology manufacturing idea adoption for Turkey and South Korea. Selected countries are particularly appropriate for this analysis as they were standing at the almost similar economic circumstance many years ago. Moreover, this truth cannot be ignored: Turkey has had a definite better position, and a more hopeful development possibility right before the 1960s. It is also important to highlight that the Turkish economy and developmental progress has been impressively increased through structural state policies between 1923 and 1950. It might be right but, today's world economic development outcomes have been showing a miracle growth for South Korea; the growth rates of GDP, production, and incomes per capita have reached unprecedented heights. However, Turkey has been missing the sustainable economic development opportunities due to inefficient technology manufacturing approach and education incapability since 1960. In this parallel, South Korea has been trying to convert itself into high technology products producer country with the contemporary education system, and it's the innovated economy has already been matured to answers the world technology requirements in short period time. In today’s world, the developed countries have been preparing itself against upcoming Industrial Revolution 5.0. South Korea has not positioned itself as it possesses somethings for the paradigm change which has been approaching, it will smoothly enter a new period as it already established a required environment in the area of science and education. This paper intends to evaluate the impact of high technology of economic development on economic growth and shows whether is there a positive correlation between educational development and economic growth through empirical analysis.

Keywords: Turkey, South Korea, High Technology, Education and Science

EKONOMİK GELİŞME İÇİN YÜKSEK TEKNOLOJİNİN ÖNEMİ: TÜRKİYE VE GÜNEY KORE'NİN KARŞILAŞTIRMALI ANALİZİ

Özet

Bu çalışmanın amacı, Türkiye ve Güney Kore için yüksek teknoloji üretim fikrinin benimsenmesinin etkilerini incelemek ve daha iyi anlamaktır. Seçilmiş ülkeler, yıllar önce birbirine benzer ekonomik şartlara sahip olduklarından, bu analiz için özellikle uygundurlar. Aslında, şu gerçek göz ardı edilemez: Türkiye, 1960'lardan önce kesin olarak ekonomik kalkınma açısından daha iyi bir konuma ve daha umut verici bir kalkınma imkânına sahip bir ülkeydi. Türkiye ekonomisinin ve kalkınma sürecinin 1923-1950 yılları arasında yapısal reformlar ve devlet politikaları yoluyla etkileyici bir şekilde güçlendiğini vurgulamak da önemlidir. Bu doğru olabilir, ancak bugünün dünya ekonomik kalkınma sonuçları değerlendirildiğinde, farklı bir durumla karşılaşmak söz konusudur. Güney Kore mucize bir büyüme gösteriyor; GSYİH, üretim ve kişi başına düşen gelirlerin büyüme oranları daha önce görülmemiş yüksekliklere ulaşıyor, ancak Türkiye ise 1960 yılından bu yana verimsiz teknoloji üretme yaklaşımı ve eğitim yetersizliği nedeniyle sürdürülebilir ekonomik kalkınma fırsatlarını kaçırıyor. Bu teknoloji Güney Kore, çağdaş eğitim sistemi ile kendini yüksek teknoloji ürünü üreticisi bir ülkeye dönüştürmeye çalışmaktadır ve ekonomisi kısa bir süre içinde dünya teknoloji gereksinimlerini karşılayacak şekilde olgunlaşmıştır. Her şey göz önünde bulundurulduğunda, gelişmiş ülkeler yaklaşmakta olan Sanayi Devrimi 5.0'a karşı hazırlanıyorlar. Güney Kore, yaklaşmakta olan bu teknoloji değişimi için bir şeylere sahip olduğu için kendini konumlandırmamış, bilim ve eğitim alanında gerekli ortamı oluşturduğu için yeni döneme rahatça girecektir. Bu makale, yüksek teknolojisinin ekonomik kalkınma için büyüme üzerindeki etkisini değerlendirmeyi amaçlamaktadır ve eğitimsel gelişme ile büyüme arasındaki ampirik analiz ile pozitif bir korelasyon olup olmadığını göstermektedir.

Anahtar Kelimeler: Türkiye, Güney Kore, İleri Teknoloji, Eğitim ve Bilim

Acknowledgement

Firstly, I would like to declare my sincere appreciation to my advisor Prof. Dr. Suat Teker for the continuous guidance during my Master Science study and related research, his motivation, and immense knowledge played a critical function for this research.

I am using this opportunity to express my gratitude to my parents and my sister for supporting me spiritually throughout writing this thesis and my life in general.

Finally, I need to express my very heartfelt appreciation to my wife Gulsen Koc for giving me endless support and continuous encouragement during my years of study and through the process of researching and writing this thesis. This achievement would not have been imaginable without you.

Dedicated to Ela Koc...

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Abbreviations

DP	: Democrat Party
FDI	: Foreign Direct Investment
GDP	: Gross Domestic Product
GBE	: Governmental Business Enterprise
ICT	: Information and Communication Technology
IMF	: International Monetary Fund
IoT	: Internet of Things
IoP	: Internet of People
IPR	: Intellectual Property Rights
JDP	: Justice and Development Party
KIST	: Korea Institute of Science and Technology
NPD	: New Product Development
OECD	: Organization of Economic Cooperation and Development
PLC	: Programmable Logic Controller
PMS	: Programmable Management System
R&D	: Research and Development
S&T	: Science and Technology
SPO	: State Planning Office
US	: United States
WW I	: World War I
WW II	: World War II

1. INTRODUCTION

Since the world has existed, the incredible speed of changes and paradigm transitions has been accelerating our world. These two things, which have been described sometimes as a new economy or world order, both subjects have revealed a phenomenon. Mostly changes and transitions were come up from technological developments, and it became the principal actors for a more efficient and stable economy, enrichment and international competitiveness in every part of Revolutions. Today, countries and companies have to adopt sustainable competitive and innovation-based policies in order to sustain their existence. Because technology and technology products are shown as the root of modernization and economic growth during the history. Determining the needs of the market in advance and concluding these with new or innovative products has become the reason for the existence of today's enterprises. When examining the market-leading countries and companies, it is seen that the essential characteristics of them are to develop a new product or production methods with contemporary educational infrastructure. The critical determinants of economic growth and productivity increase are based on technological change and innovation activities. Whoever dominates or produce new technologies, whether they are firms or countries; the advantage of these developments is that it will benefit from who has it first; in other words, will have a competitive advantage in the market economy.

According to the theory of comparative advantages which is developed by David Ricardo, can people imagine that how many a truckload of wheat need to buy a high technology product or do people know one smartphone equals to how many kilo tomatoes, working hour, blue worker and land? The fact that this direction of technological developments in the world has transformed from standard technologies to knowledge-based technologies and the result of this process with each passing day proves that the world has started to enter a more merciless destructive period. In particular, recent developments in science have allowed the evolution of new concepts such as aircraft, spacecraft, pharmaceuticals, communications equipment, nanotechnology, software engineering, and genetic engineering. Therefore, it is

comprehended that developed countries try to develop new products and get monopolistic advantage position by establishing efficient education structure. On the other hand, science and education projects, which create the essential source of developing technology capacity, contribute to the economic extension and progress of nations and sectors by strengthening the technical capacity and generating competitive advantages based on increasing technology capability. In this context, science and technology policies, which are followed both nationally and individually, have increased their value over time. South Korea is a country that has been rapidly climbing the steps to catch up with this technology challenge as it called the new economy by understanding the importance of technology and completing its industrialization with the well-structured policies. Korea's development adventure started as a process of imitation from innovation. In the development periods they began by attempting to imitate the products in developed countries, they created a unique model without being "dependent" on foreign investors. Motivation was maintained as a result of the government's pursuance of an export-oriented policy and the other significant, and the simple thing is that they targeted to be high technology producer country at the right time and established their education and science around this target. While examining the development of South Korea can easily say they well understood, adopted and endogenized the requirements of their target. One of the frequently asked questions in the field of growth and development is the question of why developed countries are developed. One of the main answers to this question is that the developed countries have a qualified workforce as a result of their great importance to education. This is a straightforward and valid explanation.

On the other hand, while examining the secondly selected countries' development process, their results are entirely different about Technology advancement and educational progress; even Turkey has the same target. Turkey's target had announced even before South Korea. Right after the victory of the Turkish Struggle for Independence period, the most significant challenge for Mustafa Kemal Atatürk was delivering contemporary life standards to the Turkish society. Therefore, the Great Turkish Leader had declared the following target right after military achievements: The purpose was to modernize and reach the level of contemporary civilization in the quickest time. However, Turkey's education system and inefficient technology adoption approach made an adverse effect on to promote the transfer of technology,

innovations and R & D activities. Even worse, while examining the current export share of Turkey, it results shows that country make significant contributions to help developed countries to protect their monopoly position in the market.

2. HISTORY OF INDUSTRY REVOLUTION

Before the emergence of the Industrial Revolution, the majority of the society lived in small towns and rural villages where today's modern life existence turned to settled life. The inevitable Industrial Revolution started mid of the 18th century when agricultural societies moved to more industrialized life. The beginning of contemporary life respectively brought the cross-country railroad system, steam power, electricity, and other inventions which make life easier. Thus, paradigm transition reshaped the society's way of living. Industrialization Revolution designated a change in the relationship between human power and specialized machinery, factories, mass production. Therefore, it is beneficial to examine the Industrial Revolution as it has contributed a vital capacity on economic developments.

2.1. Industry Revolution

There is no doubt about the history of the world has been witnessed a few critical changes and transition. Throughout history, revolutions which emerged in the different periods have been played the most significant role to brought fundamental paradigm the changes, transitions in human mindset, ways of living and doing business. Societies have been seeking to develop and change themselves during the world history; therefore, the history of humanity has been examining in the different profile and shape (Hazar, 2006). Some societies have started the events of these revolutions, some societies tried to catch up on these new movements, and some societies regrettably were being insusceptible or late. Mainly it is good to point out that, all macro and microeconomic changes were affected or reshaped or completely wiped out by the revolutions.

According to Alvin Toffler's research on the "The third wave", the world's first mass economic movement was started with the Neolithic Revolution about 8000 B.C, also more widely known as the Agricultural Revolution and followed by the Industrial Revolution, the Second Wave, and the Third Wave is based on Computer Technology which is the milestone of human history. He firmly believed that giving exact dates on

the revolutions might be the wrong approach since each movement phase is denoted as a "wave" metaphor in the book – beginnings and endings cannot be precisely pinpointed. Besides, the Agricultural Revolution was conveyed from China to India to Africa to Europe to the Americas in a long while,

> Land was the basis of the economy, life, culture, family structure, and politics. In all of them, life was organized around a village. In all of them, a simple division of labor prevailed, and a few clearly defined castes and classes arose: a nobility, a priesthood, warriors, helots, slaves or serfs. In all of the power was rigidly authoritarian for the people. In all of them, birth determined one's position in life. Moreover, in all of them, the economy was decentralized, so that each community produced most of its necessities (Toffler, 2011).

The most critical transition event in the society of the agricultural period, the hunter-gatherer way of life was transferred to be a farmer(producer); therefore, the history of humanity was moving from pre-history to civilization (Maney, 2013). For a quite long while, the general structure of the economy and society were consisted by depending on the land and feudal obligations, which are two critical manufacturing arms "merchants" and "craftspeople" were placed in the towns to provide cloth weaving, masonry, and furniture doing service with a very labor oriented, therefore production was remaining low, expensive and slow contrast sharply with today's standards. Regarding the First wave, people were not mobilizing from one point to another point and mostly stuck in the same territory during their life. First wave civilization's population is into two major categories; the primitive and the civilized. The primitive people were more on the move as a tribe for gathering, hunting and fishing were based on consuming nature.

On the other hand, the civilized world had a completely different way of doing business, most people worked on the soil to produce something from soil and sought to tame animal. Thus, while the significant majority of the population were spending most of the time on the farm, they developed their knowledge how worked on the soil and earn a livelihood from the soil. In all of them, while the new world order was establishing around the villages, and the new subject "democracy" has emerged just as a conceptional idea in that period (Baloch and Kareem, 2007). The mostly adopted idea is that democracy is emerged and envisaged in ancient Greece. Political life owes to ancient Greece much, additionally, emerging of the democracy is a significant and remarkable source of knowledge for whoever face a problem on the democratic

transitions. However, the rise of democracy was a prospective explanation; all the poleis (there were hundreds of poleis in ancient Greece) evolved Archaic period (800–500 BCE) as aristocracies, the thing is that power was not distributed which was expected, quite the contrary concentrated in the hands of a few noble families (Hanssen, 2013). In this direction, a fundamental division of labor was created to recognize castes and low classes according to people's economic status; nobility, priesthood, warriors, helots, and slaves. All classification was representing fear and authoritarian power. Due to the escalation of the importance of land, it caused started to embryonic mass production in ancient Greece and Rome via oil, and there were money and exchange basis business models. A bureaucratic model founded in Babylon and Egypt.

Great urban capitals established in Asia and South America. The new trade routes determined around the desert, ocean, and mountains. These are some of the visible and noteworthy developments in the First Wave. At this point, it would be useful re-describe the general framework of The First Wave.

i. Land and being a landholder were two vital concepts for economic, life, culture and politics.
ii. Civilization was spreading from the villages.
iii. Castes and classes were at the very heart of labor division; nobility, priesthood, warriors, helots, and slaves.
iv. The structure of the economy decentralized since the political developments.
v. Human and animal muscle power, wind and water were the main ingredients for power and energy. Until the end of the French revolution, civilization met their energy needs from horses and oxen.
vi. First wave societies were dealing with fundamental inventions such as winches and wedge, catapults, winepress, levers, and hoists.
vii. Organized conveys of ships and animals were standing as the best solution for shipments and trade. Main trade products were glass, paper, silk, tea, oil, wine, and wool.
viii. The general production and consumption framework occurred thus and so; minimal production work on the food, goods, and services, sharing

approach was quite limited for who was not their family members. Every community that creates their community had to produce and consume as much as their needs.

ix. The tacit knowledge was the prevalent method for knowledge transition from master to the next generation.

Before the Industry Revolution, focusing the voluminous literature on agricultural revolution needed clarifies to understand capitalism which is increased its effectiveness with Industry Revolution would be crueler for the duration of paradigm changes and transition. Agricultural civilization or First wave emerged any time around 8000BC and shaped the history of humanity until around 1800s (Baloch and Kareem, 2007).

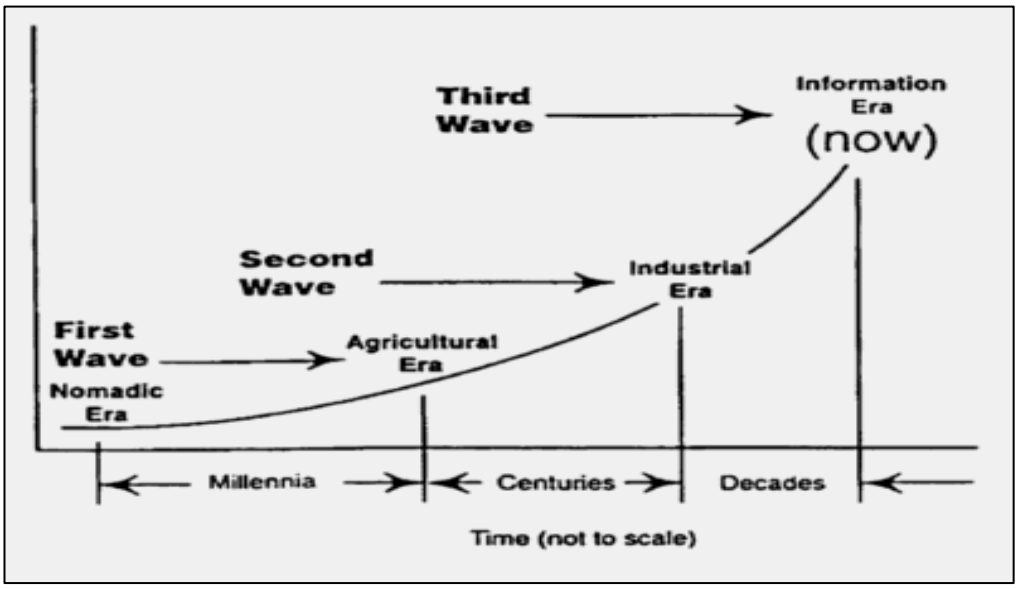


Figure 2. 1 Development waves of civilization
Source: http://www.hastudio.us/MuseumSchool/Chapt02/Chapter02.htm, Accessed at: 12.12. 2018.

While spending a plenty amount of time in the First Wave, the rate of economic growth was unsatisfied for the development, and the range of inequality in the living standards was not swiftly widening in that period. However, the world entered the new paradigm transition with Industrial Revolution, so the bell rung for irresponsible grow with the dazzling high rates, slow and ungainly structure left at the first wave. The role of demand caused by the rise of capitalism. The birth of capitalism is re-interpreted with the industrial revolutions, and the liberal approach comes along with capitalism as a political and social output. Liberal movement argued that the operating model of the

capitalist economy has enough capacity in itself to solve any determined or anticipated economic problem without any thirds parties' intervention (Irge, 2005). As indicated Adam Smith in his book “Inquiry into the nature and cause of the wealth of nation” under the Invisible handle metaphor. A quick scanning of his book highlighted that without any governmental intervention give the opportunity to people on the controlling who want to be guided in the markets. His approach would pave the way to drawing third parties field of range in the business ecology. Therefore, the theory of invisible hand caused this kind of paradigm change, and the consumer would be more independent to choose on the what to buy, the producer would increase the variety of product and service against resplendent demand in the same parallel, Smith emphasizes that:

> As every individual, therefore, endeavors as much as he can both to employ his capital in support of domestic industry, and so to direct that industry that its produce may be of the greatest value; every individual necessarily labors to render the annual revenue of the society as great as he can. (Smith, 1976).

According to the above paradigm transition, which is mostly started with Industry revolution, created a more ruthless “creative destruction” for people, cultures, companies, countries, political movements and technologies. Therefore, investing in education and human capital dramatically increased since work lines have been changing, literally, every day. Capital investment increased, labor market expanded, sciences pointed out inventions, technological developments, transportation and increased the number of shipment options, gained importance of entrepreneurship, changing daily life standards, and new opportunities were standing on the Industrial era meaning. So instead of insisting for a keeping paradigm approach, established a great number of factory and industries, focused on scientific for doing efficient business models and inventions, social and cultural life moved from agricultural life to manufacturing life for rationalism, mechanization and mass production (Talu, 2010). The prophet of innovation, Peter Schumpeter's the process of creative destruction laid the foundation at the beginning of Industry 1.0, with these developments: the steam engines, railroads, steamboats, iron, steel, interchangeable parts, petroleum, chemicals, electrification, telegraph, telephone, radios, automobiles, airplanes, filmmaking, paper production, plastics, and motors and generators of all sorts (Komlos, 2016). It is apparent that Industry 1.0 was a mobilization step for the

process of the creative destruction for the new developments, but it would become highly effective, chronic and destructive for those who not follow the scientific developments as he described:

> The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers, goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates ... The opening up of new markets, foreign or domestic, and the organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the same process of industrial mutation — if I may use that biological term — that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in (Schumpeter, 1950).

2.2. Industry Revolution 1.0

This part of the research reflects the importance of the role of technology during the emerging (birth) of the Industry 1.0 since there was practical and basic knowledge at the center of technological developments instead of scientific knowledge for production before Industry 1.0. Technological development which was the most significant actor is emphasized as a source of Industry revolution. Technological advances which were started at the Industry 1.0, has always been directing the process of construction of social, political, cultural with the power of change and transition (Baser, 2011). Even so, the emergence of technology is a product of its culture and society; indeed, it must be a standard product of humanity. Technology can exist from one culture to another culture or improve itself with such as events of discovery, trade, wars, and migration (Basella, 2000). The most significant historical change which is realized by Industry 1.0, human, animal, water and wind power remained incapable against more efficient and effective power as known as "steam power." The process of production reached a new shape, and a new social class emerged with Industry 1.0 in the meantime. Industry Revolution 1.0 is a foundation of today's knowledge-based economy from the end of the agricultural life. It is important to highlight this point because all social, economic, political and cultural developments which happened in the world history are the result of the emergence of the Industrial Revolutions for the last 200 years (Baser, 2011). One of the characteristic points is that George Stephenson's steam engine locomotive which was named as a "Rocket" provided the

first commercial transportation service between Liverpool and Manchester in the world on September 15, 1830. Stephenson's steam engine locomotive was a symbol of the most important technological development of the world last 250 years. Industry Revolution 1.0. Represented the society of who used energy-producing steam engines instead of agricultural societies who needed on the of windmills, watermills, horses and other animals (Levy, 2017). The invention of the steam power representing clearly as an indicator or start point of Industry Revolution 1.0 in the world history, and it is the most well-known information about for this period. However, there is one more underlying phenomenon before the invention of steam power. In this period, economists were aware of the importance of technological advancement and steam engine power after agricultural life. Therefore, it would not be wrong to say that the spark point of Industry 1.0 is Adam Smith's book " The Wealth of Nations." The reason is that Smith especially indicated in his book the importance of the development of machines and creating the division of labor to explain how these things play the key role in the process on inventions and people's life (Smith, 1997). Besides, Adam Smith argued that the economy market which is based on competitive framework would regulate society by his metaphor "invisible hand," and individual interest would be a key element in the manner of increasing of the wealth of nation. His book " The Wealth of Nations" was published in 1776, and it has started its economy journey as a recipe book of Industry 1.0. Adam Smith laid the foundation of the historical development of Industry 1.0 by the publishing of " The Wealth of Nations." At this point, it would be more appropriate to highlight the explain Industry 1.0, with his sentences;

> The resemblance which it evidently bore to those machines which are produced by human art, necessarily impressed those sages with a belief, that in the original formation of the world there must have been employed an art resembling the human art, but as much superior to it, as the world is superior to the machines which that art produces. The unity of the system, which, according to this ancient philosophy, is the most perfect, suggested the idea of the unity of that principle, by whose art it was formed (Smith, 1976).

According to Adam Smith, Industrial sectors brought more productive structure and less manufacturing defect with the same or quantity of labor, the contribution of machines and positive science. To make an investment in the maintenance and improvement of machines was the heart of the first economic growth; thus,

entrepreneurs could accelerate their manufacturing process and get more profitable results since mechanical developments reduce the cost and duration of manufacturing. Adam Smith had already revealed the critical importance of machines for economic progress in the first chapter of Wealth of Nations before James Watt's steam machine (Soete, 1997). Therefore, Adam Smith's "The Wealth of Nations" book was the first trigger of the wave of Industry Revolution 1.0 in 1776, as it accelerated structural changing from the feudal windmill to capitalist industrial life.

The symbolic event of Industry 1.0, the invention of the steam engine was the overemphasized event since the beginning of the 17th century. The fundamental principle of the steam machine is to convert the difference of pressure which is stuck between liquid water and water vapor into the kinetic energy. When the liquid water is heated with wood, coal, oil or petroleum derivates for superheated steam, it is collected into a steam chamber. This superheated steam generates a vacuum effect on the piston with the sudden cooling of the steam chamber. The force of vacuum creates kinetic energy and trigger to the piston cycle (Karaoglu, 2016). The first attempt started with Otto von Guericke and Evangelista Torricelli, but both of inventors did not get any result on artificial vacuum because of their insufficient mechanic knowledge in 1643. Afterward, French physicist Denis Papin worked on the steam digester which is the high-pressure cooker in 1679, and then military engineer Thomas Savery has invented the steam pump in 1698. The most important progressed happened through English inventor Thomas Newcomen's the atmospheric steam machine which is the prototype of the steam engine, and it was the most preferred machine with John Smeaton's contributions over the 50 years. The atmospheric steam machine was used prevalently in mining, shipyard and irrigation demand (Baser, 2011). In 1763, James who was a Scottish instrument maker and inventor invented the most awaited steam engine. While he was working at Glasgow University, he received a Newcomen steam machine for repair, and he was impressed by its power of steam. He immediately started work on it to improve efficiency, and he changed a few points on the machine and had been patented in 1698. James Watt had realized Newcomen's steam engine unfortunately insufficient and started to think about how to improve performance, the Newcomen's steam engine was losing of latent heat in every movement of the cylinder. The primary operating system of the Newcomen's steam engine was that heating and

cooling the cylinder, but it was causing the engine wasted most of its thermal energy. James Watt made a breakthrough by the keep of the temperature of the cylinder at the same temperature. This contribution created a different result than others, and the machine was losing less energy while the cylinder cycled every time (McFadden, 2017).

James Watt intended to solve the efficiency problem by adding the new condenser. Otherwise, steam and fuel were losing the efficiency by having both heating and cooling take place inside the piston cylinder. He installed a new chamber which is separate from the cylinder; thus, superheated steam would be cooled to create the effect of vacuum. Additionally, the separate condenser could be saved permanently hot and the condenser cooling, separation allowed the piston cylinder to keep the same temperature with the much consequent saving of energy (Kingsford, 2018). The double-acting engine caused steam engine more efficient by harnessing the power of prior idle steam to push down pistons. His invention created a new capability faster, safer, cleaner, and even more economically functional.

Table 2. 1 Coal Consumption in Various Types of Steam Engine in Manufacturing Applications

Type of steam engine	**Pounds of coal per hour per HP**
Savery engine (18th century)	30
Newcomen engine (mines) (1700–50)	20–30
Newcomen engine (1790)	17
Watt low-pressure engines (1800–40)	10–15
High-pressure engines (1850)	5

Source: Freeman, C., & Louça, F. (2002). As time goes by: the information revolution and the industrial revolutions in historical perspective. Oxford University Press.

Even his machine used to work with low pressure, and it was the first machine, which operates a smooth circular motion. He awarded due to his enormous contribution to the engineering science, the name of the international power unit has been labeled as Watt(w), so still, his name is frequently calling by people (Karaoglu, 2016). Watt's business partner, Matthew Boulton, presented the steam engine as a source of energy for all kinds of industries, especially, the largest textile industry at that time.

Table 2. 2 Steam Power by Industry, 1800-1907

	1800		1870		1907	
	Number of engines	(%)	Steam HP (power in use)	(%)	Steam HP (power capacity)	(%)
Mining	1064	48.56	360000	26.22	2415841	26.49
Textiles	469	21.41	513335	37.39	1873169	20.54
Metal manufactures	263	12.00	329683	24.01	2165243	23.74
Food and drink trades	112	5.11	22956	1.67	266299	2.92
Paper manufactures	13	0.59	27971	2.04	179762	1.97
Building trades	12	0.55	17220	1.25	347647	3.81
Chemicals	18	0.82	21400	1.56	182456	2.00
Public utility (waterworks, canals, etc.)	80	3.65	36000	2.62	1379376	15.13
Others	160	7.30	44375	3.23	309025	3.39
Total	2191	100	1372940	100	9118818	100

Source: Kanefsky, J., & Robey, J. (1980). Steam engines in 18th-century Britain: a quantitative assessment. Technology and Culture, 21(2), 161-186;

As a result of, most of the research point out the invention of the steam engine as a remarkable start point of Industry 1.0. However, when examining the widespread effect of this period, it remains insufficient to explain how happened paradigm transition with just steam engine invention. Since Industry Revolution 1.0 did not emerge suddenly on the stage of history, it is highly challenging to determine the exact start and end date. Scientific methods and rational approach also accelerated the sustainable technological developments. Therefore, there has always been a positive correlation between industrial revolutions and technological developments. As indicated by Adam Smith in his book; the process of machine development would create an incredible impact among people. The people of that period are voluminously impressed by his book; thus, he drew people's attention to the machine and scientific methods (Kahraman, 2017). Therefore, the importance of Industry 1.0 is highlighted by Thomas Carlyle in the most beautiful poetic manner of telling, and he named this period the Age of Machinery.

> There is no end to machinery. Even the horse is stripped of his harness and finds a fleet fire-horse yoked in his stead. Nay, we have an artist that hatches chickens by steam; the very brood-hen is to be superseded! For all earthly, and for some unearthly purposes, we have machines and mechanic furtherance; for mincing our cabbages; for casting us into magnetic sleep. We remove mountains and make seas our smooth highway; nothing can resist us. We war with rude Nature;

and, by our resistless engines, come off always victorious, and loaded with spoils (Carlyle, 1829).

i. James Watt made a breakthrough improvement on the steam engine and decreased the level of the leak of the energy.
ii. Robert Fulton used the power of the steam engine in ships. This significant development would happen in the field of transportation in 1807.
iii. The first regular transoceanic journey started with steamships in 1840.
iv. Between 1800 – 1830, the speed of the bridge canal and railway constructions rapidly increased (Kahraman, 2017).

With these developments and contributions, England reached to world workshop, because the steam engine became applicable to all industrial sectors. In this way, the advanced steam engine is used in weaving looms in the last part of the 1700s, and this development is accepted as a symbol of the first industrial revolution or industry 1.0. Since scientific developments in the field of the engine would solve various problems in the production process. Increased value of Industry 1.0. caused efficiency improvements first in the textile industry, and then it would spread rapidly to other sectors and revolutions (Egilmez, 2018).

2.3. Industry Revolution 2.0

Industry Revolution 2.0. is a second wave of the Industrial Revolution. James Watt and other machines engineers' steam engines mostly are accepted as a symbol of the Industry Revolution 1.0. Throughout the first wave, it was developed by mechanical engineers; however, the new movement is shaped by Industrial engineering, and it becomes their revolution. With this new period, knowledge has also acquired a new meaning for the application business process and increase effectiveness. Therefore, these kinds of activities jumped right into the non-increasing functions, unless a major development creates new opportunity. It is possible to mention that the invention of steam engine represented Industry Revolution 1.0, and Henry Ford's automobile assembly plant project is highlighted in the heart of the second wave and it becomes conveyed as a symbol of the Industry Revolution 2.0. Doubtless, it would be the completely wrong approach to explain the dynamics of the revolution just around of

the one innovative new capability. This means that the second wave refers to the importance of new inventions, material, energy source, transportation, and management theories. As indicated before, knowledge acquired a new meaning to be applied in the field of the business process, the productivity of the second wave owed much to the first wave; thus, a vast number of new products or management came into the industry and people's life. Notably, the use of power changed hands from coal-steam to oil and electricity in Industry Revolution 2.0. Also, it added new values to daily life with cars, buses, planes, telephone, bulb, television, cinema and radio (Pena, 2014).

The English inventor Bessemer took the first step in the second wave with the invention of "reasonable steel" for industries. The age of iron played an important role until the end of the 1850s. However, wrought iron was not practical for many uses in the industry. Wrought iron was causing a high amount of cost for machine parts and railroads, especially in machines and construction since wrought iron was not insufficiently elastic. Bessemer process was trying to find a solution with the aim of mass help production and increase effectiveness. While entrepreneurs would like to increase the mass production in their industry, the main subject was not made steel for them, and the main demand was to reach high quality "cheap" steel. This idea considered to have started with Henry Bessemer steel in the 1860s. This idea believed to have started with Henry Bessemer steel in the 1860s and remained paramount in mass production with of course assembly line. The cost of steel production was falling with Bessemer's new method, the process if machine production was getting more natural, and the mechanization was spreading rapidly among a few countries. With modern industrial development, people's life would get cheaper and more comfortable in every sector, and a few luxuries product which belongs to the privileged minority would be more available to everyone. Henry Bessemer mostly solves the first problem of industry 2.0, and cheap steel started to use in many sectors building, ship, machine, weapons and especially in railroads (Mokyr, 1992).

Table 2. 3 Spread of Railways in Ten Selected Countries (in kilometers)

Country	1840	1860	1880	1900
Austria-Hungary	144	4,543	18,507	36,330
Belgium	334	1,730	4,112	4,591
France	496	9,167	23,089	38,109
Germany	469	11,089	33,838	51,678
Great Britain	2,390	14,603	25,060	30,079
Italy	20	2,404	9,290	16,429
Netherlands	17	335	1,846	2,776
Russia	27	1,626	22,865	53,234
Spain	-	1,917	7,490	13,214
Sweden	-	527	5,876	11,303

Source: Halsall, P. (1997). Modern History Sourcebook: Tables Illustrating the Spread of Industrialization. Fordham University: https://sourcebooks.fordham.edu/science/sciencesbook.asp Accessed at: 12.10.2018.

The significant change using of electricity was a new concept and knowledge to solve economic problems and increase effectiveness. The first useful electricity output came up not in power transmission, but communication. Samuel Morse who is American inventor invented the communication code named after him that made the single needle system feasible. Transatlantic connection set up with telegraph and radio signals, so the stock market and equity certificate have emerged in this period.

There are three dynamics of Industry Revolution 2.0; petroleum, steel, and electricity using in the industry. It caused significant increases in the production capacity and production speed. Notably, the use of electricity in the field of the industry has had an impressive impact on production and caused severe reductions in product costs; thus, the production system and workflow methods restructured for effectiveness. It was highly well known that Henry Ford did not invent the automobile, but his invention created more progress rather than the automobile. The first mass production started with the first assembly line in Henry Ford's company. Therefore, the revolution was shifting England to the United States, and this movement pointed out that manufacturing and industrial jobs would be one of the most critical topics in the United States of America.

Henry Ford's Model T and assembly line triggered paradigm change in the history of the industry. Unfortunately, the automobile was a luxury thing which purchases by only wealthy people until 1908. The model T was the first automobile on the assembly line, thus producing less expensive cars to the world and creating higher wage jobs in the market.

> I will build a motor car for the great multitude...it will be so low in price that no man was making a good salary will be unable to own one and enjoy with his family the blessing of hours of pleasure in God's great open spaces ...When I am through, everybody will be able to afford one, and everyone will have one. The horse will have disappeared from our highways; the automobile will be taken for granted. Moreover, we will give large numbers of men employment at good wages. Henry Ford

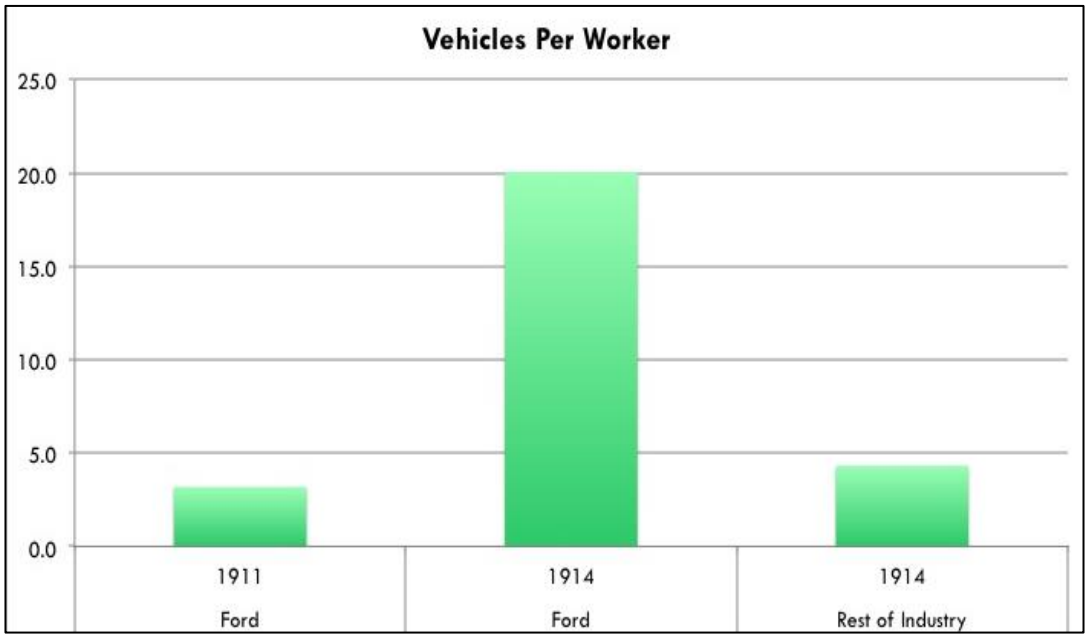


Figure 2. 2 Vehicles per worker (1911-1914)
Source ARK Investment Management LLC, Ford Factory Facts, EconEdLink

Model T's were changing the world with its speed of production, and unstoppable production (half of all automobiles in the United States were Model T.) until the begging of the Big Depression.

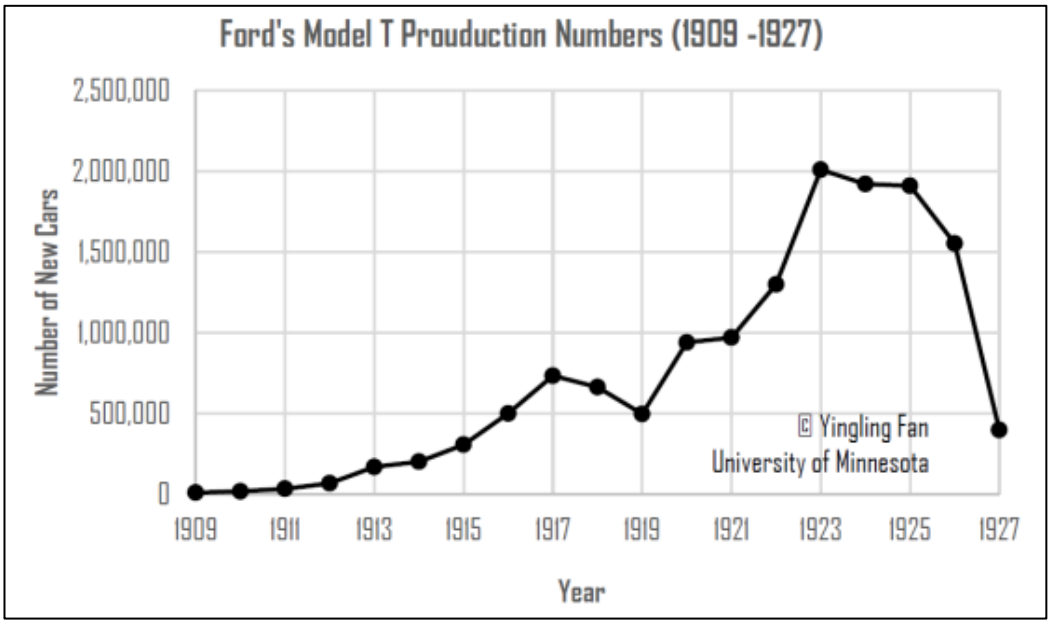


Figure 2. 3 Ford's Model T Production Numbers Between 1909 and 1927.
Source: Fan, Y. (2018, 03 29). The Injustice and Sociopolitics of Transit Decline, 1921-1972. Global Transit: https://globaltransitblog.wordpress.com/2018/03/29/the-injustice-and-sociopolitics-of-transit-decline-1921-1972/ Accessed at: 11.10.2018.

While machines performance was increasing, a few thoughts started work on increase specializations and innovations in workplaces by effective planning methods and division of labor. Thus, the new concept Scientific Management was led to reach a great watershed for organizations.

2.4. Taylorism

Frederick Winslow Taylor started his career as a chief engineer in the steel company. While he was working at the Midvale Steel company in 1881, he was studying on factor operations. The dominant topic was " efficiency," and he realized the importance of every minute of worker's actions since he had an engineer brain. He was aiming to increase worker's efficiency with the " scientific management approach, so he created a new concept in the industry to perfect efficiency; from the standpoint of Taylorism were telling workers when to stand or sit, how much to carry. How long to shut down.

Obviously, his first sentences in the book "principle of scientific management ' were explaining the purpose of the theory,

> The principal object of management should be to secure the maximum prosperity for the employer, coupled with the maximum prosperity for each employee. The words "maximum prosperity" are used, in their broad sense, to mean not only large dividends for the company or owner but the development of every branch of the business to its highest state of excellence, so that the prosperity may be permanent (Taylor, 1911).

The cornerstone of Winslow Taylor's theory was standing on the four principles to the maximum reach level of the skills and contributions of each worker while the machines were working industries correctly, why labors performance should not reach the same level. As a result of, Taylor's task management system would intend to increase efficiency with the idea of spending less, produce more and resist unions, unfortunately, this crucial system is entirely adopted by a few companies during its long history against increased demand, and Europe interpreted differently this theory as a “labor was supervised” Taylor and Ford were ultimately affected by mass demand, so both engineers always worked on why don't workers harder?

They recognized the organization with machine metaphor as they did not care about labor's physical and mental depreciation, Henry Ford's scary sentence explain his way of doing business “Why is it every time I ask for a pair of hands, they come with a brain attached?”. Think of all of the management theories went into how would work efficiently when labors were lined up correctly (Lune, 2010). It would not be wrong if "effectiveness" would represent Industry 2.0, instead of the assembly line. Industry Revolution 2.0 caused a direct effect on the many industries, so it created the vast number of development on inventions and theories; the iron, steel, railroad, electrification, machine tools, petroleum, fertilizer, rubber, chemical, turbines and modern business management. Other significant development in the Industry 2.0, industrial-technological and branding leadership shifted from Britain to the United States, but the lead remained in the Western Industrial World (Mokyr, 1992).

2.5. Industry Revolution 3.0

First industrial and second industrial revolutions have had a significant effect on the 19th and 20th century respectively. III. The Industrial Revolution was also a primary

influence on the 21st century. This revolution, like the other two industrial revolutions, has changed the working and living conditions from essence. While the third industrial revolution was focusing on the development of intelligent factories by combining information technologies with the automation of machines, developed countries were expected to regain their declining competitive power and their growth, because of WW II. Thus, a new industrial revolution started from the beginning of the 1970s to the present day. Industry 3.0 process; it is still an ongoing process as people's still investigating its influence in their daily life.

By 1970s it was introduced with the first programmable management system (PMS). The technology is brightened in this period when electronic and information technology systems used in an integrated way. This process is an essential point for automation to manifest itself in production. Another critical point is the discovery of the PMS system and its subsequent widespread use. If consider that the birth of many giant corporations is in this process, also the sound foundations of our digitalizing world have been laid down in this process. Industry Revolution 3.0 is the period when computer technology used as an interface. In this period, the importance of human power diminished, and the speed of production increased considerably through the computer systems.

Along with this, new software has been presenting with semiconductors, server computers (the 1960s), personal computers (1970-1980s), and internet. In these years, the value of networks, smartphones, the extensive adoption of the internet has changed and developed the manufacturing process in every direction. Advancements in the area of communication and transportation, business and production models are globalized. The symbol of the Industry 3.0 is "automation of production" and the decline of human activity in manufacturing (Egilmez, 2018).

With the automation of the production process caused remarkable benefits opportunity through the utilization of computer-based technology system. The quality of time and product were increasing in the manufacturing life because the human being can come up with the different results day by day, on the other hand, a well-programmed machine system provides the same operational consequences without excuse until it breaks. The principal purpose of the use of programmable automation system is that

reduces the cost of production and increase productivity, in other saying the Industry Revolution 3.0 is that a vast of blue-collar workers will lose their job while productivity is rising. To better explain this change, computer integrated manufacturing industries were making it possible to create the safer and healthier environment; thus, robots or technological tools stole a quite jobs like welding, spray, painting, machine loading and lifting from people (Helfgott, 1986). The industrial computer system was standing right at the center of Industrial Automation system, and it spawned out by the mixture of three key components – hardware, software, and programmable elements. The new technology or digital era initiated a plastic manufacturing industry with computer control, robots, sensor controls, laser barcode scanners and computerized testing for mass production.

Industries are obligated to adopt the computer-based technologies because machines or programmable automation systems can recognize itself swiftly to perform a new task with any training or education, thus system able to response real-time - real demand. Computer-based technology industries created new capability on the drawing and designing tasks; white color workers enabled to increase their productivity and knowledge in their business area. The key word of Industry 3.0 was automation as indicated above. The device which is named as Programmable Logic Controller (PLC) was a cornerstone of today's automation system. At the beginning of 1970's the new technology automation with the power of the computer, automatic equipment, and other digital devices increased supply performance and controlling capability in the different functions of the production process at the same time. Programmable automation was reinterpreting as a source of contemporary manufacturing life. The new form of the industrial revolution had multiple reactions on the duration of the manufacturing process, material capacity tracking, inspection and calculability on the machines assembly and quality (Oliveria, 2007). David Williamson sorted out what kind of remarkable changes happened in the industries with the programmable automation system (Schrader and Elshennawy, 2000);

i. Reducing human involvement and thus decreasing the possibility of human errors. This eventually raises the level of quality and increases the productivity gains of the company.
ii. Better planning and control of the manufacturing process and thus decreased manufacturing costs.

iii. Increased process performance is resulting in better quality of products.
iv. More efficient operations with computer control.
v. Improved machine reliability by employing computerized preventive maintenance programs
vi. Better utilization of machines and other equipment, which improves productivity and reduces bottlenecks in production activities, Setup time is decreased
vii. Increased efficiency and improved safety levels with automated machines and equipment.
viii. Minimization of waste, thus manufacturing costs.

On the other hand, an economist and energy visionary Jeremy Rifkin came up with a new phenomenon in an attempt to increase people's attention on the renewable energy topic at the period of Industry Revolution 3.0. The "Industrial Civilization" has made great distances with the First and Second Industrial Revolutions. Petroleum and other fossil fuels have been consuming without restraint by the industries since the beginning of the industrial revolution, the technologies that derived from these energies are falling behind the times, and their maintenance is getting harder. The worst of all is the impact of climate change arising from industrial activities based on fossil fuels, and ecosystems are breaking down. It is causing continuing evolution for nature. Jeremy Rifkin's "Third Industrial Revolution," which has been holding the forefront of the environment for many years and working on more fair and sustainable economic models, reveals the whole situation in the layman's terms. The book, which shows the mistakes people have made in the past, offers valuable tips and suggestions for the future.

Foreseeing that the Third Industrial Revolution defined capitalism from the very beginning, Rifkin also reveals the possibilities of a greener future. The impacts of the changing climate were becoming increasingly evident and affected how people do business. These impacts are unusually severe on the most vulnerable segments of the world's population. Therefore, Jeremy Rifkin's the third industrial revolution book consist of the three parts and nine sections. The general expression of the book is the carbon-based age industry must make a great transition to renewable energy since

Climate change endangers to drive almost 100 million people into extreme poverty by 2030, with increasing heat waves and extreme weather events only a precursor to the rising sea levels, flooding, and droughts.

Moreover, people are losing the battle against time. The new approached should be placed in the people's brain; green or renewable electricity is damned nature-friendly instead of Coal, petroleum and natural gas which described as conventional fossil fuels. Rifkin, with the Third Industrial Revolution, thinks that the development in the energy and transportation sectors is slowly started to make a transition in this period. Electricity distribution companies are already planning to install electric charging stations on highways, parking lots, commercial premises for future electric vehicles. Mainly, which is started with General Motors the business dealings between automobile manufacturers and electric distribution companies is an essential signal for the future (Sezgin, 2018). The five pillars of the third industrial revolutions components should step into action simultaneously without loss of time; otherwise, the indicated below the five pillars of evolution would be most probably too late for those who missed the first and second industrial revolution (Rifkin, 2011).

1. Shift to Renewable Energy
2. Transform Buildings into Micro-Power Plants
3. Develop Hydrogen Fuel Cells
4. Create a Smart Grid using the Internet
5. Transition Cars to Electric and Fuel Cell Power

Table 2. 4 Share of Renewable Energy (Including Hydro) In Electricity Production

Region	Share of renewable energy in electricity production (incl. hydro) (%) in 2005	Share of renewable energy in electricity production (incl. hydro) (%) in 2010	Share of renewable energy in electricity production (incl. hydro) (%) in 2015
Africa	16.9%	17.4%	18.9%
Asia	13.9%	16.1%	20.3%
CIS	18%	16.7%	16.1%
Europe	20.1%	25.7%	34.2%
Latin America	59.3%	57.7%	52.4%
Middle East	4.3%	2.0%	2.2%
North America	24%	25.8%	27.7%
Pacific	17.9%	18.6%	25.0%

Source: Energy data (2016). Energy Statistical Yearbook.

As comprehended if the most critical structural steps are not taken on the above five pillars would stand as a flourish story for several countries or regions. With this context, most of the researcher believe that if they start using renewable energy in their investment decisions or the industry, this will quantify the tangible economic effects of climate change and lead to minimizing climate risk exposure for developed and developing countries. Positive results could help pivot investments away from high-carbon emitting projects and spur more investments in climate-smart alternatives.

By the 1970s, a microprocessor-based programmable an electronic logic circuit was produced that carries the information from the sensors to business segments within a program structure. Moreover, it caused to create a new capability to automate the production system by using this method to production operations. This development has also minimized the error by reducing human contribution. Thus, a new industrial revolution rose from the origin of the 1970s to the present day. Significant advancements in communication and transportation, trade and industry are globalized. Industry Revolution 3.0 is defined as automation of production and reduction of human labor in manufacturing. The revolutions I would like to point out two significant characteristics so far:

i. The times between revolutions are diminishing. Approximately 12,000 years have passed between the agricultural revolution and the first industrial revolution. The industry time between 1.0 and 2.0 is about 80 years. This period is almost 90 years between 2.0 and 3.0 in Industry, 70 years between 3.0 and 4.0 in Industry.
ii. The essential need for human labor is diminishing. Each industrial revolution has made it possible to reduce the demand for human labor according to the previous production system. Furthermore, the primary sources of world energy production are unrenewable energy sources such as oil, natural gas plus coal today. An absolute energy source has gained importance every different period. However, the renewable energy sources perception is created by Jeremy Rifkin in this period; thus alternative energy sources will increase its value in the coming years.

Table 2. 5 Electricity Production from renewable sources, excluding hydroelectric (Turkey, Korea Rep., World, EU, OECD) (kWh)

Country	1990 (million)	2015 (million)
Korea, Rep.	1.00	8,260.00
Turkey	80.00	16,511.00
World	156,082.00	1,644,540.00
European Union	18,856.00	594,687.00
OECD members	140,705.00	1,114,666.00

Source: World Bank Data, Electricity production from renewable sources, excluding hydroelectric (kWh), https://data.worldbank.org/indicator/EG.ELC.RNWX.KH?end=2015&locations=OE-TR-KR-EU-1W&start=1990., Accessed at: 12.12.2018.

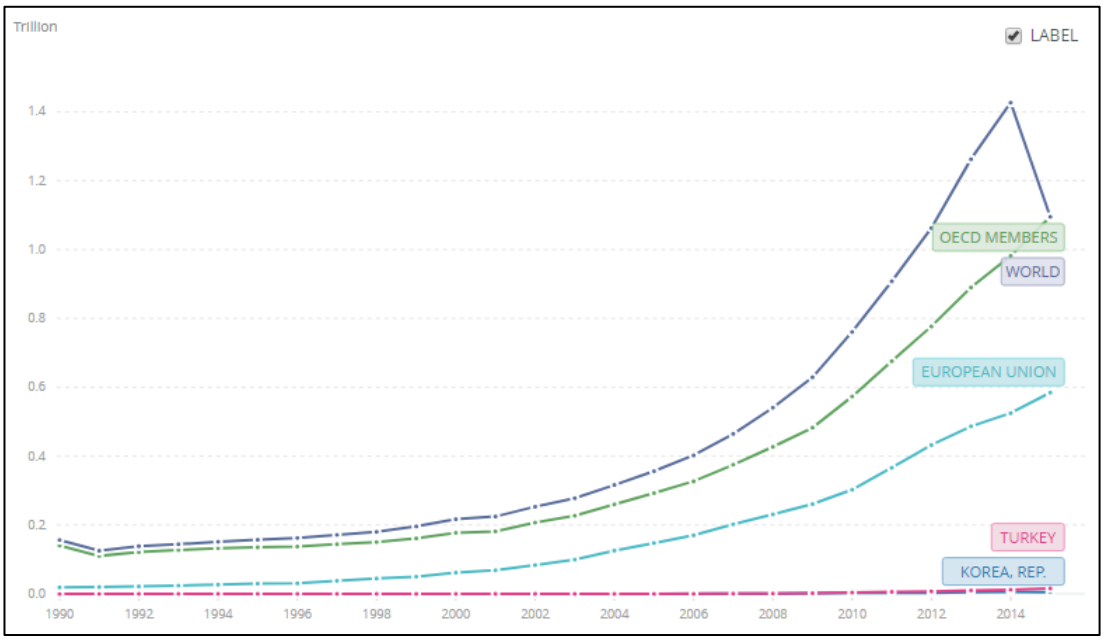


Figure 2.4. Electricity Production from renewable sources, excluding hydroelectric (Turkey, Korea Rep., World, EU, OECD) (kWh)

Source: World Bank Data, Electricity production from renewable sources, excluding hydroelectric (kWh), https://data.worldbank.org/indicator/EG.ELC.RNWX.KH?end=2015&locations=OE-TR-KR-EU-1W&start=1990., Accessed at: 12.12.2018.

2.6. Industry Revolution 4.0

It is unquestionable that, modern societies and developments are owe everything to Industrial Revolutions. The engine of the industrial transformation began with the mechanical production powered by the steam in the 18th-century. Second development which is mass production assembly lines requires labor and electrical energy have the light gas to the engine in the 19th-century. With the automated production using electronics is accelerated the engine in the 20th century. Today, the engine has been working fabulously fast and digital since everything is connected to each other via wireless and internet in the 21st century. The Fourth Industrial Revolution can be labeled as the advent of "cyber-physical systems," it would not be wrong to say that this development symbol of the fourth wave, and it involved entirely new capabilities for people and machines. Cyber-Physical-Systems is about the constant development of knowledge and information system in blending with an uncontrollable increase of computing, transmission, and storage capacity, it facilitates the evolution of frequently strong, interconnected new technological operations. This new capability, devices can communicate with several other machines and with the manufacturers to perform whatever people now describe as a "cyber-physical production system" (CPPS). A good definition is addressed by Kagermann *et al.* (2013) "include embedded systems, production, logistics, engineering, coordination and management processes as well as internet services, which by courtesy of sensors directly collect physical data and utilizing actuators influence physical procedures. These systems are interconnected via digital networks, use worldwide available data and services and are equipped with human-machine interfaces. Cyber-Physical-Systems are open socio-technical systems, which enable several novel functions, services and capabilities." (Bartodziej, 2016).

Along with the quick shifts in the era of information and communication technologies (ICT) have destroyed the invisible boundaries between virtual reality and the present world. The primary concept behind Industry 4.0 is to construct a social network "anywhere" machines enable to communicate with several other machines at the same time, it is named under the Internet of Things (IoT) and for people, named the Internet of People (IoP). All adverse developments help manufacturers integrate the actual labor-oriented system right into a virtual system, artificial intelligence and enable organizations to collect dynamic valid data, interpret them, and even make decisions

based on unexpected events. This transformation has a compelling right to speak to make changes in the production technology, social life, economy and education system. In this chapter, the concept which is described by German's Industry 4.0 will be examined in detail. This time revolution has emerged from the German government's announcement under the “strategic initiative” headline Industry 4.0 in January 2011. Industry Revolution 4.0 actualized by the Communication Promoters Group of the Industry-Science Research Alliance. The German government has been adopting a High-Tech Strategy for research and innovation studies against the problems of climate/energy, health/food, mobility, security, and communication. Besides, within the new smart manufacturing development, Industry Revolution 4.0 is created own motto “smart thinking” approach in manufacturing environments. (Bartodziej, 2016). With the Smarty Factory concept, an interconnected world which established on the Internet of Things and Services would be the vital economic actors who changed into intelligent infrastructures and planets. This transformation has been increasing the interest in the emergence of smart grids and intelligent or intelligent buildings in the field of energy supply.

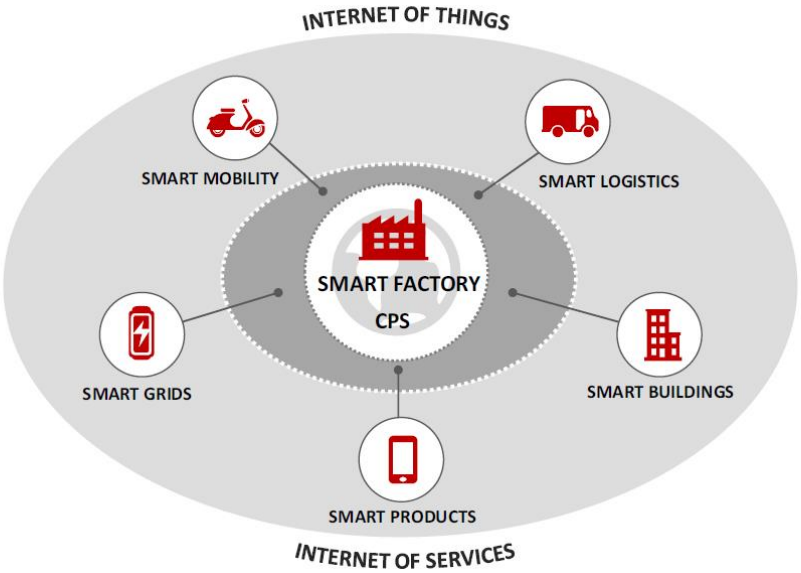


Figure 2. 4 Smart Factory in the center of the concept of Industry 4.0.
Source: Kagermann, H., Helbig, J., Hellinger, A., & Wahlster, W. (2013). Recommendations for implementing the strategic initiative INDUSTRIE 4.0: Securing the future of German manufacturing industry; final report of the Industrie 4.0 Working Group. Forschungsunion.

Primary, the dynamics of the idea will be considered followed by an explanation of what is meant by this new revolution, potentials, and international approaches. Afterward, the meaning of an end-to-end digital integration within a Smart Factory

will be described in simple language. The basic framework of Industry Revolution 4.0 is an approach that aims to maximize computerization in the manufacturing industry via high technology production equipment. There are five primary goals for this period (Egilmez, 2018);

i. The reduction the number of human labor in the production, thus human mistake rate diminishes automatically at the same parallel,
ii. To obtain maximum flexibility in the production line to produce exceptional products when requested by the customer,
iii. Acceleration of the production process,
iv. Increase communication channels between produces and consumer,
v. To create tracking capability on the waiting period of the order process.

The manufacturing industry is related to significant structural transition due to global demands. It is important to point out that several ongoing developments of Industrial Revolution 4.0, which substantially influenced the entire manufacturing products which include;

- cloud computing
- advanced analytics
- mobile computing
- machine-to-machine communication
- advanced robotics
- community platforms
- 3D printing, optical technologies
- microsystems technology
- nanotechnology
- biotechnology

Therefore, these new products have been drawing entrepreneurs' attention to make an investment on the cornerstones for future productions, embedded systems, smart objects, Smart Factory, robust networks, cloud computing, and IT-security. For this reason, the new emerged, interconnected value chains changed the traditional way of

doing business models and organizations structure because of the incredible potential of the fourth industrial revolution for the entire manufacturing environment is candescent. Hereupon, the technology has gained utterly new meaning for the modern life and for those who intended to be high technology producer (Bartodziej, 2016);

i. Data, computational power, and connectivity (e.g., wireless networks),
ii. Analytics and Intelligence (e.g., artificial intelligence of objects),
iii. Human-machine interaction (e.g., augmented reality (AR) solutions),
iv. Digital-to-physical conversion (e.g., 3D printing).

History always proofs itself that consumers intend to gain new capability from industrial revolutions as the cost of goods downs while quality increases, and it remains this is the entirely accurate idea for the latest.

As Schwab writes (Davis, 2016):

> The new technology age if shaped responsively and responsibly, could catalyze a new cultural renaissance that will enable us to feel part of something much larger than ourselves – a truly global civilization… We can use the Fourth Industrial Revolution to lift humanity into a new collective and moral consciousness based on a shared sense of destiny.

For this chapter, Industry Revolution 4.0 is distinguished as a theory endowed by German institutions, organizations, and companies to guarantee and strengthen Germany's active competitive status in various industrial fields. Industry 4.0 is often practiced as a metonym for the fourth industrial revolution in Germany. The whole potential of the fourth industrial revolution for the entire manufacturing conditions still is robust to figure out; however, it is examined massive depending on the sector. In various other circumstances, there are related strategies (particularly in the US), which also continue the development of its industries. These strategies, on the one hand, can be recognized as a challenge, when the involved actors work for the preeminent position in the world.

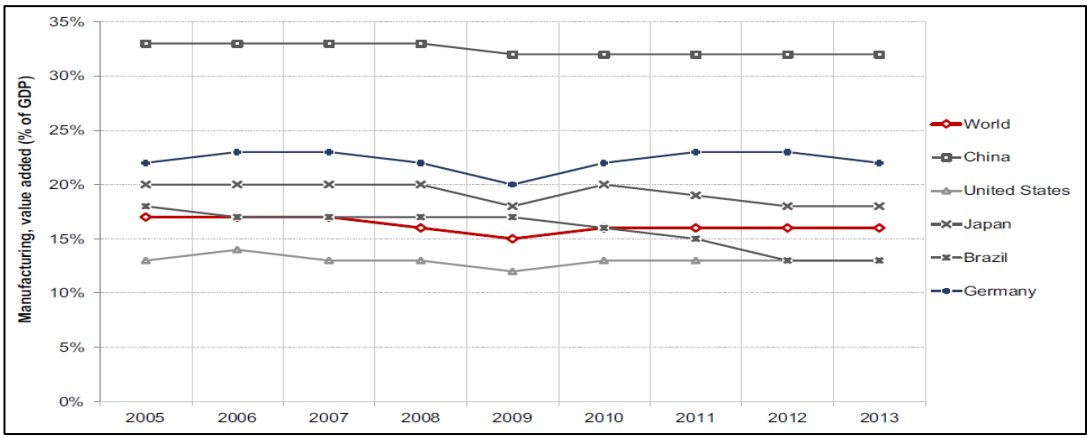


Figure 2. 5 Automation percentages in jobs

Source: Worldbank, 2015.

The evolution of the fourth revolution is predominantly operated by new business requirements such as volatility, flexibility, and individualization as well as via technological innovations. The combination of new technologies such as Cyber-Physical Systems and Internet of Services within industrial processes allows entirely new opportunities such as new business standards and business institutions. Due to the wide-ranging ingredients of the concept Industry Revolution 4.0 and its indications, the aim is wholly established on the technologies, which allow the transformation of a fourth industrial revolution.

The process of industrialization movement started with the foundation of mechanical manufacturing material and equipment at the end of the 18th century. The advancement of the enables it to the steam engine by James Watt, machines and engines reformed the way goods were produced. The paradigm transition from an agricultural to an industrial civilization has emerged. The first industrial revolution performed an enormous benefaction to the reduction of "famine catastrophes" in industrial-oriented countries or societies and, concurrently, to the resulting growth of a population explosion. This revolution was followed by a second industrial revolution that established approximately the turn of the 20th century and linked electrically machine powered mass production of goods based on the division of labor. This revolution predominantly invented by organizational changes such as the invention of Henry Ford's assembly line and the scientific management methods based on Frederic W. Taylor, famously known as Taylorism. The large-scale industrial mass production increased and mainly developed in chemical and electronics industry as well as in mechanical engineering and automotive industry production. This advancement was

followed by the third industrial revolution that rose during the beginning of the 1970s and has remained valid up to the 2000s.

The Industry Revolution 3.0 was shaped around the development of digital electronics and information technology for programmable automation. Hence, an indispensable result of this transformation had remarkable socio-economic and socio-cultural impressions, namely a high degree of rationalization in the organizations. However, the reliable productivity of manufacturing processes enhanced due to the installation of serial production systems. The third wave is still an ongoing present, but it is sleekly changing right into a new era of industrialization – the fourth industrial revolution. The Fourth Industrial Revolution is critical to recognize because it does not just affect "manufacturers' interest"—it affected all of us. While Industry 4.0 has expanded to surround the business operations, the workforce and society itself, it is standing at the heart of the supply chain and manufacturing compound the cornerstone of the world as we understand it on today's world. Industry revolution 4.0 did not start and last with only supply chain or product developments. Its influence could be much more extensive, touching every industry and business, even societies and lifestyles. Industry Revolution 4.0 capacities can enhance business processes and revenue increase, changing products, and customer experience. The alliance of digital and physical technologies would change how clients, users, employees, and other third parties of the industry aspect demand to experience and communicate with an organization. The organizations that concentrated on the production and evolution of information. As before mentioned related departments finance, energy, technology, and healthcare—would challenge many of the related problems as just focused on the production and evolution of physical goods: how to use knowledge from logical systems to operate better products and services, customer expertise, and joints with merchants and different stakeholders. The consequences of Industry Revolution 4.0 can be touched at various business levels: across whole ecosystems, at the organizational level, and the private operator and customer level. On the other hand, should indicate one more significant point for those who late for Industry Revolution 4.0. The growth of smart intelligence and omnipresent, logical systems in the era of Industry 4.0 resembles to proclaim a change in what kind of companies will have the concern of their workers: what abilities they require for the new period, what responsibilities need to be performed, even what positions would be alive (Kagermann et al., 2013). Nevertheless,

current many job descriptions may inevitably resemble the loss of jobs all around the world. The United Kingdom or the US are good examples for this issue, technological developments created to create 3.5 million new businesses opportunity between 2001 and 2015, indeed while it caused to the loss of 800,000 in the fourth wave or 47% of US jobs will disappear because of automation or computerization (Mahdawi, 2017). It merely says that smart intelligence will serve many essential tasks. Unfortunately, Industry Revolution 4.0 can both enable and challenge workers to do much more things. Many jobs will entirely disappear because; many will directly redefine with the technology. Therefore, people will likely face a lack of required skill problems for new conditions or be out of work circle by 2030. If you do not educate your children according to the requirements of the new period, robots will take our children's job!

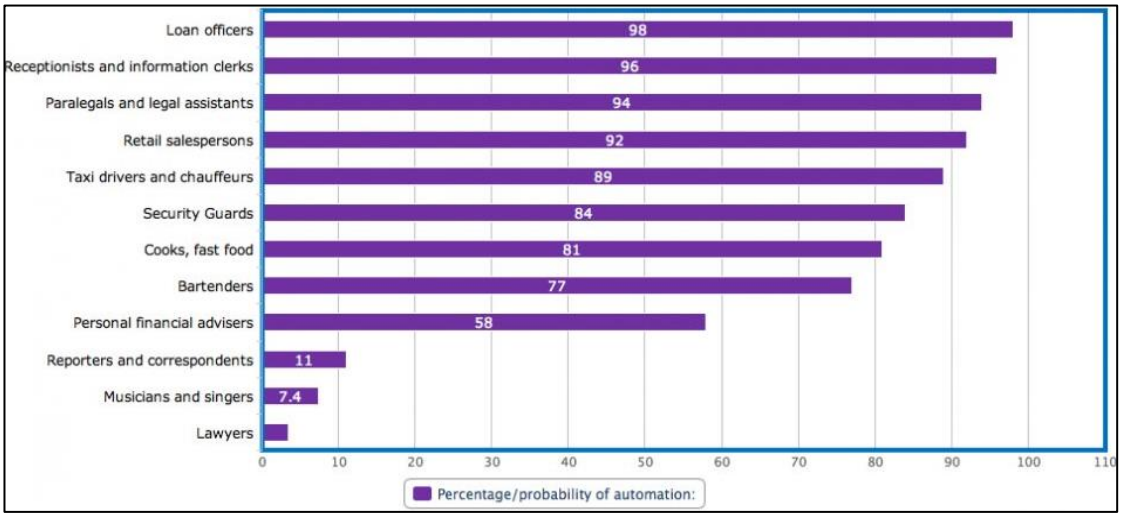


Figure 2. 6 Automation percentages in jobs

Source:https://www.businessinsider.de/likelihood-of-your-job-being-taken-over-by-robots-2016-8?r=US&IR=T, Accessed at: 12.12.2018.

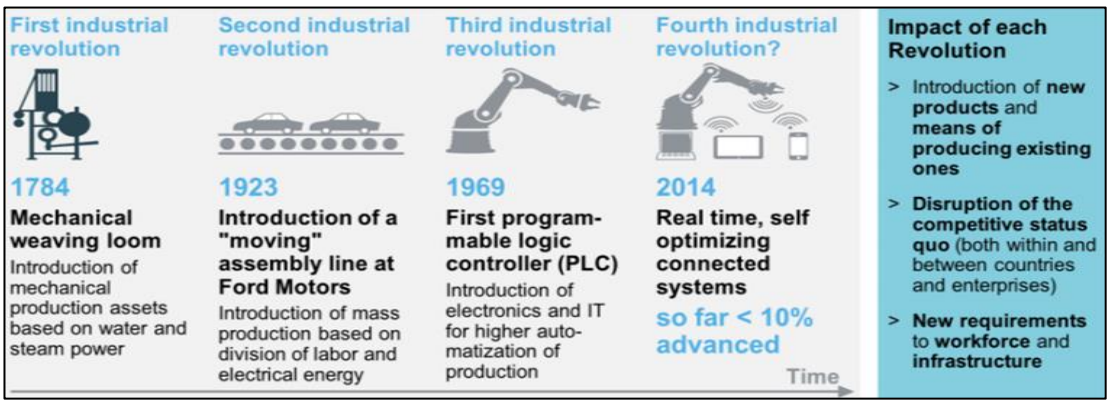


Figure 2. 7 Development Stages of Industrial Manufacturing

Source: http://www.globalskillsummit.com/whitepaper-summary.pdf, Accessed at: 12.12.2018.

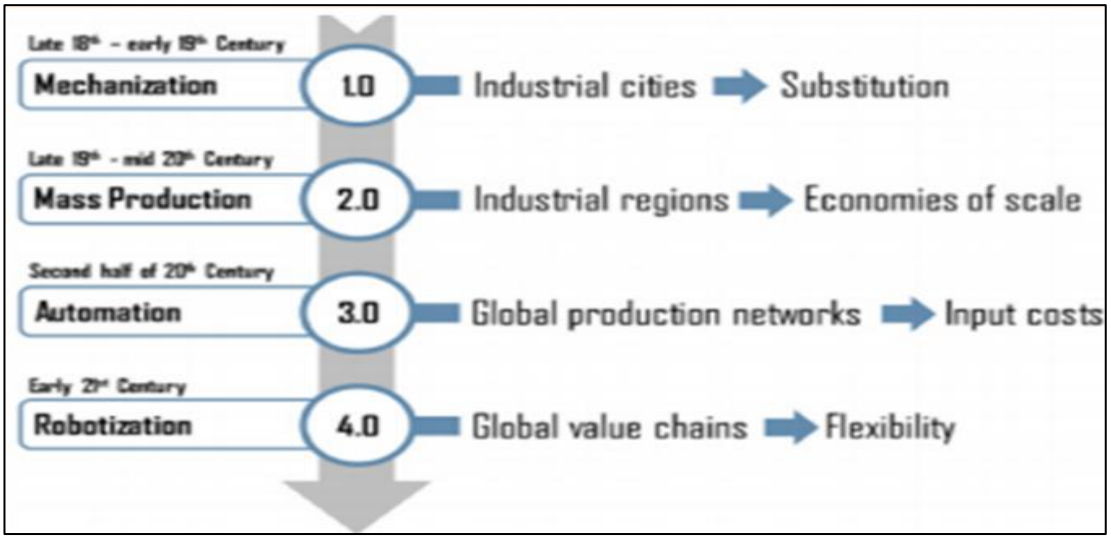


Figure 2. 8 The four industrial revolutions.
Source: https://medcraveonline.com/IRATJ/IRATJ-03-00079.pdf, Accessed at: 12.12.2018.

In order to survive in such a crucial competitive environment, it is necessary to keep up with change without losing time. The first thing to do about this is to consider consumer preferences and thoroughly understand the requirements of time; otherwise, no one firms can survive long survive as it seen Figure 2.9.

Only These 61 Companies Were in the Fortune 500 in Both 1955 and 2015		
3M	CVS	Lockheed Martin
Abbott Laboratories	Deere	Marathon Oil
Alcoa	Dow Chemical	McGraw Hill Financial
Alleghany	DuPont	Monsanto
Archer Daniels Midland	Exxon Mobil	Navistar
Ashland	Freeport-McMoRan	NCR
ATT	General Electric	Northrop Grumman
Avon Products	General Dynamics	Owens Corning
Boeing	General Mills	Owens-Illinois
BorgWarner	General Motors	PepsiCo
Bristol-Myers Squibb	Goodyear Tire and Rubber	Pfizer
Campbell Soup	Hershey	Procter and Gamble
Caterpillar	Honeywell International	Raytheon
CBS	Hormel Foods	Rockwell Automation
Celanese	IBM	Sealed Air
Chevron	International Paper	Textron
Coca-Cola Enterprises	Johnson and Johnson	United States Steel
ConocoPhillips	Kellogg	United Technologies
Crown Holdings	Kimberly-Clark	Weyerhaeuser
Cummins	Kraft Foods Group	Whirlpool
	Lear	

Figure 2. 9 61 firms in both 1955 v. 2015 Fortune 500 List
Source: http://www.aei.org/publication/fortune-500-firms-in-1955-vs-2015-only-12-remain-thanks-to-the-creative-destruction-that-fuels-economic-growth/, Accessed at: 12.12.2018.

2.7. New Technology for Quality of Life

As examined the importance of shifting from primitive life to civilization in the first chapter, so now on will point out very significant driving power in people's lives to make more accessible this paradigm transition. The world named this driving power as a " technology". Correspondingly, emerging of technology has been one of the dominant parts in shaping civilization especially for the modern life. The primary meaning of technology is to enable multiple tasks in our daily lives, indeed; also, can define technology as new products and processes utilized to oversimplify our daily lives. People use technology to increase their abilities, which makes people the essential part of any technology. Technology is part an application of science handled to resolve problems. However, it is vital to understand that technology and science are separate subjects, which work hand-in-hand to perform specific tasks. People use technology in nearly everything they do in our daily lives; they use technology at the office, they use technology for communication, transportation, e-learning, manufacturing, securing data and scaling businesses (Ramey, 2013). Technology has the ridiculous dynamism to change people’s lives, help economic development rate, and produce opportunities for individuals, businesses, and nations throughout the world. In this point, it is critical that to understand how people develop technology and how technology products or developments shape people's communications with individually, thus the real world is related not only for those who work for the new capability. Technology is all around us: it is in progress and creates opportunity all people for those who use their daily and produce who intend to contribute to humanity. Although early people and their relatives experienced various natural rules and improved abilities for inventing helpful tools for hunting and gathering, it would be a wrong approach to described them as the first inventors, since their inventions; mathematical rules, cured illnesses, built great structures, created new materials, and learned how to read the stars and planets were not based on science. Technological development or inventions is about delivering capability to answer a human necessity or requirements rather than merely understanding what is happing all around the natural world, which is the aim of science. Therefore, the invention of the wheel deserves respects in the world history as indicated by Jerome S. Meyer " Man’s first invention, and one of the most important in history was the wheel (Bunch and

Hellemans, 2004). However, today's our understanding of technology meaning refers to an utterly different sense from the past for humanity, but in this part, it would be more beneficial to examine today's technology developments and products. Especially over the last fifty years, technology has been well matured to create valuable tools in modern nations, which has been moreover contributing various new opportunities and capabilities as we do not have before. Doubtless, technology is an utter necessity modern life cannot stay away from it since it has a very significant function in our daily lives. In another expression, it has been answering most of the Mankind difficulties. Over the centuries technology has been evolving that is the remaining as an unchangeable rule for the essence of technology. Modern technology has encountered massive development in recent years, commencing to its far-reaching use by people of all ages. Advanced technology is frequently considered as a process to increase the effectiveness and efficiency of humanitarian requirements. Modern technology is not the only thing rising at the exponential numbers. The vast of inventions which recently popularized technologies get adopted by users is also growing faster, too. In the modern world, through extensive connectivity, prompt communication, and installed infrastructure operations, innovative ideas and products can expand at the incredible speeds never witnessed before, and this allows a brand-new product to get in the hands of users at the speed of light. Modern technology products adoption and using have changed to a much abbreviated in the last 60 like; microwaves, cell phones, smartphones, social media, tablets, and other irreplaceable inventions from the modern era all show incredible adoption speeds. The bedazzling result is the tablet computer, which went from approximately 0% to 50% adoption in five years with modern marketing strategies (Desjardins, 2018).

On the figure 2.1, the rate of people's new product adoption approach gives us, and technology is a pivotal explanation on the enhancing growth and competitiveness in business. It would be useful to point out while technology has been increasing its significant role in the global competitiveness and that causing expedition in the rate of purchasing at the same parallel, these developments would be a tempting reason for those who want to participate effectively in the global market.

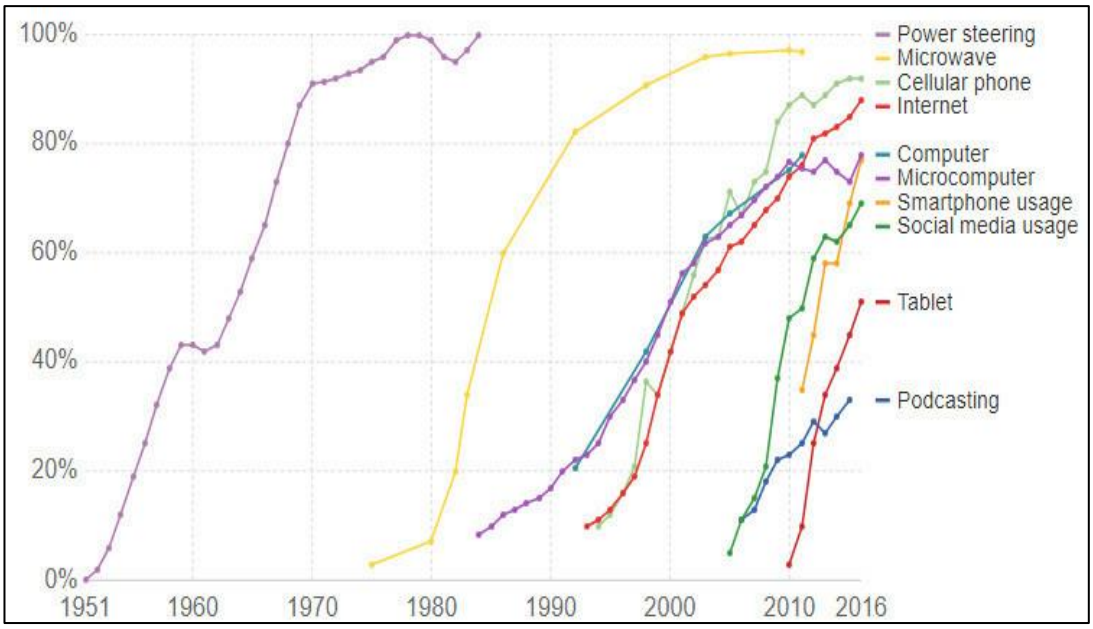


Figure 2. 10 The rate of people's new product adoption approach
Source: https://www.visualcapitalist.com/rising-speed-technological-adoption/, Accessed at: 12.12.2018.

According to Hatzichronoglou (1997), in the meaning of economic globalization, declared that technology is an outstanding engine in advancing business and raising competitiveness power. Technology-oriented manufacturing companies are building more innovation structure, accessing new business and utilizing existing resources and knowledge to increase productively, causing better salary opportunity for their employees. Therefore, developing countries or who want to reach developing country level must work on their technological capability, knowledge, and adaptability to be successful in the more demanding and asymmetric global environment. The qualified employment market, natural resources, economic and political stability, the contemporary educational system, the number of R&D activities and innovation in the country, are reflected advancement. These actors can cause to differences in development and growth among countries; however, the most significant factor is the technology on which production is based, but it is vital to understand what kind of technology products produce causing the main difference among the countries. It is essential for understanding where the comparative advantages of countries at differing levels of advancement may stand. The classification of "high-tech" and "low-tech" has matured for the examination of economic policy in recent decades. Beginning with the classification of manufacturing businesses right into high-tech, medium-tech and low-tech divisions by the OECD, this separation has been extensively adopted, sometimes with the further different new approach (OECD, 2003).

Table 2. 6 Technology Intensity Definition

Technology Level	ISIC Revision 3 Industry Classification
High-technology industries	Aircraft and spacecraft
	Pharmaceuticals
	Office, accounting and computing machinery
	Radio, TV and communications equipment
	Medical, precision and optical instruments
Medium-high-technology industries	Electrical machinery and apparatus
	Motor vehicles, trailers and semi-trailers
	Chemicals excluding pharmaceuticals.
	Railroad equipment and transport equipment
	Machinery and equipment,
Medium-low-technology industries	Building and repairing of ships and boats
	Rubber and plastics products
	Coke, refined petroleum products and nuclear fuel
	Other non-metallic mineral products
	Basic metals and fabricated metal products
Low-technology industries	Manufacturing, n.e.c.; Recycling
	Wood, pulp, paper, paper products, printing and publishing
	Food products, beverages and tobacco
	Textiles, textile products, leather and footwear

Source: OECD 2007, https://www.oecd.org/sti/inno/48350231.pdf, Accessed at:18.01.2019

The classification into high-tech, medium-tech and low-tech areas are based on the relevant sectors' average share of expenditures for research and development activities. Various scholars have recently criticized the advantage of the low-, medium- and high-tech classifications well as of the aggregative opinion on R&D intensity (OECD, 2003). The purpose of the present chapter has been to examine various types of concepts applied in technology classification and OECD's expression in different varieties of classification. The purpose has been to investigate the extent to which principles and practice deal with technology regarding structures in the objective or technology rely on four groups of industries have been identified based on the degree of technology intensity, it is worthwhile to mention that two indicators "High tech" and "Medium high tech" have been playing the significant role in the increasing of national welfare and income as it seen on Figure 2.11 and 2.12 .

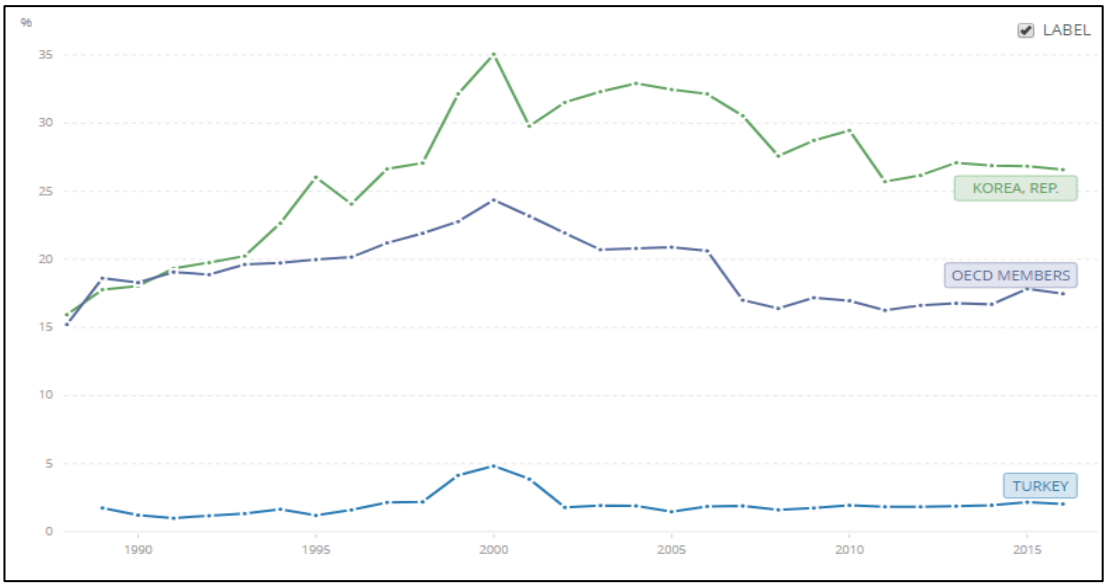


Figure 2. 11 High-technology exports of South Korea and Turkey (% of manufactured exports)

Source: World Bank Data, High-technology exports (% of manufactured exports), https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS?locations=KR-TR&view=chart, Accessed at: 12.12.2018.

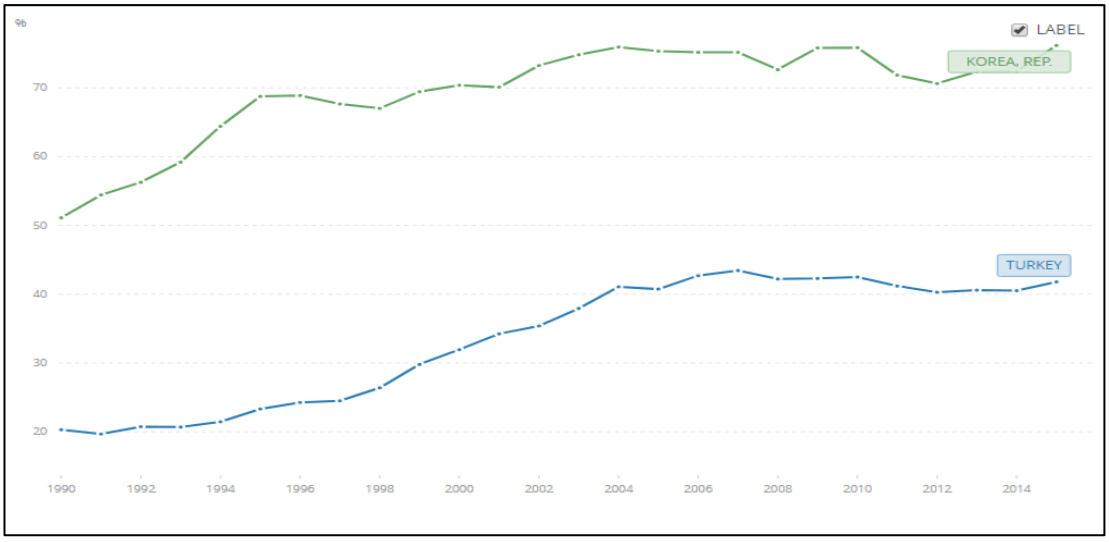


Figure 2. 12 Medium and high-tech exports of South Korea and Turkey (% of manufactured exports)

Source: World Bank Data, High-technology exports (% of manufactured exports), https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS?locations=KR-TR&view=chart, Accessed at: 12.12.2018.

3. HOW TO ACHIEVE TECHNOLOGICAL DEVELOPMENT: R&D AND INNOVATION

Having a structure of innovative or giving importance to R&D activities should always be a character of countries and companies. With a productive and imaginative perspective, difficulties can be resolved creatively and permanently. Innovation and R&D activities are vital in modern and manufacturing life because both subjects provide an advantage in competitive markets with a faster and better solution to developing markets, especially in developing countries. The process of technological developments is essential as it is one of the primary ways to reach a new product which can cause a creative destructive or make more differentiate the current product for the competition.

3.1. The Process of Innovation

The concept of innovation in business has derived principally from the study of economist Joseph A. Schumpeter. He was trying to explain that the innovation as distinctly different the meaning of the invention. However, the primary and unacademic approach to the innovation is that creating new service or product is the explanation of the innovation, but, that is not true. Innovation and the process of innovation containing lots of different methods more than estimated. Mainly, people have devoted much attention to the subject of innovation in the last few years, and most business leaders accepted the remarkable value of innovation. When people look at the right into the Latin roots of the word, “innovation” exactly means “in a new way.” Therefore, innovation has matured the buzzword of the managerial business at the beginning of the twenty-first century. It is straightforward to highlight that the most significant innovation is innovation! Most people await differentiation from daily life and growth whenever they are confronted with innovation. Various indicators can help us to understand the essence of innovation.

Peter Schumpeter who is the father of innovation, pointed out that the innovation as a purpose of the entrepreneurial exercise, in which their activity that produces new or significantly improved goods processes, marketing methods or business organization. (Tuncay, 2003)

Another significant innovation explanation came up by Kanter (1983);

> Innovation refers to the processes of bringing in any new, problem-solving idea into use. Ideas for reorganizing, cutting costs, putting in new budget systems, improving communication, or assembling products in teams are innovations. Innovation is the generation, acceptance and implementation of new ideas, processes, products or services.

Peter Drucker (1985) argues that innovation is the purpose of entrepreneurship, whether in an actual business or a new venture started by a solitary individual in the family business. However, the critical point on his argument, entrepreneurs should utilize the change to produce new service and market opportunities. Entrepreneurial companies by their essence to build a market for answering a consumer need. These enterprises cover small businesses, large enterprises, and nonbusiness co-operation institutions. Beginnings for innovative opportunities in industries include brand-new knowledge and changes in business formation and perceptions.

Innovation is a critical method since it is a vital determinant for the challenge and competitive power of organizations. The primary contribution of the industrial innovations in the production operations is to produce a new capability which does not have before. Notably, the process of innovation is the exhilarating part of having a new value or creating a new capability so, various theories have been introduced to estimate for the innovation process. Process innovation meaning is exclusively different from the innovation in both scope and size. The reason is that the introduction of a radically new service or product, the process innovation ordinarily needs a longer planning time and support from the decision management level. The process of innovation is that performing a different or a considerably advanced production or distribution plan amounts to process innovation. Significantly improving the techniques, knowledge, software, and tools(material) in these manners is also estimated process innovation. It produces a sustainable and usually an easier way of doing business to increase the amount of production while trying to reduce the cost of production. Therefore, countries or companies should not underestimate the significance of process

innovation. By advancing in new plant and equipment, firms can increase productivity, material utilization, quality or reliability (Boutellier and Heinzen, 2013).

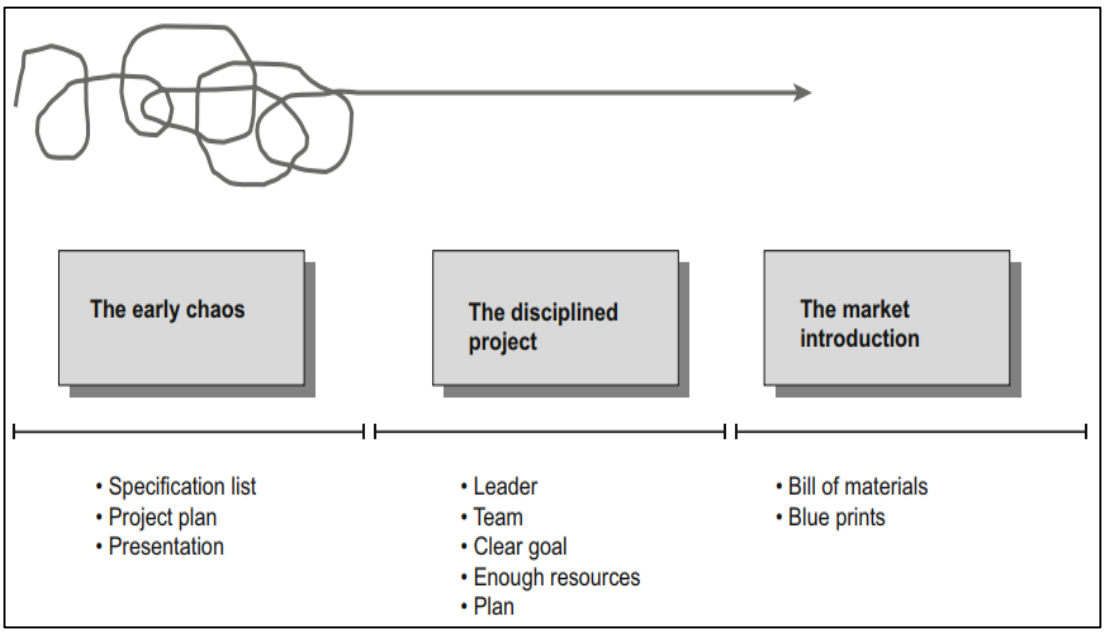


Figure 3. 1 Basic Innovation Principles
Source: https://link.springer.com/chapter/10.1007/978-3-319-04016-5_11., Accessed at: 12.12.2018.

In this part examine the technological and organizational process innovations which are two components of one single phenomenon and are affected by the same forerunners. It analyzes and contrasts two types of innovations, specifically: technological innovation and organizational innovation. From connections and distinctions between these two models, assumptions for the theory and practice of innovation management are inferred.

3.1.1. Technological Process Innovation

The technological process innovation consists of a series of forms required to achieve improvements or develop a new production process, product or service. It is the acceptance of technologically innovative or significantly improve the old version of production techniques, including plans for outcome delivery. These plans may involve advances in equipment, or production organization, or a mixture of these changes, and may be acquired from the use of innovative knowledge. Furthermore, “product innovation” or “process innovation” terms were occurred following in Oslo Manual. In this sense, product technological innovation is the result of manufacturing and commercialization of new innovative goods or with improved performance quality

characteristics, while process technological innovation answers to the choosing of a new or improved production process. It is unquestionable that most innovative organizations introduce both forms of innovations at the same time, endeavoring price competitiveness or technological competitiveness. The technology innovation is also the foundation of a good or service that is innovative or significantly developed concerning its components or designed applications. It holds significant developments in technical designations, parts and materials, hardware, user-friendliness or other operative characteristics. The technology innovation can utilize new knowledge or interpretation or can be located on new techniques or combinations of existing knowledge (Manual, 2005). The most memorable or remarkable example of technological process innovation could be Henry Ford's invention of the world's first moving assembly line. This design improvement not only interpreted in the vehicle assembly process but also reduced the time required to produce a single vehicle. Recently, Amazon discovered a new way to the customer through technology by destroying the traditional or old school grocery selling way and developed direct connections between market and customer without a cashier.

3.1.2. Organizational Process Innovation

Organizational process innovation is the application or study of a new organizational method in the companies' business circle, workplace organization or outside relations. Organizational process innovations can be denoted to enhance a companies' production by diminishing managing, administration costs or business costs, increasing workplace satisfaction (Herzberg's Motivators and Hygiene Factors), getting access to non-tradable assets (tacit knowledge). Also, the organizational process innovation which is composed of fluctuations in the focused intelligence patterns which essence what the organization performs. Therefore, it is the outcome of important decisions taken by the company's decision level within a newly developed business approach in order to provide a sustainable competitive advantage in the business life. Lam highlights the role of organizational innovation: "Economists consider that organizational development is an answer to technical change, when in fact organizational innovation could be a necessary precondition for technical innovation." Organizational changes are not only a supporting factor for outcome and process innovations; they can also have a substantial impression on firm performance

on their own. Organizational innovations can increase the condition and efficiency of work, improve the exchange of information, and improve firms' capability to discover and utilize new knowledge and technologies (Lam, 2004).

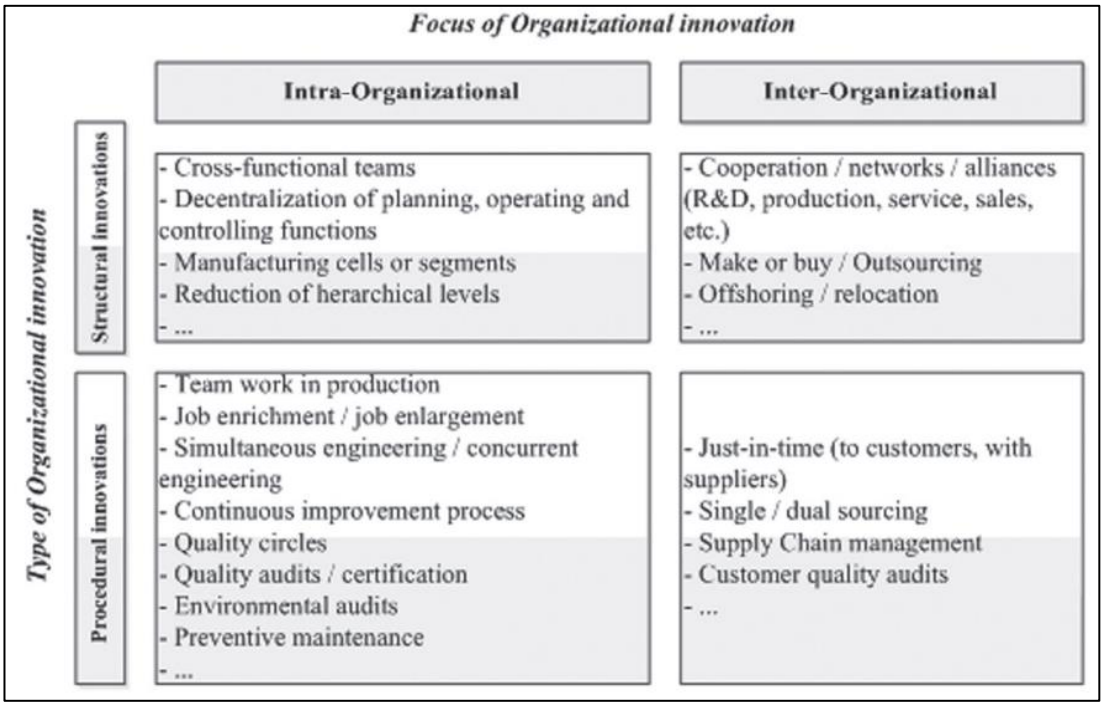


Figure 3. 2 Types and focus of organizational innovations.
Source: Ofec, E. & Sarvary, M. (2003). R&D, Marketing, and the Success of Next-Generation Products Marketing Science, Vol. 22, No. 3, pp. 355–370.

The Japan Quality Circle method could be an excellent example for the organizational process innovation Many large Japanese firms launched the purpose of the quality circle in a well-organized attempt to connect all their employees, at every level, in their organization's ambition for quality.

3.2. Innovation Paradox

As indicated in the previous chapter, the innovation process could be more complicated which is estimated for the countries and companies. The innovation process is commonly described as the research for, and respectively the exploration, development, improvement, adoption and commercialization of, new methods, new products and new organizational structures and procedures (Giovanni, 1988). The process of creating a new product or service requires the proper context in position; therefore, only the right people or organization can inspire and enable to have new ideas and drive projects to onforward. Definitely, another essential thing is that the

appropriate devices and components are in the environment so that the value of such innovation thing can be obtained, and decisions make as to what resources should be designated for long-term innovation in new technologies or business models. Otherwise, most entrepreneurs today, overall industries feel more responsibility among senior managers that innovation is an indispensable source of competitive success and significant for producing future growth and profitability goals. However, despite this often-stated focus, and the attention that the pressure to be more innovative is increasing, there still appears an immense gap between the plan (intention) and actual innovation capability. Indeed, regulations should advise that government or companies move into production lines thought to be more growth the critical point that countries unable to innovate in their existing industries are unlikely to do so in new industries. In this part the research focus why the government should get involved the process or why regulations should provide better and better support, encourage and prevent packages for the innovation development because these are essential to take precautions against the innovation dilemma or challenge. Primarily, it is good the highlighted that what are the market failures and what are needs to be solved by the governments in order to increase innovation production. Therefore, governments' capabilities should not be weak to design, implement, and coordinate effective policies. Governments, particularly in many developing countries, can face the lack the human sources, knowledge, regulations and organizational capability to create and complete required procedures that could improve business and system malfunctions and it consequently cause innovation trouble in their countries. These weaknesses are vital components to the innovation paradox or challenge, yet the role that public servants, ministries, and agencies operate in securing or threatening the effectiveness of innovation strategy is generally absent in "policy" discussions (Quintane et al., 2011). Thus, Xavier Cierera and William Maloney focused which policies or regulations should be provided to market and how to improve them against innovation challenge by the governments?

3.3. The Importance of R&D Investments for Innovation

Within the scope of this work is to investigate the question on the: what are the relations between investments in R&D and new or innovative products, intangible

developments of business performance in the market? The general explanation of citation describing R&D is the OECD Frascati Manual, which was first declared in 1963. The Frascati Manual defines R&D as the following:

> R&D is a term covering three activities: basic research, applied research and experimental development. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view. Applied research is also an original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. Experimental development is systematic work, drawing on existing knowledge gained from research and or practical experience, that is directed towards producing new materials, products, and devices; to installing new processes, systems, and services; or to improving substantially those already produced or installed (Manual, 2002).

Since countries have been in a vital competitive environment, and firms are forced to adopt contemporary strategies in order to dare competition, increase profitability and market share. R&D expenditure has an indispensable function for these strategies or purposes. There is a considerable investigation regarding the relationship between profitability and investments in research and development. A vast of the optimistic researchers claim that the essence of the problem is that the disappointing outcomes emerged by mismeasurement failures, the problematic business design of the research and time ranges between learning and planning adjustment because R&D investments need plenty of time to show positive results (Nikos, 2007). If examine this issue all around the world, many countries have understood and admitted the influence of R&D investments on the way to development, welfare and have tried to destroy their deficiencies by designing a new system with various incentive policies and governmental legal regulations.

The economics research lays on great emphasis on distinguishing between innovation and research and development. As Schumpeter's researches were argued, change has been described as the actual critical source of development, and especially when the market launching of a new product or the use of a new procedure during production. The first is product innovation, the latter on shifted process innovation, and research and development may imply the event of either a product or a process. In other statements, R&D might be the main asset to the innovation process; examination itself capability, however, it is essential to understand that R&D is not innovation till its

outcome emerges on the market or in the production process line (Fagerberg, 2006). Therefore, it is important to denote the explanation of innovation provided in the Community Innovation Survey, CIS of the European Union:

> It follows that research and development (R&D) itself is not innovation but expenditure on innovation. And this is not the only expenditure of this kind. Innovation inputs also include when a firm purchases machines to implement its innovations or when managers make extra efforts to prepare the introduction of new processes or products. What is more, it is possible that the firm itself does not perform R&D activity, yet it can still introduce new products or services relying, for example, on technology transfer.

The innovative product or service needs that firms acquire a grand vision to understand what customer needs in order to be able to produce that products which want or demand by people. The knowledge to create products that help "actual" customer demands is the main reason for triumphant innovation. To produce products which requested by the large mass, firms also must generate solid business plans to support and promote those products in the long run, because sustainable profitable be more meaningful (Halpern and Murazközy, 1996).

However, a successful innovation process has very small to do with the specific amounts of money firms spend. It is entirely right that people do not want to spend time in R&D labs. Companies must follow R&D with strategy and assure that they have robust innovation management processes in place to take products to market. If the innovative product or service witnesses to be successful, firms on the technical knowledge should be able to produce with the brand-new technology. Otherwise, the competitor firms may have already realized the necessity of demanded product until someone starting. The influential the competition, losing catch up to the competitors would be the more depressing. Most of the economic theories increase an awareness to endogenous technological development to explain the growth models of world economies. According to these named endogenous developments models, founded by Romer (Romer, 1986), technological development or innovation is generated in the research and development (R&D) areas utilizing human resources and the existing knowledge assets. Therefore, the competitive companies that should keep up to date their contemporary knowledge skills with their R&D investment to protect their position on global competitiveness index. Besides, R&D - marketing dynamics is admitted to be a critical movement within New Product Development (NPD). These

models are standing in the right middle of the heart because their valid assumption that endogenously defined innovation allows us very sustainable economic growth result which is very commonly repeated sentence all around the world. There are consistent records of innovation in courses of human capital employed in the R&D areas (Kachouie and Sedighadeli, 2015). Afterward uses various valid data methods, which produce by World Bank or OECD to investigate the following assumption of R&D based endogenous growth models: (1) R&D investment increases innovation, and there are constant returns to innovation.

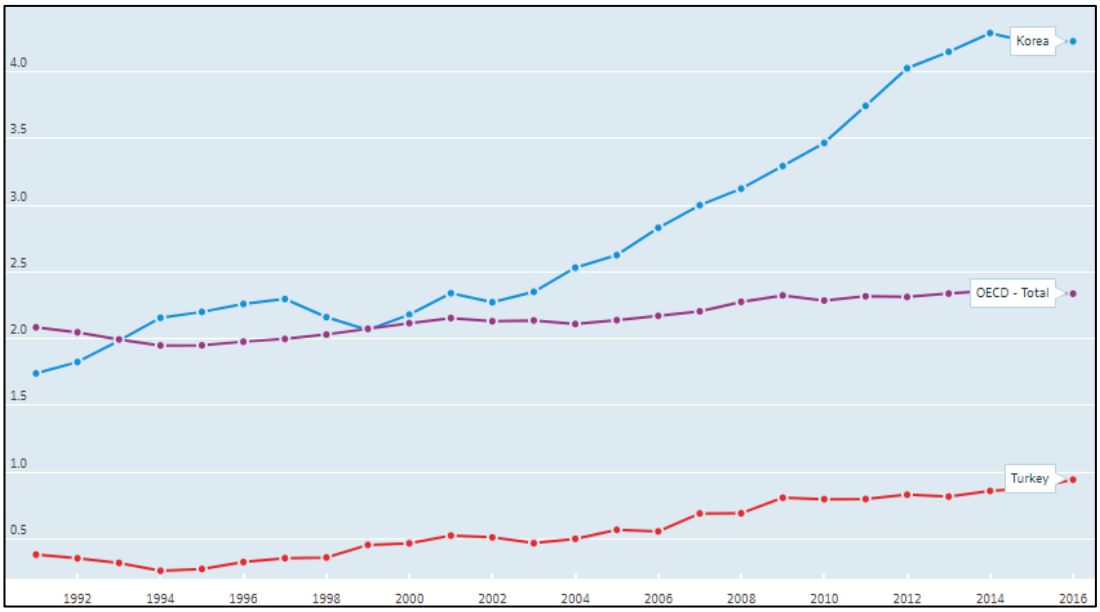


Figure 3. 3 Gross domestic spending on R&D (Turkey, South Korea, OECD)
Source: OECD, Gross domestic spending in R&D (Turkey, South Korea, OECD) https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm, Accessed at : 18.01.2019

3.4. Patent System for Encoring Innovation

It is beneficial to explain Intellectual property rights (IPRs) because the topic has never been more economically significant or questionable than this is today. Patents, copyrights, protection, trademarks, industrial designs, combined circuits, and geographical implications are frequently considered in investigations and discussions on such various topics as trade, industrial policy, knowledge, biotechnology, the Internet, the entertainment and media industries. Subsequently, in the area of the knowledge-based economy, there is no any suspicion that a better perception of Intellectual property rights is essential to policymaking in all sectors of human advancement. However, the experimental proof on the role of intellectual property

protection or patent systems in improving innovation and growth, overall, remains inadequate and indecisive (Garrison, 2006). There are quite conflicting views to argue that on the influences of IPRs on development probabilities. Even so, there is a sufficient compromise to be declared for the informed that patent rights had habitually considered of regarding presenting a monopoly over commercial activity but not extending so far as to catch noncommercial activity.

We cannot imagine that competitive markets environment, in the absence of patent protection regulations. Patent protection has been extensively practiced as one of the most important tools for encouraging and protecting the R&D purpose and reducing technology free riding (spillover) among competitive markets. In this section, examine combine a cooperative R&D right into patent protection regulations for supporting R&D incentives. It is important to point out that patent protection regulations always improve R&D incentives in the appearance of a cooperative R&D right. Moreover, this protection right dominates showing parallel information to increase R&D incentives under patent protection. The patent protection, innovation, and profitability are all closely correlated in all industry. Without patent regulations would be no marketing environment exclusivity, and malevolent competitors would directly enter any market where there was a new good profit, eventually starting price down to the marginal production cost.

Patent implies that the particular use right enabled for technological development, invention. Ultimately, the patent system grants a monopoly advantage for the individual obtaining protection, so not only the expenses invested in the progress of the invention can be returned, but further profit can be received, besides. According to the main point of patent protection is the producer of the individual, innovative product manufactured in the area of literature, science and arts, the author or scientist or creator, to whom the person-related tenancy rights belong. In this context, several people already inquire for protection for their idea, or operational method. As indicated by Mazzoleni and Nelson (1998), patent regulations have the following inherent advantages;

i. It encourages innovative activity

ii. Encourages the implementation and commercialization of innovative activities

iii. Promotes the acknowledgment of innovations and sometimes patents facilitate the systematic progress of comprehensive possibilities

4. AN OVERLOOK TO ECONOMIC HISTORY OF TURKEY

Turkey has the different privilege and popularity as it has been holding to be the first modern secular country trait in a highly predominantly Islamic the Middle East. In purpose of this section is not lay emphasis on the Turkish chronology development in the history, but in order to understand or compare today's the economic circumstances of Turkey, it is good to know some explicit information about the roots. The Ottoman Empire before World War I was in a state of rapid change and sickness. During the medieval era and into the modern era, the history of the Ottoman Empire had been one of the world's highest and noblest supreme powers. During the 17th century, the Ottoman Empire was ruling the widespread area of Eastern Europe, Northern Africa, and the Middle East. Ottoman Empire power reached from the Persian Gulf to Central Europe; Ottoman Sultans controlled almost the whole North Coast of Africa and West to Egypt and the Holy Lands quite a while. The Ottoman armada controlled the seas of the Mediterranean, while their merchants challenged those of Spain, Portugal, and the Italian. The Ottoman Empire was controlled from Constantinople (today called as Istanbul). Until 19th century was one of deterioration, because of the Ottomans strived to the control of empire power, in the face of extreme tension and internal turbulence (Llewellyn et al., 2014).

It is good to point out that the Ottoman Empire was not intended to get out of the circle of religious development, the main destruction point would be to be late the understanding of the power of the nation-state. Westphalian sovereignty agreement is the source of the modern international law that each nation-state has sovereignty across its territory and domestic matters, to the elimination of all external powers or intervention, on the primary principle of non-interference in another country's internal activities, and that every state is equal in international law. The doctrine is defined after the Peace of Westphalia, signed in 1648, which ended the Thirty Years' War. The Peace of Westphalia agreement closed the Thirty Years War, it is considered as a milestone in the development toward humanity and secularization (Egilmez, 2018).

These developments caused significant scientific progress in the eastern world because religion and state matter are parted from each other. Therefore, it caused scientific development swiftly to growth in the region and the rising of inescapable power. In parallel with these developments, the Ottoman Empire was ruling by religionist norms until it is collapsing (Egilmez, 2018).

By the 1850s the circumstances were so depressed that Tsar Nicholas 1 of Russia famously portrayed it as “the sick man of Europe.” it was shortly proved correct itself, while the sickness later became concluding. There were various causes for this deterioration. The Ottomans were faced with rising nationalism and resistance, as ethnic and regional groups demanded self-determination and autonomy. However, it is good to repeat, the empire always being late for scientific and contemporary development. Thus, the miraculous hard power of the Ottoman Empire also diminished significantly in the progress of time. The Ottomans were pushed out of North Africa and Egypt after a series of unsuccessful wars. The arrangement to start the war versus Britain and France seemingly is the ultimate proof of the incompetence of the Ottoman Empire commanders. Very immediately, by the direct intervention and by supporting domestic rebellion the Ottoman Empire was dismantled of its Arab territories. Indeed the Anatolian heartland was in threat of being dropped. The Ottoman Empire allied with Germany and Austria in World War 1. It was an unfortunate decision and one that Ataturk opposed. The forces of Britain, France and Italy divided the Ottoman Empire. The one significant victory of the Ottoman troops were at Gallipoli in 1915 under the direction of Ataturk. It is important to understand the economic changes of Ottoman Empire before World War 1 and what sort of economic capability left to Turkey after its collapsed (Gunduz, 2012).

Table 4. 1 The Ottoman wars after the Treaty of Küçük Kaynarca (1775-1923)

YEAR	WAR
1775-1776	Ottoman-Persian War
1787-1791	Austro-Ottoman War
1787-1792	Russo-Ottoman War
1798-1801	French Campaign in Egypt and Syria
1804-1813	Serbian Uprising I
1806-1812	Russo-Ottoman War
1807-1809	Anglo-Ottoman War
1815-1817	Serbian Uprising II
1821	Wallachian Uprising
1821-1823	Ottoman-Persian War
1821-1830	Greek War of Independence
1827-1829	Russo-Ottoman War
1831-1832	Great Bosnian Uprising
1831-1833	Egyptian-Ottoman War I
1833-1839	Albanian Revolts of 1833-39
1839-1841	Egyptian-Ottoman War II
1848	Wallachian Revolution of 1848
1853-1856	Crimean War
1860	Lebanon Conflict
1861-1862	Montenegrin-Ottoman War
1866-1868	Cretan Revolt
1877-1878	Russo-Ottoman War
1878	Thessaly Uprising
1878	Austro-Hungarian Occupation of Bosnia and Herzegovina
1897	Greco-Ottoman War
1904-1908	Macedonian Struggle
1912	Italo-Ottoman War
1912-1913	Balkan War I
1913	Balkan War II
1914-1918	World War I
1919-1922	Greco-Ottoman War
1919-1923	Turkish War of Independence

Source: Issawi, C. (1980). The Economic History of Turkey, 1800-1914, The University of Chicago Press, Publications of the Center for Middle Eastern Studies, No: 13, Chicago and London, p.4.

4.1. Economic Policy and Structural Revolutions During Ataturk's Era in Turkey (1923 – 1929)

After the World War I, the new Republic of Turkey which is extremely exhausted replaced by Ottoman Empire with an extremely efficient centralized economy movement plan for progress; this arrangement emphasized authoritarian supervision with an economic infrastructure based principally on agriculture plans, where the Europeans almost entirely ruled commerce and manufacturing between the Industry Revolution 1.0. and 2.0.

The Republic of Turkey was established in 1923, after the World War of Independence following the destruction of the Ottoman Empire around the late 1910s. Even though the newly formed republic had something on the historical heritage of a former empire, but its new leader immediately and continuously adapted to contemporary Western practices and doing business methods in the early periods of administrative restoration. It is essential the highlighted that the first fifteen years of the new republican modernization period, driven by the establishing president M. Kemal Ataturk, was identified by extensive social and cultural reforms, main point, the transition to secular policies in the form a religious structure (Egilmez, 2018).

It is good to divide two different parts of this era, the period between 1923 and 1929 is described the "liberal era" while the period between 1929 and 1938 is called the "étatism (state control)."

By the Treaty of Lausanne, Turkey establishment process surrounded both politically and economically. Although the capitulations caused massive negative economic repercussions in the country, a vital part of the capitulations debts from the Ottoman Empire payment guarantee was delivered to the Republic of Turkey (Boratav, 2005).

Recognizing the Turkish borders designated by the Treaty of Lausanne, the capitalizations debts of the Ottoman Empire were divided among Turkey and the other states who lived within the boundaries of the Ottoman Empire. It is mentioned that the liberal economic policy was not appropriately started in the first years of the Republic, because of the consequences of the Treaty of Lausanne in the following years. Therefore, it should be underlined that the international agreements had both direct and future impact in the process of planning the economic strategies of the Republic of Turkey.

In essence of the economic circumstance that the young Republic was faced as follows:

iv. The essential manufacturing industry could not be built in the Ottoman Empire, notwithstanding all efforts.
v. There was an economic struggle in which mass-produced goods were obtained, and raw materials were exported.

vi. There was no equipment to process for the mining. An essential part of the agricultural commodities used in industry was traded abroad, without being prepared.

vii. The foreigners built the industrial plants.

viii. The level of production was standing desperately against consumption.

ix. The human power capacity usage rate was low, and the costs were extraordinary (Takım and Yılmaz, 2010).

4.2. Liberal Economy Policies

In the early years of the Republic of Turkey had to follow by liberal economic policies. It was a model of the Treaty of Lausanne requirements. Turkey's free trade policies in the Treaty of Lausanne were monitoring stipulations. This policy acceptance lasted until 1930. During this period, it caused a significant amount of foreign trade deficit of Turkey as can be seen from the chart that below.

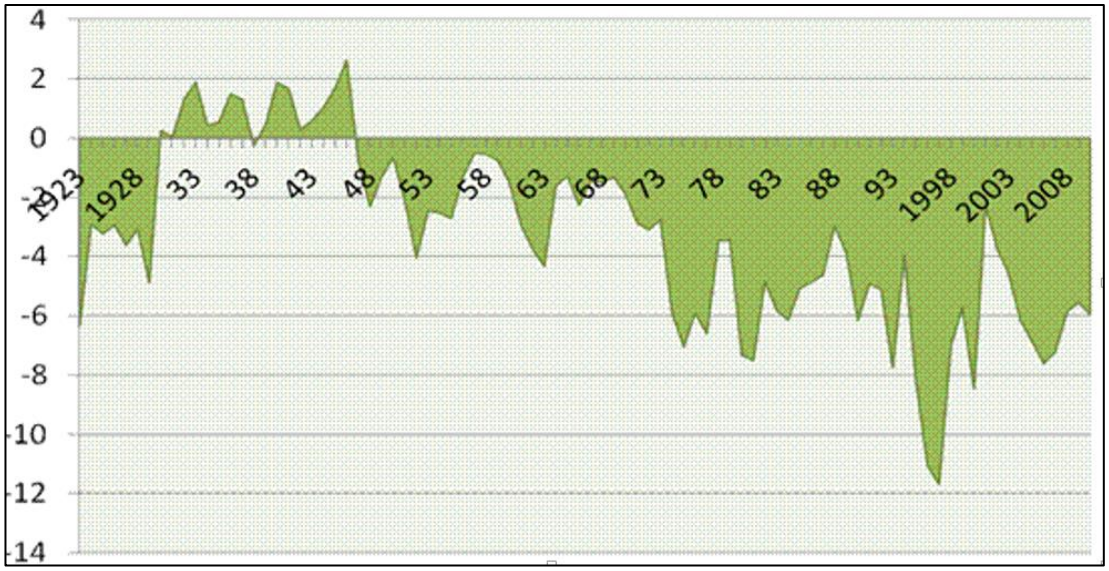


Figure 4. 1 Balance of foreign trade (Turkey, 1923-2010)
Source: http://www.mahfiegilmez.com/2012/05/turkiyede-ekonomi-politika-uygulamalar.html., Accessed at: 12.12.2018.

The new government radically has attempted to create the industrialization policy by private sectors. Despite, in the nation which has a preponderance of the population runs in agriculture the improvements in the manufacturing achievement shaped around agriculture. Therefore, developmental settlements which support farmers has been considered in Izmir Economic Congress (Egilmez, 2018).

Just after the foundation of Turkey, the statement of the new economic policy has been declared in Izmir Economic Congress (1923) which includes representatives of industrialists, merchants, farmers, and workers. In this committee, all financial difficulties of the period have been examined to find structural solutions. The new economic strategy which is entirely harmonious with the national economic policy has been designed in that congress. The new economic approach has been representing more liberal movements than before and contains statements concerning open new markets in line with this plan, some fundamental decisions that have been made in Izmir Economic Congress (Finefrock, 1981).

4.3. The Era of State Control: 1930 - 1949

To fix the poor economic results in the 1920s and effect of the world economic depression, Turkey launched a new assortment of financial strategies in the early 1930s, which assigned immense importance on import-substituting. Turkish government started the new industrial initiatives in the 1930s was quite robust, structural and caused progress and significant changes in the product. Principal investment projects were performed in the structure of the first industrial plan or strategy in between the 1934-38 period. One of a debate is that "the open market caused every problem" of the liberal capitalist economic policies was a significant reason for the crisis. The intention of maintaining arbitration by the state in the economy gained a reputation in the country (Parasiz, 1998). Commonly the etatism holding the years between 1929 and 1938, while the world economy was jumped into the Great Depression and bringing the developing countries into first liberal crisis, Turkey practiced a self-enclosed financial system, persisted out of the crisis circle and determined essential steps in the industries. The new economic model adopted during the 1930s, which were emerged under the description of etatism, by the symbols of the time, an initial answer to the problems of development.

When the First Great World Depression of 1929 popped up, the developing states that were participants to the Lausanne Treaty were not in a position to control the conditions of this treaty, and everyone was in trouble because of the devastation caused by the crisis. The first world depression had threatened the established theory that the capitalist economy was radically self-regulatory and that free market forces would

soon destroy intermittent waves down-swings in economic activities. Turkey abandoned liberal policies and taking advantage of this opportunity made the transition to the statist policies. In this period, the Law on the Protection of the Value of Turkish Currency and hence a robust foreign exchange regime came on to the table. Turkey based on import substitution, the state began a model KIT (GBE-government business enterprises) that contains the application directly for the production. Starting from 1935, a five-year industrial plan was implemented twice. During this period, the closure of Turkey's foreign trade deficit as can be seen from the above chart that over many years to return.

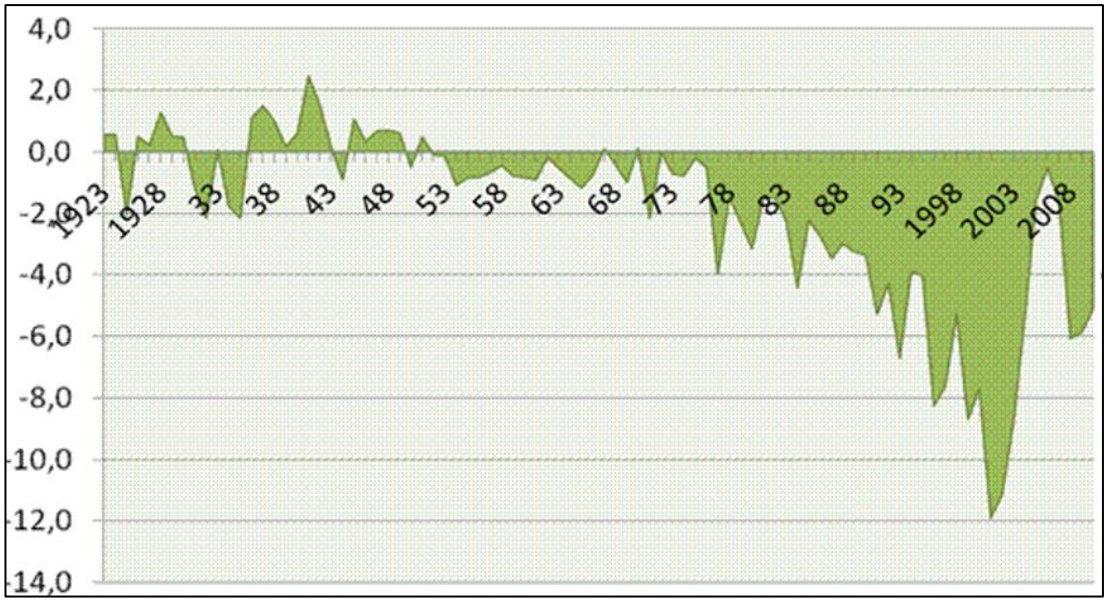


Figure 4. 2 Budget Balance/GDP (Turkey, 1923-2010)
Source: http://www.mahfiegilmez.com/2012/05/turkiyede-ekonomi-politika-uygulamalar.html., Accessed at: 12.12.2018.

For all around these developments, the conventional transition (not change) to etatism was not the entirely smooth thing. From the very beginning which happens in every shift, there were opposite who rejected its significant movement. Indeed, among those who approved them, there was an extensive division of opinions as to its ultimate goal. Foreign attractions were several and various, though not always significantly of critical importance. On the one hand, Ismet Inonu, as Prime Minister who always accepted etatism idea, got in touch with the Soviet Union in 1931, and found a Soviet loan of $8 million, transferred in 1934, performed a significant development, though not the dominant position in the investment of the first industrialization plan (Hale, 1980).

As may see below the numbers indicates, Turkey increased rapidly from the adverse effects of the depression in 1932. Additionally, the following seven years (1933-39) real GDP increased by an average of nearly eight percent per annum, related with 3-2 percent per annum during the directly leading period (1927-32) or 5-8 percent per annum during 1960-78. The 1930s noticed the creating of a structural shift in the Turkish economy, as industry accounted for around 18 percent of GDP in 1939, compared with 16 per in 1932 (Hale, 1980).

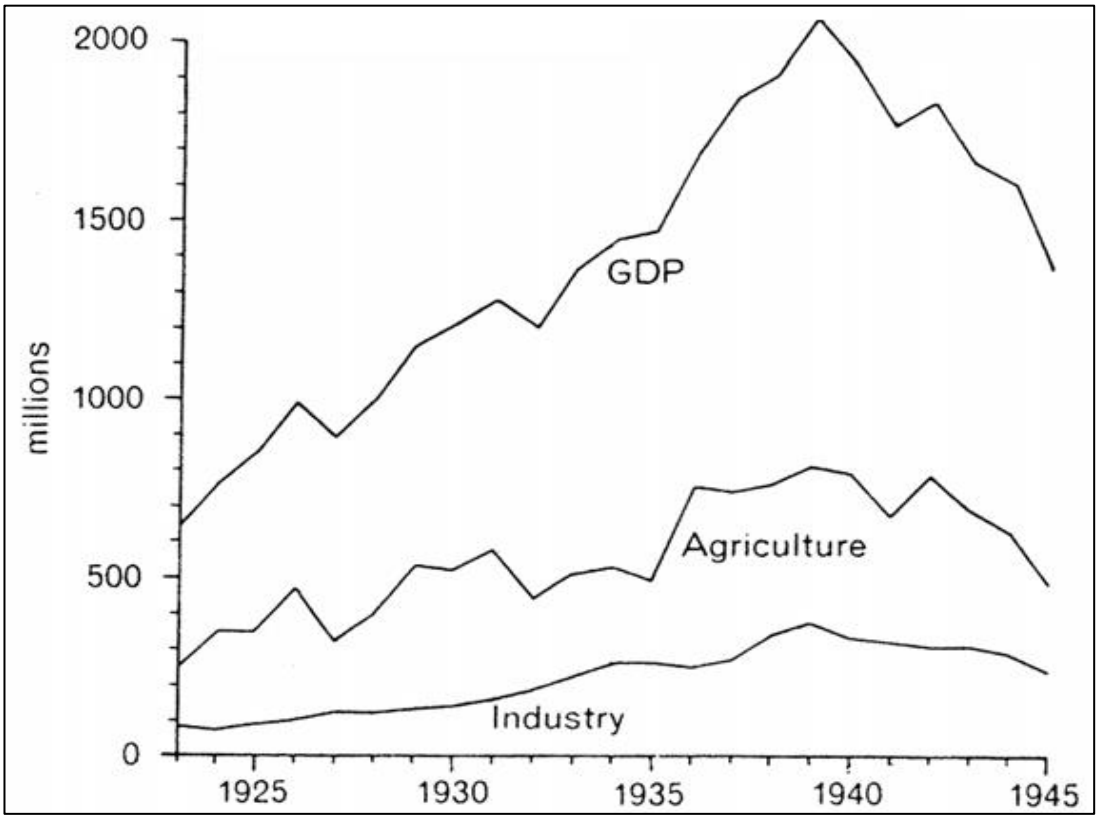


Figure 4. 3 GDP at constant (1938) price (TL, million, 1923-1945)
Source: Bulutay, T., Tezel, Y.S. & Yıldırım, N. (1974). Türkiye milli geliri (1923 [i.e., bin dokuz yüz yirmi üc]-1948). Ankara Üniversitesi, Siyasal Bilgiler Fakültesi

Other critical external developments in the era:

i. The end of World War II
ii. New political order in the world economy
iii. The deterioration of relations with USSR
iv. Marshall Plan
v. Being a member of IMF & World Bank

4.4. The Return Period of the Liberal Economy: 1950 – 1960

The etatism policies remained until the beginning of 1950. The Democratic Party, which got to the political power in 1950, has returned to liberal policies. Petroleum Law, Law on Encouragement of Foreign Capital, was established in this period and the movement of mechanization or industrialization in agriculture was launched. As a result of the bottlenecks re happened in the economy since the mid-1950s, in 1960, the system once again transformed from statist policies. Turkey suffered a trade deficit back in the 1950s. The effect of agricultural industrialization movement and the development strategies were achieved with the political systems in this period (Egilmez, 2018).

Liberal economy plans were again standing on the table in the lead with the multi-party-political era started in the 1950s. Turkey possessed its first international aid in 1948 as named under Marshal Plan and had its first experience with International Monetary Fund (IMF) by 1958 Moratorium. Right after the postwar periods, two influential circumstances formed the national strategy and manufacturing production. Turkey became more elastic with the Marshall Plan support Europe and U.S. mutual aid programs, which were notably emerged on army attention. The requirements of these external economy support plans were needed.

Turkey's post-war improvement practice could be imagined concerning a few major for this period. The 1950s represents the liberal revolution in Turkish economy including an attempt to change the etatism and protectionist strategies of the inter-war period. The importance, especially in the early part of the decade, was on getting involved with the post-war global economy restored supporting by U.S. leadership(hegemony), as a producer and exporter of just agricultural products. The second point, under successive five-year plans, emerged for the 1960s and 1970s, symbolizes a transition to national interests. Within the context of context of increasing domestic anxiety, Turkish political structure reshaped to a multiparty governmental structure ultimately ended the period of Republican People's Party and a victory for the newly established Democratic Party (DP) in the May 1950 elections (Celâsun and Rodrik, 1989).

The national bank financing models of public business deficits and agricultural maintenance investments caused high inflation in the economy, which finally drove to the involuntary preface of an IMF created stabilization principles and devaluation plans in mid-1958. This application was born by packages of foreign economic guidance and debt "solidification" under heavy multilateral conditions. In the same parallel, the DP governments evolved to oppressive attitude for the economic problems and lifting political disagreement by the elite people. The end outcome was a disastrous one for the prime party administrators and caused in the form of a comprehensive military coup d'etat in May 1960. Military command was temporary and ended promptly after the choice of a politically liberal constitution in 1961, which also contributed "checks and balances" in the governmental administration (Egilmez, 2018).

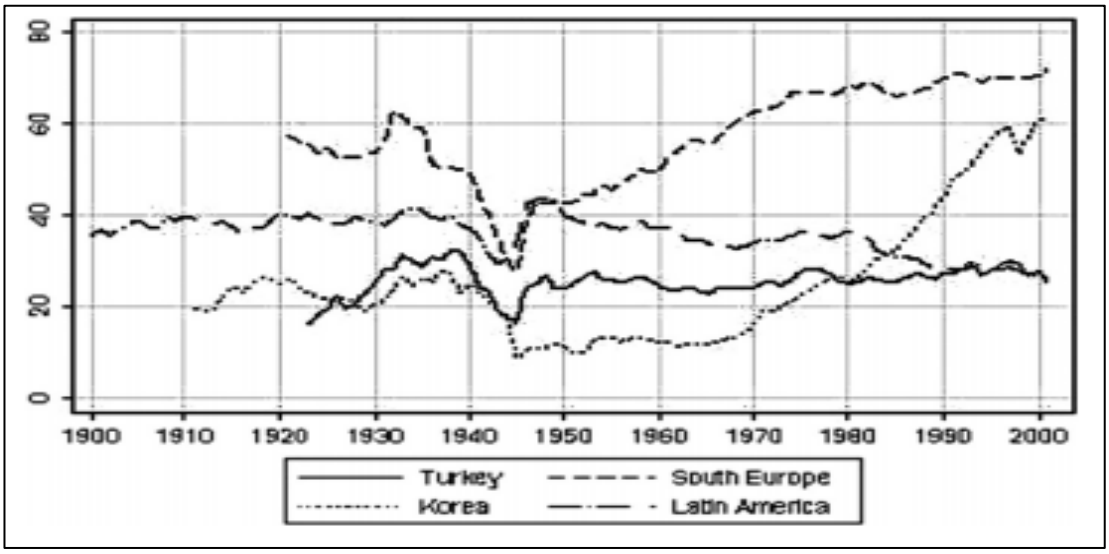


Figure 4. 4 GDP per capita relative to Western Europe and the USA
Source: Altug, S., Filiztekin, A., & Pamuk, Ş. (2008). Sources of long-term economic growth for Turkey, 1880–2005. European Review of Economic History, 12(3), 393-430.

On the figure above provides us straightforward information for development, while per capita GDP reaching pick point for Turkey, South Europa and USA beginning of the 1950s, The Republic of Korea was at the deep position. Until the second half of 1930 to the first half of 1950 gave Turkey a budget surplus. From the second half of the 1950s to the present, it has been continually giving budget deficits.

4.5. Fragile Democracy and the Mixed Economy System: 1961 – 1979

After the 1960 coup, Turkey's predominantly statist policies, including the planned economy model of the past, has followed a policy accompanied by import substitution and foreign exchange control. From time to time, price controls were accompanied by the directing of production, mainly by the agricultural sector, through SEEs. These policy implementations continued to decline until the 1980s. One of the essential features of the period was the increase in foreign trade deficits even though the public sector-oriented economic policy was followed, import substitution and fixed exchange rate regime.

The 1961 constitution came up for re-building institutions, such as a Senate (upper house), a constitutional court and an economy planning group to achieve and extend the regulations and strengthening the ability of the operations and develop "checks and balances." The country expected that the coercive structure would stop any antidemocratic economic approach within the responsible limits of economic policymaking (Eğilmez, 2015).

Between the 1961-79 was a critical time of industrialization and economic development for Turkey. In this direction, the import-substituting industrialization plan that was selected in the beginning 1960s was not a decision but a mandatory. The import-substituting industrialization strategy, which initially operated by the lines its name implied, slowly converted into an irregular assurance system that supported the monopoly system. In addition to this, the inward-looking development policies pointed out that depressed the firms to explore for export businesses.

Turkey again more saw itself in the scales of payments troubles that spread a crisis level towards the end of the 1970s. The cornerstone of growth policies, a distinct characteristic of the 1961 regulations was the necessity of symmetrical globalization preparation for next five-year strategies and long-term plans, the arrangement of which was committed to organized State Planning Organization (SPO). In this parallel, the preparation strategies maintained the merged operation of ministry expenses, "stable" macroeconomic prognostications, business consistency studies, and revised techniques of plan selection. New guidelines for the public sector, the plans focused on the private sector, based on specific incentives (Celasun and Rodrik, 1989).

The most popular improvement in this period was the happened in remittances from Turkish workers (blue workers) abroad, mostly to Germany, whose emigration had stimulated in the late 1960s. Under these conditions unusual thing increased in foreign exchange assets, an aggressive third strategy (1973-77) was affiliated with far-reaching reforms of import-substituting in capital-intensive commodity markets.

Following the extended preservation strategy of a frequently exceeded set exchange rate management, the efforts on the external equilibrium increased in 1969. In order to stop the issue of a payments pressure, the government of Suleyman Demirel was urged to enter an "IMF" established stabilization plans in August 1970, including a "maxi-devaluation." The liberalization purposes of this memoranda were mostly abandoned after the incomplete interruption of the military action in March 1971. The main reason for ringing IMF's door was that Turkey wanted to adjust outstanding debt troubles but lacked cash flows credits to was causing worsening position in the balance of payments. With inadequate national system support and out-of-hand monetary augmentation, the real sector set to import squeezing through an inflationary gap of manufacturing recession (Celasun and Rodrik, 1989).

The afore-mentioned case which is held from 1973 to 1977, the political atmosphere was polarized, and this drove into ineffectual macroeconomic decisions. Indeed, there is a stable relationship between political and macro volatility. Since mid-1977, the political atmosphere matured in extremely unpredictable structure, more numerous switches of consecutive weak coalition governments. Therefore, these coalition cabinets were “associated with instability and lacked credibility and commitment to undertake serious fiscal adjustment” as shown below. In the same parallel, the 1974 Cyprus crisis happened, and the United States forced an embargo that resulted to more economic difficulties and anxieties across the field of the economy, prominently, beginning of 1977, at the government account deficit of the scale of payments touched 3.9% of GDP. Therefore, during the 1977 - 1980 years the Turkish economy stagnated, inflation highly rose, and balance of payments problems escalated. At the same parallel, the political anxiety raised with political struggle spanning over a terrifying level. In an attempt to face with the economic difficulties, structural adjustments plans emerged support with the International Monetary Fund (IMF) suggestions in 1978 and 1979.

Table 4. 2 Macroeconomic data of Turkey Between 1953-1978

	Actual				Predicted[b]			
	1953	1963	1973	1978	1953	1963	1973	1978
A. Accumulation (% of GDP)								
1. Investment								
a. Savings	11.5	12.0	14.8	17.8	16.3	18.0	19.6	20.5
b. Gross investment	14.8	15.6	18.3	21.6	18.0	19.6	21.0	21.8
c. Capital inflow[c]	3.3	3.6	3.5	3.8	2.8	1.6	1.4	1.3
2. Government Revenue								
a. Government[d]	16.0	16.6	21.1	24.4	15.6	16.8	18.7	19.7
b. Tax[d]	12.6	13.9	18.5	20.2	15.0	15.8	17.8	18.6
B. Allocation (% of GDP)								
1. Domestic demand								
a. Gross investment	14.8	15.6	18.3	21.6	18.0	19.6	21.0	21.8
b. Public consumption	11.0	11.5	14.1	12.7	12.2	13.6	13.7	13.8
c. Private consumption	77.6	76.6	71.2	69.4	71.5	70.1	68.9	68.2
d. Food consumption	41.4	38.9	28.9	27.4	33.9	30.4	26.7	25.1
2. Production (value added at factor cost)								
a. Primary	45.9	40.1	29.7	26.9	34.4	30.2	24.5	22.0
b. Industry[e]	12.8	19.2	22.9	25.0	22.6	23.5	26.8	28.4
c. Utilities	5.7	8.8	10.7	11.0	6.2	7.1	7.5	7.8
d. Services	35.6	31.8	25.7	37.1	36.2	38.8	40.5	41.2
3. Trade								
a. Imports	11.3	9.6	11.4	9.9	17.0	16.2	15.6	15.3
b. Exports	8.0	6.0	7.9	6.1	17.3	15.2	14.8	14.6
c. Primary exports	7.4	4.0	4.1	3.3	10.8	9.7	8.3	7.6
d. Manufacturing exports	0.6	1.0	1.8	1.2	4.4	4.8	6.0	6.6
e. Service exports	—	1.0	2.0	1.6				
C. Labor allocation								
1. % Share of:								
a. Primary labor	79.2	77.6	64.8	60.9	56.9	53.8	47.2	44.9
b. Industry labor	7.4	10.1	13.6	15.3	15.8	17.9	21.7	22.9
c. Utilities & service labor	13.4	12.3	21.6	23.8	17.4	28.2	30.8	31.9

Source: Celasun, M. (1983). Sources of industrial growth and structural change: The case of Turkey. World Bank.

Table 4. 3 Turkey's financial system between 1970-1980

	1970	1975	1980
A. Total assets of financial institutions (% of GNP)	76.7	80.1	66.6
B. Distribution of assets			
1. Monetary system (Central bank and deposit banks)	68.4	73.3	84.7
2. Investment banks	12.4	11.5	6.3
3. Social insurance institutions	14.4	11.8	6.4
4. Other institutions	4.8	3.4	2.6
Total	100.0	100.0	100.0
C. Net issues of domestic nonfinancial (real sectors)			
1. Total (% of GNP)	59.7	57.8	47.8
2. By sector (%)			
a. Public sector	48.2	42.9	55.1
Administration	27.3	23.6	31.8
Enterprises	20.9	19.3	23.3
b. Private firms	37.3	47.6	37.3
c. Households and others[a]	14.5	9.5	7.6
Total	100.0	100.0	100.0
3. By type (%)			
a. Equities	8.9	11.2	6.9
b. Debt issue			
Bonds	11.3	8.6	8.6
Nonbonds[b]	79.8	80.2	86.6
Total	100.0	100.0	100.0
4. Held by (%)			
a. Financial system	87.1	83.9	85.8
b. Monetary system	57.0	59.7	71.1

Source: Akyüz, Y., & Ersel, H. (1984). Turk Ekonomisinde Mali Yapi ve ilişkiler-istatistik Ekler. Financial Structure and Financial Relations in the Turkish Economy-Statistical Appendix), Industrial Development Bank of Turkey, TSKB, Istanbul.

For the history of the Turkish economy, from the 1970s were the best of times and the worst of times until 1980, it represents entirely up and down. The decade testified a great explosion of financing and development until approximately 1977, followed by everything seemed like a constant growth in revenue distribution. That was supplanted by a political accident which was unexpected. As of mid-1977, Turkey located in a deep budget debt crisis which led many years of difficult consultations with creditors, bankers and rescheduling agreements with international organizations to resolve (Eğilmez, 2015).

4.6. Free Market Economic Policies After the 1980s

Turkey once again was located at the heart of the balance of payments crisis; the situation was forced to take the decisions of January 24 in 1980 and reshaped to the economy after a severe devaluation. The period of return to liberal policies started with a new administration which is controlled by Turgut Ozal. Turkey eased the exchange control in this period, the intervention of the fixed exchange rate regime shifted to a floating exchange rate regime was abandoned price controls on the market, it began to reduce losses of KIT (government business enterprises) task. When the increasing public expenditures were-not covering with tax revenues, public borrowing was rapidly increasing since the-mid-1980s, borrowing became almost the primary means of financing. The rapid increase in budget deficits has become a vicious cycle machine that increases Inflation, increased inflation, and increases public borrowing. The 1990s are perhaps the most problematic years of Turkish public finance. Entering a deep economic crisis in 1994, Turkey has managed to emerge from the crisis with the IMF once again support the economy, but the cost of this crisis was hefty. In the light of a mix of economic liberalization strategies at the beginning of 1980 and after that, the economy started with a different arrangement way with absolute confidence upon export enlargement and market capabilities. The military intervention decided to leave the management of the economy to technical experts and invited Turgut Ozal, the architect of the "January 24 Program" to assume the responsibility of its implementation as deputy prime minister. Turkey acquired many amounts of additional lending and debt assistance in between 1980-84. The new management model was about the manufacture of an export-based recovery and to be creditworthiness in the international market by 1982-83, however, less developed countries were facing a deep crisis stage in their development process in the same parallel — Turkey's 1980 agenda pointed to combining Turkish economy market into the global market by changing to a global growth strategy. In this structure, Turkey followed the renamed "classical approach" and the principal changed its foreign trade, supported by financial markets.

Nevertheless, the economy reformation works proceeded until 1991, with the ambitious efforts of the financial models, prominently on the side of the Central Bank of Turkey (Ersel, 2013). The government's economic plans which were created in between 1991 and 1999 disappointed to reboot the reform in the economy — the inadequacy of government economic policies converted to the crisis which was created by the severe management errors of the ruling government.

The crisis decreased the economic power and influenced a sizable reduction in support of the government's economic policies. Political parties that established coalition administrations during the 1990s endeavored to improve the influence of the public sector. Unfortunately, problems were extending from incompetence economy policies to corruption until 2001. In fact, throughout the years mentioned above governments were utterly weak in order to find solutions to the enormous public-sector debts that risked the confidence of the economy. An unfavorable outcome of the liberalization movement of the financial operation was the rise in public sector debts by easing the public sector borrowing limitations. It was ultimately driven Turkey to a higher crisis in 2000, due to excessive progress in public sector financing conditions and public-sector debt capital. The economic pressure that pushed the coalition government to get a new rescue package from the IMF in early 2000, and in 2001 Turkey had to start a different, and more fundamental, structural adjustment program. It caused the three coalition parties that formed the government were expired in 2002 (Eğilmez, 2018).

4.7. Justice and Development Party (JDP) Period

Turkish s economy after the 2001 crisis has started a new era of economic and political life. Several academics and politicians examined the general structure of Turkey's economy in 2002 and after the performance, including the crisis and its consequence, a very successful reflects especially by experienced during the 2002-2007 high growth rate, not experiencing a financial collapse during the world crisis and some major macro- improvements in economic indicators verify this observation. While similar developments were taking place in different regions of the world and different income groups in the same period, the 2001 financial disaster was a depressing situation in Turkey's recent economic history, driving into essential and permanent reforms in the way of almost all economic instruments. A substantial analysis of the essence of these

reforms made way on the political and financial developments at the mid of 2001. Since the Justice and Development Party won the general elections on November 3, 2002, it would be correct to take the end of 2002 as the beginning of the everything in which it started to manage the economy. JDP's election victory throughout its tenure was remarkable. The JDP, which came to power at the end of 2002 when the economy began to recover itself from the bottom of the 2001 crisis. The new government quickly reversed the adverse base effect created by the economic crisis in the first years, with the acceleration and financial support which provided by the IMF program, and two crucial structural reform moves after the crisis; banking sector regulation and the public sector achieved a successful economic performance in the first 6 to 7 years as a result of the steps taken to ensure fiscal discipline (Eğilmez, 2018).

Similarly, the World Bank (2006) has betokened, Turkey's economic achievement after the 2000/2001 economic crisis has been 'solid,' and the administration has been correlated with general structure amelioration (Turkey Overview, 2018). The JDP administration has been selected to government towards the end of 2002, has provided to this achievement by supporting the IMF-sponsored stabilization plans and by suggesting a variety of improvements obliged under the EU's Copenhagen standards. Accordingly, the JDP should be trusted for lending trustworthiness to the stabilization plans, securing democratization improvements to the EU view, and within willing to Turkey's economic achievement regarding growth and stability. As an example, the ratio of the public debt which increased with the impact of the 2001 crisis caused the production diminishing in the country because of the economic reforms made by IMF after 2002. The public debt policy, which reached 74 percent of the domestic product in 2002, decreased gradually and decreased to below 40 percent after 2010 (Ugur, 2008).

The main argument in this period JDP's management suddenly devised a stabilization program which was sustained by the IMF, as applied after a few times after liberalization movements in Turkey.

Table 4. 4 Arrangements with the IMF (1948-2005)

	Date	Cancellation	Number of Months	Amount (SDR Millions)	Disbursed (SDR Millions)	Disbursement rate (%)	Arrangement type
	1948		12	5	5	100	Gold tranche
	1953		12	10	10	100	Gold tranche
	1954		12	20	20	100	Gold tranche
	1957		12	13.5	13.5	100	Gold tranche
	1958		12	25	25	100	Gold tranche
1	1961		12	37.5	16	42.6	Stand-By
2	1962		9	31	15	48.4	Stand-By
3	1963		11	21.5	21.5	100	Stand-By
4	1964		11	21.5	19	88.4	Stand-By
5	1965		12	21.5	0	0	Stand-By
6	1966		12	21.5	21.5	100	Stand-By
7	1967		11	27	27	100	Stand-By
8	1968		9	27	27	100	Stand-By
9	1969		12	27	10	37	Stand-By
10	1970		12	90	90	100	Stand-By
11	1978	1979	24	300	90	3	Stand-By
12	1979	1980	12	250	230	92	Stand-By
13	1980		36	1,250	1,250	100	Stand-By
14	1983		12	225	56.3	25	Stand-By
15	1984	1984	12	225	169	75	Stand-By
16	1994	1996	14	610	460	75	Stand-By
17	1999		36	1,5038	11,738	78	Stand-By and SRF
18	2002		36	12,821	11,914	92.9	Stand-By
19	2005		36	6,662	Continuing		Stand-By

Source: IMF Annual Reports (2000-2004); Eğilmez, 2005. Ekzen, N. (1980). Stabilizasyon Paketinin 1958, 1970 ve 1978-1979 Paketleri ile Karşılaştırmalı Analizi. Yurt Yayınevi, Ankara.

In order to achieve the IMF's economy program, the JDP's management announced many neoliberal legislation and regulations on an extensive field of problems, especially "Central Bank" autonomy, independence, solid banking reforms, wide privatization movements, and agricultural support, in shorter than a year (Arpac and Bird, 2009). Including the IMF major economy improvement program, Turkey was also forced to keep its primary surplus at 6.5 % level. Also, Central Bank started to achieve an “inflation targeting” financial plans. As a result, from the end of 2001, Turkey management model reconstructed its economy administration from doing a quasi-liberal one to a thoroughly neoliberal one. During the 17 years between 1986 and 2002, a total of $ 8 billion was privatized, while this figure was 30.6 billion dollars for seven years from the end of 2002 until the end of 2009 when the JDP took over the power. Among the critical privatizations made during the JDP government were the 70 percent stake in Turk Telekom ($ 8.5 billion), the 65.76 percent stake in Tüpraş ($ 4.5 billion), the 46.12 percent stake in Erdemir ($ 2.8 billion) and the 86 percent in

Petkim. (2.3 billion dollars) Also, TEKEL's six cigarette factories ($ 1.7 billion), thus privatization revenue in 2010 was $ 2.5 billion. Foreign exchange inflows through full privatizations in recent years (as well as international dynamics) played an essential role in the appreciation of TL against the dollar.

Table 4. 5 Inflation and real interest rates: Turkey (2002-2007)

	2002	2003	2004	2005	2006	2007
Inflation Target (%)	35	20	12	8	5	4
Inflation Turn-out (%)	29.7	18.4	9.3	7.7	9.6	8.4
Expected Inflation (% at start of year)	48.3	24.9	13.1	8.4	6.5	6.8
Real interest rates (%)	30.5	33.9	15.3	6.0	11.6	7.0

Source: http://www.tcmb.gov.tr; http://www.treasury.gov.tr/stat/e-gostergeeng.htm, Accessed at: 20.10.2018.

One of the most critical economic achievements of the JDP government is the fact that it has degraded inflation from high double-digit to single-digit rates. The Central Bank, on the other hand, cannot achieve its 5% inflation target with the government for years. Although the target source seems to be the target of the Central Bank, the failure to reach this rate because the government's high economic growth rates aim, it belongs to the JDP government as well as the Central Bank (Eğilmez, 2018).

Emphasizes how the Turkish economy experienced high economic growth rates period between 2008-2009 global economic and financial crisis. High growth rate aims during the post-2001 years were frequently associated with the improved economic and political confidence given by the government. The JDP had a significant effect linked with single digit inflation for the first time for some periods (Zafir, 2012).

The JDP period created different meaning in phrases of the economic and political while using the construction sector in Turkish history. The construction sector became locomotives sector for economic growth, and it has contributed profits to various assemblies among the Turkish population, and the main point is that sector shifted an essential component of the JDP's neoliberal populist policy. Significant construction projects were an active part for delivering the message of efficient, robust, diligent

government, so construction “urban transformation,” works were indispensable for the JDP’s authority. Furthermore, because of the significant construction transition in the national marketplace, loans and investments in the construction area have promoted the increase and employment in the national economy outcome. All these details have been using weapons to increase the government’s influence and power (Özdemir, 2015).

Throughout 2003-2007, Turkey overgrew unrestrainedly. Any of the statisticians pointed this progress as a dominant pattern of neoliberal transmutation, even though there was no correction in unemployment percentages which got penetrated at approximately 10%. Global economic crises in 2007 – 2008 have caused a noticeable deterioration in Turkish economics since 2009. Nevertheless, in 2010 Turkey recovered to high growth, although growth was stagnant since (Özdemir, 2015).

In order to explain the new meaning of economic growth caused discussions in the county, there has been an extensive deliberation on Turkish economic difficulties. (Zafir, 2012)claims that the created account deficit holds a positive impression on the economic development but negatively on the inflation until control it. Opposite, Karabulut (2013) assumed it is wrong to approach to understand that created economic deficit is causing a big dilemma in Turkish economy because he states if state finance it, would not be an obstacle point which the JDP did. On the other hand, Ahmet Atıl Aşıcı (2015) indicates significant of two judgments of Turkey’s economic difficulties before than JDP's account deficit difficulty; the permanent structural weakness and an uncontrollable decline in financial inflows (Aşıcı, 2015).

However, it is essential to understand the primary source of the current account deficit is energy dependency and energy imports extremely critical for budget deficit; Turkey is 90% dependent on oil and natural gas in the outside. In 2003, the share of energy imports in the current account deficit was 40%, in 2011 it was 71.9%, and in 2012 it was 123%.

This part of the chapter highlighting Turkish expenditure models is proving raised investment on imported goods. Since 2002, revenues have grown, and Turkey’s

currency has recovered, appearing in an inflated market on foreign-made consumer goods, such as extravagance cars, new consumer electronics(phones) and global clothing brands. Statistics of the Turkish Statistical Institute on the rate of imported products explains that after 2002 the import of capital goods has lifted by 23 percent, the import of intermediate goods by 26 percent and the importation of consumer goods by 29 percent. If Turkey will not able to produce value-added export products, the massive increase in foreign-made consumer products shows a more consumerist society (Yalçınkaya, 2009).

Since the 1950s and late 2000s, the Turkish economy world has faced back-to-back monetary and economic crises. Intense and long recessions developed one another, and finally, the crisis of 2001 was the weak point of the Turkish economy. After the 2001 economic crisis, Turkey's economy proceeded in full-speed forward, except for a slight dislocation in 2009 due to the global financial crisis. Throughout the period 2002-2014, while the economy increased near 4.9% per year on average, the real growth came up from construction sector projects had been 6.5% per annum. Throughout this period of accelerated economic development, construction works progressed at a faster level than the whole economy, but within the days of stagnation, the construction industry was the first to suffer as it was a sustainable business. Demand for construction sector still seems to be quite high. It was quite reasonable, while the perception of becoming a homeowner was rising in the global conjuncture, liquidity was abundant and fluid. Then suddenly caused the global crisis exploded in 2008. There were several reasons for the crisis. However, one of the most important reasons was the housing bubble in developed economies. Thus, a significant amount of FDI money did not come to Turkey. The first effect of this was the loss of TL. This problem cannot be developed for the manufacturing industry in Turkey as higher imports of capital goods, imported goods, and hence the cost of increasing inflation. An increase in interest rates followed this. Banks no longer provide as easy and inexpensive credit as before (Eğilmez, 2018).

However, the demand for housing idea still resembles to be quite high. Don't let this surprise anyone. Because the government is drawn attention to the construction sector, and people believe that there is no area to invest outside of construction. It is not possible that this will last forever, and it did not happen anywhere. Just like the Far

East, which had followed the same policy in 1997 and entered a crisis in 1997, the US, Spain, and the United Kingdom have recently fallen into crisis. As a metaphor, the head of the locomotive cannot pull the train when it comes to the slope, and the train starts to pull back the locomotive as well. Pretentious government's infrastructure projects have been played a vital role in Turkey's construction works and economic growth rate as well (Eğilmez, 2015).

i. A third airport in Istanbul that is expected to be one of the world's largest when it opens in 2019. Costing an estimated $29 billion, this is currently Turkey's most expensive mega project
ii. A 26-mile shipping canal to link the Marmara and the Black Sea, which is expected to cost $15 billion
iii. A 24-tower public-private real estate development that will contain approximately 5,000 luxury apartments, at the cost of $8.4 billion
iv. A $5 billion rail tunnel that will run under the Bosporus
v. A third bridge across the Bosporus that will cost $4.4 billion
vi. A $2.6 billion financial center complex for the central bank, financial regulators, and private financial firms
vii. A $2.5 billion luxury high-rise that includes a hotel, a new mall, office space, and a spacious performing arts center
viii. A large new tunnel under the Bosporus that will cost $1.4 billion
ix. A $1.35 billion development with two marinas, two five-star hotels, a massive mall, and a 1,000-capacity mosque
x. A $700 million ship port, along with luxury hotels and offices
xi. A $180 million luxury hotel and office skyscraper called the Diamond of Istanbul that will replace the Istanbul Sapphire as Turkey's tallest building when completed
xii. Turkey had only 46 malls in 2000, but now has over 300, and there are plans to build at least 300 more in the next decade. 1.5 million square meters of shopping space is expected to come online in 2014, representing an 18 percent increase in Turkey's total shopping mall space.
xiii. As with malls, there has been an explosion of new hotels built in Turkey in the past decade, and many more are in the pipeline. In the next three years,

65 new four and five-star hotels with a total number of 38,853 beds are expected to be completed (Colombo, 2014).

Credit-oriented construction and foreign made product consumption have been Turkey's two main locomotives of unsustainable economic growth near the past decade, and the inevitable conclusion of these unsustainable balloons will depart from the country without a viable source of growth. To sum up, briefly, the percentage of the construction industry in the Turkish economy is the one and only indicator for economic growth rate. In addition, the construction sector has been brittle and highly unpredictable due to sectoral volatility in the past decades. The most important result of this study is that the construction-oriented growth model had short-lived impacts on economic development and thus could not offer sustainable solutions for the economic difficulties in Turkey.

5. AN OVERLOOK TO ECONOMIC HISTORY OF SOUTH KOREA

Last 60 years, and notwithstanding the results of colonial control and destructive war, the Republic of Korea has changed itself from an impoverished agricultural life to a very competitive and modern industrial authority with low of debt. This paradigm transition toward a major producing nation has drawn widespread attention from all around the world. Moreover, South Korea had a relatively small geographical dimension, natural resources, and population power even an aging population. These facts did not increase the threat that South Korea's economy might fall behind in its competitive market as they had a well-understood target by every segment of society. The examining of South Korea's history may answer the question of why Korea has achieved while developing countries attempting similar objectives have remained in less successful in their financial statement.

East Asian countries (South Korea, Hong Kong, Singapore, Indonesia, Malaysia, Taiwan, and Thailand), which are also referred to as Asian tigers, showed a structural transformation from agriculture-based development to manufacturing-oriented development in the 1970s. It can be said that there are three main factors behind this transformation. These are entrepreneurship, innovation, and learning. In addition to these, the success of the high level of savings behind of Asian tiger' countries is owed to physical capital and infrastructure investments, as the governments have a significant controller in the market. Another factor behind success is the movement of the workforce from low-productivity sectors to highly productive sectors. Asian tigers have been able to achieve this orientation with their 1990s. The increase in the human capital after this success has a large share in the emergence of new products and the use of new technologies (Nelson and Pack, 1999).

South Korea is one of the Asian tigers, like other Asian countries that have successfully entered the export markets and provided economic growth and increased the living standards of their population. The development success of Asia's tiger' countries, and especially of South Korea, where the advantages of being actively involved in the

global economy can be seen, was remarkable. The most effective factor underlying South Korea's success is the importance given to the real economy with educational support. However, the main reason behind this success is the fact that the sectors supported in each period are different and they understand the importance of making production according to the conditions of the day (Report, 1993).

The Republic of Korea has been encountering agile, and most importantly, "sustained" economic and welfare development since the 1960s. The consequences of this development appeared in its real GDP per capita rising swiftly allowed the one low-income nation to enter the levels of high income industrialized nations cluster in a short period for the annals. In order to explain phenomenal economic growth, this section analyzes the way and history of developments in The Republic of Korea. The main argument establishes on the several periods, concentrating on the developments in GDP and the structural reforms that reconstructed the economy, especially right after the Korean War. These are examined with regards to agglomerate and sectoral augmentation and changes, the advance of investment and technological-intensive activities, the enlargement of the range of business operations, and shifts in the size and design of foreign business. The section including evaluates the fundamental or structural reforms in many economic areas, such as management, manufacturing, service sectors, agriculture, mining, and others. It accompanies with an analysis of the structural shifts in industrial formation and organization, their attention to economic development (Chung, 2007).

Korea has an ancient and deep-rooted history, and its history has undeniable importance in its formation. The Japanese occupation of Korea 1910-1945, there was a worldwide rush for colonists acts among the essential hegemonic powers because every empire and nations attempted to generate fields of authority for their economy and continued colonial objectives. Korea was found itself in the battle between China, Russia, and Japan as all endeavored to get it as a colony. Other hegemonic powers, like Britain, France, and the United States also were positioned in this race. Japan already settled its authority over Korea when it got the upper hand in the Russo - Japanese War (1905). Western hegemonic powers, like the United States and Britain, did a tiny thing to prevent with Japan’s attempts to settle its fields of authority in Korea. The Koreans, nevertheless, countered attempts to protect their independence.

Therefore, The Republic of Korea was predominantly an agricultural nation, but it did minimal attempt some industrialization throughout the Japanese colonial control, from 1910 to 1945, frequently in the northern territories (Miller, 2015).

The origin point was not favorable: agricultural and industrial production were entirely under pre-war levels and much of the material plant and facilities hardly operating. Inflation rate reached triple numbers. The levels of the unemployed were increased by the return of a considerable number of refugees from other parts of the Japanese empire. Levels of human capital and per capita income were higher in the North, which predominated in industry, mining, and power generation, as compared to the South which is mainly agricultural. Meanwhile, Korea gained its liberation from the Japanese colony following World War II, and it became additionally recognize to its ample business potential. The South Korean economy circumstance in 1945 was in a hodge-podge structure, a condition hardly obstructer for the developments as a newly independent nation. There were many barriers right in front of the economic development related to those that various underdeveloped countries suffered. The primary was the destruction of Japanese economics; thus, the Korean economy had been deeply affected. The destruction meant not merely damage of essential small part, capital, human power, and other requirements but the main point was a loss of markets.

Furthermore, when the Japanese left the Koreans after World War II were worsened factories, facilities, and other property assets that had been dismantled and used in the last stage of the Japanese conflict opposite the Allies. In manufacturing and construction, the number of operating asset list in South Korea dropped from 10,000 in 1943 to 4,500 in 1947–48. Moreover, what is worse, the Japanese colony power abandoned the people of South Korea with an improper financial structure and "uneducated" Koreans who needed the necessary knowledge in operating a confident economy. South Korea was wholly cut off from North Korea’s coal, electrical, fertilizer, and heavy industries. In 1940, the area that became North Korea produced about 54 percent of Korea’s industrial output and had 86 percent of the heavy industries. The consequences of war destruction extended as a malignant melanoma to all sectors (Chung, 2007). About 40 percent of it was in residence. More than 600,000 service units, or more of the estimated, were destroyed or undergone significant damages (Hong, 1962). Also damaged during the war were 46.9 percent of the

railroads' system, 1,656 trails (a total of 500 kilometers), and 1,453 bridges as indicated by Ministry of Transportation 1954. The destruction of power plants was even more disastrous, with approximately 80 percent damaged. Within two months of the beginning of the war, energy production nosedived to 11,000 kilowatt-hours in the entire country, such trouble. However, the study of Korean history in this study will be irrelevant, but it is essential to understand the economic dynamics of Korea, and where it comes from today's economic power. In general, Korea's purposes for industrialization during the last 50 years can be compiled chronologically as follows.

5.1. Early Development of Science and Technology 1950 – 1960

The war destruction spread to all areas. After the war, the begging point of evolution was, the trade balance was the primary matter of every policy in the beginning stage of industrialization, which was redefined by import-substitution and export increase orders. Second, the government supported planned private industry in the massive and chemical business by designating a significant percentage of resources to them. Third industrial policies encouraging some strategic areas like electronics, automobiles, and computer microchips had qualified South Korea to launch the development of "high technology". In supporting these industries, caused the starting of national R&D applications and liberalization of technology import has had meaningful consequences. After World War 2, the incredible contrast in the level of industrialization between Western Countries and newly independent ones was an unusual subject. There was a significant distance in the level industrialization between freshly sovereign nations and the western world. Newly independence countries including Korea, which required adequate human infrastructure in areas such as transportation and energy, came to understand that science and technology were one of the most paramount responsibilities for their industrialization progress. In order to reach these objectives, the circumstances were started like; Concomitantly the loss of social overhead capital (SOC), before-mentioned as transportation and utilities, the war made massive damages of manufacturing capability and product. Throughout 1951, 44 percent of industrial buildings and 42 percent of manufacturing plants were out of service, and the calculated number of destroying was as high as $549 million due to consequences of the war. A whole of 68 percent of all factories it equals 4700

had been damaged. If needed to emphasize the intensity of destruction of major industries, the beginning of the first four months of the war was supposed to be as high as 70 percent of the textile and chemical industries 40 percent. Other significant disadvantages were emerging from the entirely different point, some Asian developing countries compared to western countries in their improvement were that their natural resources had been depleted during the colonial period and, moreover, they had to receive higher production expenses because they had to import most of the production equipment from outside. The imminent problem for newly independent states was as follows,

i. A low level of technical capacity and knowledge
ii. A lack of adequate human power
iii. A negligible science and technology investment
iv. An ineffective science and technology development policy
v. Weak social infrastructure

As late as in the 1950s, South Korea had also suffered from all of the difficulties as mentioned above, facing most developing countries today. After all, thirty-six years of Japanese colonization left a small industrial base that was destroyed by the Korean war during the time. When the armistice was signed in 1953, the net commodity product was 26% lower than the figure of 10 years before, decreasing net commodity product per capita by 44%.

South Korea's per capita expenditure fell about one-third, from $71 in 1949–50 to $50 in 1952–53, before improving to $60 in 1953–54, putting South Korea among the poorest countries in the world. Conditions were so dangerous that many would have weakened to death had food not been provided by aid programs from abroad. No matter what happens, there are two crucial development came up in this period to be high technology produces country in the future;

i. In July of 1948, the division of Vocational Education was established in the Ministry of Education as the first administrative organization dealing with science and technology policy.
ii. The Korean government attempted to increase the utilization of atomic energy by importing the technical knowledge from the United States. This

Atomic energy project proceeded by the Department of Atomic energy in the Division of Vocational Education in 1956. For the first stage of the project, more than 180 researchers were sent abroad for training. The Atomic Energy Board was established at Seoul National University in 1959.

As a consequence of these two developments, institutes provided modern research departments and studying fields to the high-level or well-educated scientist from local or for those who come from abroad. Furthermore, it served as a window for international cooperation and information gathering from foreign countries.

5.2. Industrial Development Policies in the 1960s

After the two-crucial development, the new primary goal which industrial development plan was to set an industrial framework by supporting import-substitute manufacturers, light industries and produces good sectors designed in the 1960s. The regular science and technology strategy was to increase under the light of scientific and technical education and build up technological infrastructure. Throughout this period, the Ministry of Science and Technology, a significant governmental body, was built to increase scientific and technological advancement activities. Also, the Korea Institute of Science and Technology, a multicultural and multidisciplinary R&D institute, was introduced in 1966. The Science and Technology promotion act was created in 1967 and connected the role of government in the technology development field. In this parallel, the government started the " First Five Year Economic Development Plan" in 1962 focusing on energy, civil infrastructure, export-import, and technology development. The plan even was warned for not considering increase human resource area. Therefore, another plan designated the " First Five Year Economic Development Plan" it was redesigned without any political arrogance and relaunched in 1962 by the Economic Planning Board. Redesigned planned were including entirely different development fields in this instance;

i. Demand and supply of technical human resources
ii. Technology transfer
iii. A national system of S&T development
iv. Legislation for vocational training

v. Industrial standardization
vi. Tax incentives
vii. Recognition of the achievements of scientist
viii. Detailed patent system
ix. Strategic fields of R&D
x. Management of public R&D institutes
xi. Cooperative R&Ds
xii. International Science and Technology exchanges

Above developments caused to set up the goal for Division of Technology Management created "First Five-year Human Resources Development Plan" was standing a human resources Study.

The founding of the Korea Institute of Science and Technology (KIST) in1966 was another essential point for creating R&D management system in Korea. It was not only the first combined research institution in the area of industrial technology but also a model for other research institutes in the phase of management of research organizations. As is, the institute was the first tried to achieve human resources and research projects on a commitment basis in Korea. To ensure its autonomy and financial liberation, the institute advised a legislative bill, named " Korea Institute of Science and Technology Supporting Act" which covered the independent choice of research projects without the government approval and immunity from the general audit.

In the meantime, a new development has emerged with the establishing the Ministry of Science and Technology and Building S&T Infra-structure. It had been extensively identified that there should be an autonomous ministry in charge of national science and technology policy. Why South Korea needed to create this kind of governmental administration; the performance of the First Five Year Economic Development Plan demanded more technical human sources and R&D capabilities to adopt new technologies from foreign countries.

At this moment, the governmental administration related to S&T was minimal and decentralized to secure its effective implementation. On the other hand, the S&T administration is disorganized in developing the national S&T capacity linked to

national developments plans because there was no centralized coordinating organization for national S&T policies. In parallel with these developments, the government enacted to establish the Ministry of Science and Technology as a heart of coordinating all science and technology-related policies. In this way, Korea became the first country which had ministry-level management of S&T among developing countries. The primary purpose of the MOST was distributed to the long-term plan as follows:

i. Combined overall planning for the S&T development
ii. Coordinating offices of a test, survey, and research
iii. International collaboration on S&T
iv. Research and utilization of atomic energy
v. Adoption and distribution of foreign advanced technology
vi. S&T associated human resources development
vii. Supports of private R&D activities
viii. Development of specific technology based on Joint Venture.

In order to reach the Long-term plan for S&T development, over 400 professionals got involve supporting South Korea reach the middle point of industrializing counties concerning Science and Technology within the domestic evolution of technology. It is essential to explain what were the technology fields which indicated above; metal and ceramic materials, design technology in machinery, chemical engineering, electronic materials technology, agricultural breeding, and ocean science technology.

Furthermore, the government began to encourage the heavy and chemical industries from the First Year Economic Development and established a plan for developing vital sectors including steel, petrochemicals engineering and machinery with electronics, automobile, and shipbuilding. These industries were supported and generated by the S&T development policies and shifted one of the leading exporters of Korea.

These achievements came up even so few big internal troubles; After the cease-fire in 1953, South Korea experienced various economic and other challenges, both political and social. It has undergone political revolutions: the students' revolution in 1960 that defeated Syngman Rhee's government; the military coup d'état in 1961; the Yushin Reformation in 1972. Curiously enough South Korea's development policy after 1960

consequently performed excellent growth rates. According to national revenue data, throughout the ten years between 1962 and 1971, the average annual growth rate of South Korea's GDP was 11.5 percent. Since economic growth during the 1960s and the 1970s was remarkable, so South Korea shifted into the levels of the world's fastest-growing economies.

Hyundai – In an example: Founded in 1967, Hyundai Motor Co. has developed within the Hyundai Motor Group, with more than two dozen auto-related affiliates, subsidiaries, joint ventures, and branches. Hyundai Motor — which has seven manufacturing fields outside of South Korea including Brazil, China, the Czech Republic, India, Russia, Turkey, and the U.S.

5.3. Industrial Development Policies in the 1970s

The components of industry-relevant plans in the 1970s were to import sufficient technologies from abroad and utilize and understand those technologies for further advancement. This application was continued by many research institute concentrating on technology disciplines. When the Second Five Year Economic Development plan announced in 1971, the nation had established the foundation for the economic take-off. In the same period, the objectives of the Third Five Year Economic Development Plan focused as following.

i. Improvement of the agricultural sector
ii. Expedition of export
iii. Structuring the heavy and chemical manufacturing
iv. Productive land use

The Third Five Year Economic Development Plan created unimaginable impression during the time, and the export rate increased 35% in yearly average percentage, and 86% of exports outcome such as plywood, clothes, footwear, wigs, knit products. However, the business markets for these labor-intensive products were very competitive and aggressive with other developing countries who want to enter the same international market. To counter this course, the government had launched the

alteration concerning Korea's industrial formation into the heavy and chemical industries such as steel, electronics, and petrochemical. This change in industrial composition needed to improve technology, which required a radical change in the supply of technology area. Most of the public research institutes and university research hubs were, though, inadequate to answer the requirements of relevant technologies, because lacked by the economic situation. Also, the research institutes in the private sector, which mostly depended on imported technologies, did not get a vital attempt to improve techniques by themselves. Therefore, the government took leadership to develop industrial technology that was crucial for the Third Five Year Economic Development Plan. The first reaction came up from Ministry of Science Technology had set up national technologist certification method to develop the social importance of technologies and technicians, and to make an effective linkage between demand and supply with technical human resources. Furthermore, the government decided to support R&D activities in fundamental science by establishing the Korea Science and Engineering Foundation.

Import exchanges and export potentials have reshaped the process of industrial progress in Korea. The government has encouraged the advancement of technologies correlated to the export-oriented activity. In an example; fertilizer factories were introduced by the United States on a turnkey operation during the First Five Year Economic Development Plan. To gained necessary knowledge which means how running and operating the plants, Korean engineers acquired the technologies that can be used in other process industry in the 1970s.

Another apparent structural change in that period, industries needed not only choice and transfer of imported technologies but also internal advancements of technologies in the fields of machinery, steel, chemical engineering, shipbuilding, and electronics designated as the critical industries. In this parallel, the government established a public research institute to serve selected strategic sectors because of the low level of technological capability in the private sector. Therefore, the extensive research institute was established under the "Specific Research Institute Supporting Act" plan in 1973;

i. Korea Ship Research Institute,
ii. Korea Machinery & Metal research Institute,
iii. Korea Institute of Chemistry,
iv. Ocean development Research Institute,
v. Korea Atomic Fuel Corporation,
vi. Korea Electric Device Institute,
vii. Korea Telecommunication Technology Institute.

Besides, the government changed the import of technology, to a limited extent, by amending the "Foreign Investment Introduction Act" in 1978. At the same time, the Ministry of Science& Technology built the "Information Center of Technology Import" to support firms who are selecting relevant technology and advancing the adoption and dissemination of foreign technologies.

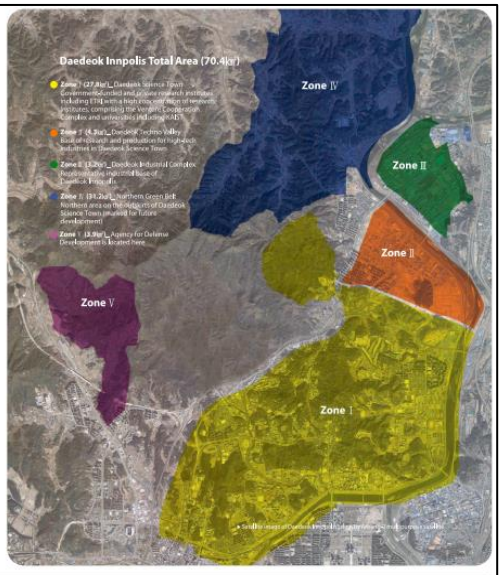
One of the critical facts happened in that period on the oil prices. With the first oil shock, the government warned the industrial system to help less energy-intensive manufacturers such as electronics and accuracy devices preferably than steel and petrochemical which utilize more energy comparatively.

Also, as the first investment organization for industrial technology development, the Korea Technology Promotion Corporation was authorized to finance venture business, and the Korea Development Bank introduced a loan program for technology advancement in1976

Daeduk Innopolis: MOST intended to build a new technology and science center by relocating not only the critical research institute but also extra public research hub from Seoul to Daeduk. It proposed the President and the construction signed it started in 1973.

Table 5. 1 Overview of Daedeok Innopolis (2010)

Establishment	November 1973 Korea National Government Initiated
Address	81 Exporo Yuseong-gu, Daejeon Metropolitan City, Republic of Korea
Employment	55,614 person (9,055 PhDs) as of 2010 *About 11% PhDs in Republic of Korea
Tenants	• 129 organizations (in relation with R&BD) : 30 Government Research Institutes(GRI), : 42 Private Research Institutes (PRI) : 8 Support Agencies (public) : 5 Universities(HEIs) : 14 Public Institutes : 22 non-profit Institutes • 1,179 high-tech companies (SMEs) : Spin-offs from GRIs and PRIs, high technology-based venture businesses
Major Fields of Science and Technology	IT (40%), BT (14%), Material Science (9%), Chemical Engineering (8%), Energy Resource (8%) etc.
Size (Developed Area)	Total area: 70.4km² Zone 1. Daedeok Science Town(DST; 1972~1999): 27.8km² - for research and education, and includes a residential area Zone 2. Daedeok Techno-Valley(DTV; 2005): 4.3km² - venture business area, pilot plants Zone 3. Daedeok Industrial Complex; 1988): 3.1km² - local industrial park & manufacturing area Zone 4. Projected area (Green-Belt area): 30.2km² - green belt area and includes land set aside for incoming Zone 5. Agency for Defense Development: 5.0km² - for military and defense-related industry



Source: Daedoek Innopolis Management Office (2012).

The place is reaching almost 27.8km2, and the Korean government started the construction in Daedeok Science Town. The cost of the structure was one trillion Korean won, which was afforded by the national government with the private sector. Daedeok Innopolis is placed in the center of the nation's territory, approximately 167 km from Seoul, the capital of the Republic of Korea. Overall, there are 30 government-funded organizations, five universities, over 400 corporate R&D centers, and more than 1,200 high tech companies (SMEs) situated on this site. Daedeok is a hub where people, technology, and knowledge harmoniously coexist, as well as remaining a hub where networking, knowledge sharing, and research activities convey efficiently and professionally. World's No.1 Innovation Cluster.

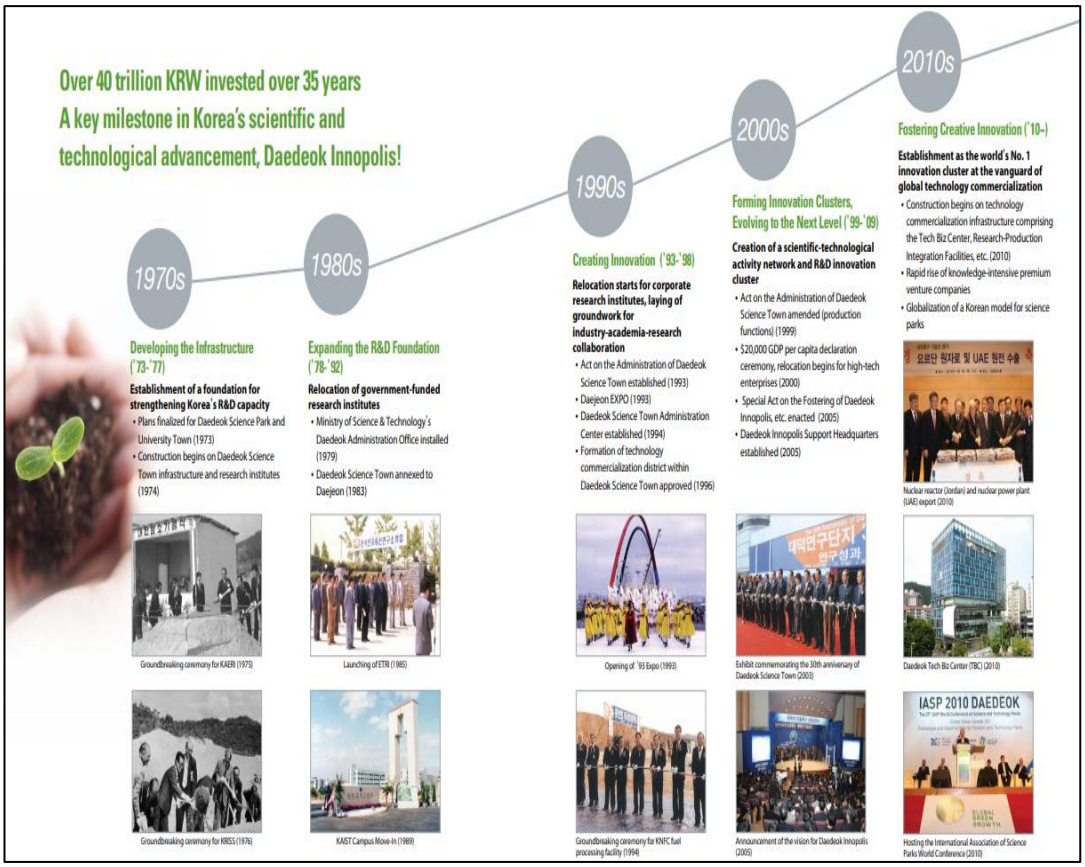


Figure 5. 1 Milestone of Daedeok Innopolis
Source: Daedoek Innopolis Management Office (2012).

5.4. Industrial Development Policies in the 1980s

The stage of the economic period brought another reaction for the forward. The South Korean marketplace went within ups and downs for the 1980s because, throughout the late 1970s, South Korea remained as one of the world's most productive economies. Suddenly, significant external trauma effected to the South Korean economy, as well as the world economy, came up in the 1970s and the early 1980s in the sort of oil shocks. In the light of these external developments, South Korea devalued its currency and examined the oil price raises, pointed to a rise in cost levels.

One of the most significant events of the 1980s was started with the new instruments of manufacturing policies that had been promoted to essential manufacturers which were challenged and had to be improved. First, the policy management which included only quantitative performances in allowing tax and investment opportunities was

modified to include qualitative standards such as firms' attempts to technological development, value-added and productivity growth. Governmental organizations pointed out that the industrial strategy should not focus only on quantitative achievements or performance but also qualitative should be a concern. Therefore, the government steadily changed the supportive policies regards dependency from the import of foreign technologies to adaptation, via the advancement of technologies by a national R&D business plan named the " Specific National R&D Program." A key viewpoint of the national business plan was supported by another national R&D development program, which was named " Industrial Technology Development program."

This indicates a need to understand the various attentions in the national production that existed mostly in the private sector to advance more in technological advancement rather than being concerned with export or baseline sales volume. Therefore, the primary objective of this period was to achieve a national R&D program inaugurated by the government was the most significant event. The plan was the first originated project to improve advanced technologies indigenously.

One of the most significant developments in this argument, the government tried to support industries selectively by classifying them according to competitive and non-competitive sectors. The governmental organization has already drawn attention to the development of the competitive industry, tax and financial supports were implemented for technology development, while firms in the non-competitive market were encouraged to consolidate or change the of products.

5.5. Reforming Policy Regime with Distributional Welfare in the 1990s

Its growing industrial sector has spearheaded South Korea's economic growth after the Korean War. During the 42 years between 1953 and 1994, the industry expanded rate nearly double that of the entire economy. Output increased from about 10 percent per year in the country on average to more than 17 percent during the next 10-year period, although its rise slowed to 10.4 percent between 1981 and 1994.

In the history of South Korea economy development, the growth rate has remained a critical factor in the 1990s. The country's most vital task for the nation was still to

protect a high rate of economic growth with reasonable distributional equity. This required reorganization of industrial structure, production system, and industry related policies, Existing industrial policies had led to the increase of big conglomerates called" chaebol." The South Korea government intentionally encourages chaebols to take advantages of economies of scale and to drive the nation's exports and economic growth.

Also, chaebols have contributed significantly to the nation's economic growth, but they are, at the same time, often blamed for distortions of national resource allocation, Chaebols' rapid growth and diversification have enormously affected the industrial structure and market concertation in Korea. 93% of all commodities, or 62% all shipments, were produced under monopoly, duopoly, or oligopoly conditions, under which the top three produces accounted for more than 60% of the total market.

This Korean "jaebeol," which appeared right after the Korean War. Throughout the colonial years, very few Koreans controlled or managed massive corporations. A significant number of the jaebeol ’s were humble merchants (rice peddlers or rice mill operators) or operated stores that manufactured detergent and fish oil. After the withdrawal of the Japanese forces in 1945, some Korean businessmen started extending their businesses in the country, and a significant number of them shifted jaebeol in the market in the late 1950s and hereafter. In the early period, the jaebeol were in markets designated by comparatively low technologies. The jaebeol’s companies enlarged far beyond manufacturing during the time. Their value-added supplying rate was higher than 30 percent and in most other fields, such as construction, finance, insurance, retailing, 52 real estates, and foreign trading. While these businesses were significant in the early 1990s, the real contribution is now leading in their electronics and high-technology industries.

The high concentration and monopolistic market conditions made policymakers reconsider the efficiencies of resource allocation and usage regarding economic welfare and equity including industrial structure, productivity, and balanced policy between small firms and big firms. Several reform policies already have been announced under the new policy paradigm discussed above. The first policy is to induce chaebols to concentrate only in several sectors with a high degree of synergy

and in which they can remain competitive with special tax and financial incentives. The second is to offer more assistance to small and medium-size firms.

The government is also trying to develop medium level technologies. Medium level technologies are defined as the technologies that are adequate and necessary for traditional industries, even though they may not be technology intensive. Therefore, the management of industry strategies changed regarding its regulation and implementation process. First, the policy also concentrated on the allocation of resources involving the size of companies and industrial areas. Next, the regulations change to indirect methods of support rather than direct interferences in private sector R&D projects. Lastly, the technology market structure, push system converted into a technology demand-pull model at the private sector technological accumulated end of the 30 years.

5.6. South Korea’s New Economic Strategy After the 2000s

South Korea's ambition and the rate of development in the last four decades of the 20th century was inspirer and extraordinary. Thus, their growth rate of GDP per capita was also the highest in the world from 1965 to 1990. After World War II, South Korea started their journey as one of the problematic and most impoverished nations in the world, but, it steadily transformed in order to be an advanced economy. In the late 1990s, Korea was deeply affected by the Asian economic crisis. The crisis showed invisible or transparent deficiencies in Korea's advancement strategies. After the Asian financial crisis, South Korea conducted to realize substantial fundamental changes.

The Asian financial crisis of 1997-98 showed transparent deficiencies in South Korea's development paradigm, including large debt/equity ratios and massive short-term foreign borrowing. GDP fell by 7% in 1998 and then improved by 9% in 1999-2000. South Korea fostered various economic improvements strategies following the crisis, including comprehensive openness approach to FDI and imports. Growth stayed to about 4% annually between 2003 and 2007. The 2008 global economic downturn walloped South Korea's export-focused economy but quickly reflected in the following years, reaching over 6% growth in 2010.

A short explanation of Asia Crisis: It was a foreign exchange crisis, which was already started in Thailand, and then jumped to economy confidence in South Korea fell, pushing international investors to pull out. South Korean corporations could not handle their debts, and the government did not have the foreign exchange resources to clear them out, the government had no alternative but to attempt a bailout from overseas.

Hahm and Mishkin (2000) implemented four significant determinants that can be caused by economy worsening and financial instability:

i. The decline in financial sector balance sheets
ii. High-interest rates
iii. Political instability
iv. The drop of nonfinancial balance sheets

The country began to develop a knowledge economy to get rid of this deep concussion. South Korea's economic structure has a detailed examination test which is made by the World Bank "Korea as knowledge economy" (2006). The source highlighted the conditions and precautions of the Korean economic model after the crisis and dynamic technological transition approach. The World Bank´s research declares that in April 2000, Korea officially started a find significant points to make a transition to an advanced knowledge-based economy and to diminish the influence of Asia economic crisis. In this sense, the economic reforms considering three main aims:

i. Leapfrog to the top 10 knowledge information leaders in the globe,
ii. Upgrade educational environments of OECD standards,
iii. Spearhead S&T such as bioengineering by upgrading to G-7 standards.

In order to recover the economic structure and to reach aims above, the government tried to re-wake up the economy and encourage public and private sectors with the below new industrial designs.

i. Financial sector reforms,
ii. Cleaning up Nonperforming Loans,
iii. Enhancing the Financial Sector Infrastructure,
iv. Corporate Sector Reforms,
v. Enhancing the Corporate Governance system,

vi. Improving Bankruptcy Producers,
vii. Removing Anticompetitive Regulations,
viii. Promoting Openness,
ix. Labor Market Reforms,
x. Enhancing Labor Market Flexibility,
xi. Public Sector Reforms,
xii. Restructuring the Institutional Regime.

The government created a critical framework, but the most prominent and incandescent development came up from the total expenditure on education. Its investment of GDP touched 7.1 percent in 2002, a much higher level than the OECD standards of 5.8 percent. Korea simply stayed right behind Iceland, the United States, and Denmark in this respect. As most will mention in conclusion, Korea has a remarkable position regarding investment in education. Therefore, Korea is a world leader in using internet and computer technology, and these are the primary sources of today's high technology production.

6. A COMPARATIVE ECONOMIC ANALYSIS FOR TURKEY AND SOUTH KOREA

6.1. General Economic Analysis

The first chapter contains overall definitional explanations and historical research between Turkey and South Korea. Now, in the second part which is the extensive conclusion of the thesis, lay on whether there a positive correlation between education and production of high technology for economic development. The Industrial Revolution after the 18th century, the world which rapidly changing has started to produce a mass with the machines. This change in the form of production has brought with its technological innovations. The only classical way to produce a product was not enough for the mass demand, to produce that mass production is improbable without a technological knowledge development. This requirement has brought technology into the center of both production and society. Technological devices, which gained a new dimension with the introduction of new communication tools in the 20th century, have become the essential tool of the society as well as the platform where they have been trying to do the best of the states/countries.

We are in the entirely new world order. All sectors and professions, including industry, manufacturing technologies, and services, are encountering significant paradigm transition. This change in the way of doing business has been reshaping the countries welfare. Each area where the machines speak to each other, from health to agriculture, from factory to bank, from home to hotel is being digitized; we are going into a period when concepts such as artificial intelligence, virtual reality, 3D are part of our lives. Not so much, ten or fifteen years ago, these concepts people were talking only among futurists, today's world is all closely following all these developments.

The technology manufacturing or developing can be considered as a dominant power in economic, and the numerous technological developments provide highly to the advantage for developing and underdeveloped countries. Technological advancement and economic welfare are positively correlated with each other. The product of

technology is also an essential determinant of economic welfare. A "high level of technology can accomplish the brisk rate of growth." As Schumpeter remarked that innovation or technological development is the only determinant of economic advancement. Inventions and innovations have been extensively useful for brisk economic growth in developed and developing countries. Technology is considered one of the significant determinants that influence economic development. The first industrial revolution is generated by the scientific development of the steam engine or restoring of a manufacturing operation with an industrial system design (industrial age). Industry revolution 2.0 or electromechanical revolution which indicates to automation emerged in the hands of a scientific approach. Directly, automation promoted the strengthening of national economies. The Industrial Revolution 3.0 or technological transformation occurred after World War II, and it is called electronic period. At the heart of the developments is a semiconductor and transistor whose application promote the advancement of computers and microprocessors. Just a piece of very small information regarding semiconductors; South Korea's technology concentrates on the semiconductor products. They are very successful in the acquisition, implementation, and management of the production of this technological product. South Korea has been one of the world's leading semiconductor manufacturers. Increasing workers' wages forced the South Korean government to reduce costs by using more advanced technologies in less complicated areas of industry. The most successful company in research and development is Samsung Electronics, and their research institute is so worldwide (www.tubitak.gov.tr, 12.10.2003, Erişim Tarihi: 06.06.2006.).

Eventually, the Industry Revolution 4.0 that launched late last century, also named an information revolution. The value of this revolution is the chip. A chip is undeviatingly associated with "high technology" - information technology and tools with digital control. The technological revolution created major developments in biotechnology, energy resources, and raw materials. Within other circumstances, it makes the wealth in national economies with the global economy and extraordinary development.

It is commonly believed that technological improvement is even more significant than capital structure. However, the capital structure can bring economic expansion to a limited amount, and it may terminate if there is no technological development. A

nation cannot survive dependent on the import of technology from their competitors. A nation must focus more on science and education research which will lead to improving quicker than another country. The reflections of the examine how the education influences economic and technological improvement and guidance to sustain these aims. The power of education and science in industrial development has been explicitly authenticated. In contemporary society, the consequence of highly techno-scientific and education is well understood. However, comprehensive education is more valuable, and this chapter presents the case to present how education could represent a more constructive role than is commonly apprehended in helping developing countries to obtain their long-term socio-economic development goals.

Nonetheless, developing countries must be convinced that any of their institutions are giving an adequate breadth of educational opportunities to students as the educated abilities that are required in a rapidly developing world. A universal education opportunity is an exemplary method of equipment for the flexible, knowledge-based professions that frequently manage the top lines of the functional labor force. The capacity to learn under the well-constructed education system, still, will extend to give valuable protection against the unpredictable rapidly changing economic circumstances. Well, a structured education system intensifies the potentialities that people will be able to achieve their roles in the development process. Science and education are indispensable for who intended to be in developing division, in these parallel nations attempt to improve their economies and improve opportunities conditions for their citizens. Conducting innovation studies or products from the developed counties, and accepting them to the internal circumstances, can help to reduce the gap between developed and under developing countries. This approach can emerge with several elements: Mainly progress of education system and institution's enrichment for human capital and skills development; afterward technology substitution and marketing innovation, environmental evolution; and potential regional development can achieve in the country. Universities and additional education organizations can play an essential function in human capital advancement and innovation practices in their countries and cluster. While education merely is considered particularly under the human capital section, it also has been performing a notable performance in production processes line and produces high technology, as well. Apparently, a significant and complex interrelation emerge among education,

technological innovations, and efficiency increases (Jones, 2002). In this regard, what is this relationship between technology and economic development for South Korea and Turkey? How does science or education lead to economic development? In order to show the positive correlation between education and welfare, it would be better to start with the examination of the selected countries economic developments.

In this study, the common data of Turkey and South Korea are used to compare economic growth. Most of the data were obtained from World Bank data resources. The time interval was used between 1970 and 2017, in order to show Industrial Revolutions differentiation, 1970 - 1980 End of the Industrial Revolution 2.0, 1980 - 2010 Industrial Revolution 3.0 and 2010 - ongoing Industrial Revolution 4.0.

Turkey's population was 22.5 million in 1960, while South Korea's population was 21.4 million people. Today the Turkish population has reached 80 million people rapidly, while the population of South Korea remained at 47.9 million, as shown in Table 6.1. Below.

Table 6. 1 Total Population of the Korea Republic and Turkey

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	25,012,374	27,472,331	
1970	32,240,827	34,876,267	Industry Revolution 2.0
1980	38,123,775	43,975,921	
1990	42,869,283	53,921,699	
2000	47,008,111	63,240,121	Industry Revolution 3.0
2010	49,554,112	72,326,914	
2017	51,466,201	80,745,020	Industry Revolution 4.0
1960 -2017	106%	194%	

Source: World Bank Data, Total population of the Korea Republic and Turkey https://data.worldbank.org/indicator/TX.VAL.TECH.MF.ZS?locations=KR-TR&view=chart, Accessed at: 18.01.2019

Throughout history, countries have performed different approaches to economic development; some of them preferred to reach targeted economic growth through industrialization rather than agricultural focus on high-middle - low-value production. One of the significant shifts that portray of a growing economy is causing the proportionate decline in the agricultural life. Industrial cities promote education and learning capability within the country for technology production. Moreover, manufacturing life facilitates sharing and distributing risk opportunity by the size of cities.

Although cities constitute a general settlement regarding historical and social conditions, they refer to a structure that includes differences. There have been changes in the content of the city concept depending on socio-economic developments.

Urbanization which is also used in the meaning of modernization; the number of cities in parallel with economic development increase in society and increase the number of cities. It is defined as the process of population accumulation which leads to specialization and changes specific to cities. Urbanization provides more opportunities for scientific development, and that brings opportunity to technology advancement activities. South Korea and Turkey give the same results in this context, as the shown in table 6.2 and 6.3.

Table 6. 2 Rural Population of the Korea Republic and Turkey

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	18,081,445	18,814,426	
1970	19,117,521	21,541,675	Industry Revolution 2.0
1980	16,499,970	24,723,263	
1990	11,212,890	21,998,436	
2000	9,579,783	22,297,834	Industry Revolution 3.0
2017	9,519,703	20,473,707	
1960 - 2017	9%	16%	Industry Revolution 4.0

Source: World Bank Data, Rural Population of Korea Republic and Turkey
https://data.worldbank.org/indicator/SP.RUR.TOTL?locations=KR-TR,
Accessed at: 18.01.2019

Table 6. 3 Agriculture, forestry, and fishing, value added (% of GDP)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	36	55	
1970	26	39	Industry Revolution 2.0
1980	14	26	
1990	8	17	
2000	4	10	Industry Revolution 3.0
2017	2	6	
1960 - 2017	-95%	-89%	Industry Revolution 4.0

Source: World Bank Data, Agriculture, forestry, and fishing, value added (% of GDP)
https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=TR-KR,
Accessed at: 18.01.2019

With the economic and social developments, the expansion of production volumes, the diversification of social demands and expectations, have increased the energy demand. It can be said that the problems caused by the increase in energy demand are more comprehensive and costly especially for developing countries. The rapid industrialization, urbanization and population growth in developing countries directly affect energy consumption. Without natural energy resources and a rapidly growing population means managing South Korea’s energy supply is an ongoing challenge. Despite its lack of domestic oil reserves, the country is one of the largest petroleum product exporters.

South Korea and Turkey have minimal internal resources, also the crowded population and the development of manufacturing process has been causing increase the export of energy as there is no oil or natural gas is produced in the country. The most important reason for the current budget deficit is the imported energy. The energy dependency is one of the most important reasons for the current account deficit for both countries. In order to solve the malignant budget deficit problem, South Korea caused a different motivation on the country development process, major export products such as clothing, footwear, and simple assembly industry products were abandoned for value added, capital intensive and advanced technology products. The majority of South Korea's exports are high-tech products making a significant contribution for macro budget balance against energy consumption problem. On the other side, Turkey's growing economy and changing socioeconomic structure have

been causing a significant energy export in the budget. The fact that energy production cannot be increased at the same rate in response to rising energy demand is being a significant macroeconomic problem such as energy deficit. Energy consumption in need in the process of Turkey's economic growth, the wrong energy production and the investments made in this area bring more energy imports. The fact that there is an increasing dependency on foreign sources indicates that the energy deficit is an essential problem to be solved. Unless Turkey does not focus Industry Revolution's 4.0 requirements rather than the low - middle technology production, the budget deficit which is caused by energy export will always remain on the table. As the massive energy import has been causing budget deficits, in the long run, the energy import trigger high inflation problem non-export-oriented countries, as shown in table 6.4 and 6.5.

Turkey, especially in the import of energy causing growing of account deficit in recent years is often referred to as the dependence to energy exporter countries. However, South Korea imports 82% of its energy needs as well; but there is a very significant main devastating point between the two countries on this issue. South Korea produces, and exports valued added or high technology products by using imported inputs such as energy. When Turkey compared with South Korea, it could not convert itself to added value exporter country from lower manufacturing output, and mostly not go beyond the assembly industry.

Table 6. 4 Energy imports, net (% of energy use)

Country Name	**Korea, Rep.**	**Turkey**	**Industrial Era's**
1971	62	29	
1980	78	46	Industry Revolution 2.0
1990	76	51	
2000	82	66	
2010	82	70	Industry Revolution 3.0
2015	81	75	
1971 - 2015	30%	156%	Industry Revolution 4.0

Source: World Bank Data, Energy imports, net (% of energy use), https://data.worldbank.org/indicator/EG.IMP.CONS.ZS?locations=TR-KR, Accessed at: 18.01.2019

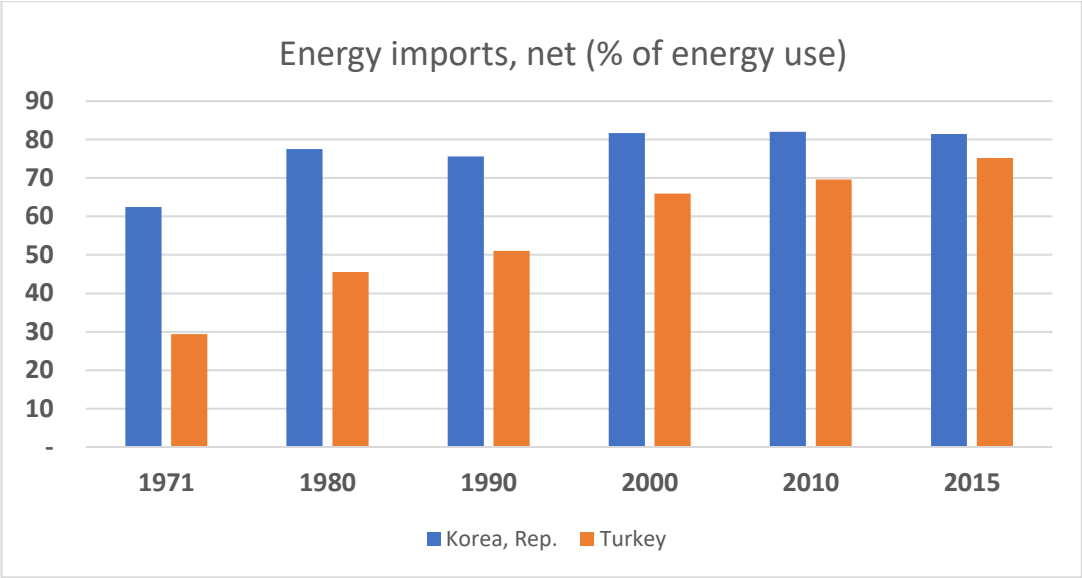


Figure 6. 1 Energy imports, net (% of energy use)

Table 6. 5 Inflation, consumer prices (annual %)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	8	6	
1970	16	8	Industry Revolution 2.0
1980	29	94	
1990	9	60	
2000	2	55	Industry Revolution 3.0
2010	3	9	
2017	2	11	Industry Revolution 4.0
1960 - 2017	-76%	97%	

Source: World Bank Data, Inflation, consumer prices (annual%), https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=TR-KR, Accessed at: 18.01.2019

The value-added products are seen by many nations globally as a useful vehicle for accelerating economic growth and development. This is because these products serve many valuable purposes some of which are economic, political and social. Specifically, through value-added products government generates significant revenue, increase competitiveness and control budget deficit, ensures equitable distribution of income as well as allocates national income for welfare. South Korea found a positive correlation between the importance of value-added production and sustainable national income in the earlier. The economic implication of this finding is that the government

can accelerate economic development by producing value-added products. The policy options for the government is to embark on policies and programs that will enhance the production level of the products of current and upcoming Industry Revolutions intending to accelerate aggregate cooperation and investment expenditures in the field of technology developments. An increase in investment expenditures in the area of technology developments is capable of increasing national revenue when the required importance given to value-added products such as South Korea.

Table 6. 6 Industry (including construction), value added (current US$)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	676,120,954	2,424,989,725	
1970	2,204,404,946	3,747,826,087	Industry Revolution 2.0
1980	20,468,037,469	16,161,656,014	
1990	99,928,082,966	46,801,666,769	
2000	192,059,666,124	73,438,528,471	Industry Revolution 3.0
2010	379,076,796,121	189,901,430,663	
2017	549,069,084,307	248,419,844,577	Industry Revolution 4.0
1960 -2017	811%	101%	

Source: World Bank Data, Industry (including construction), value added (current US$), https://data.worldbank.org/indicator/NV.IND.TOTL.CD?locations=KR-TR, Accessed at: 18.01.2019

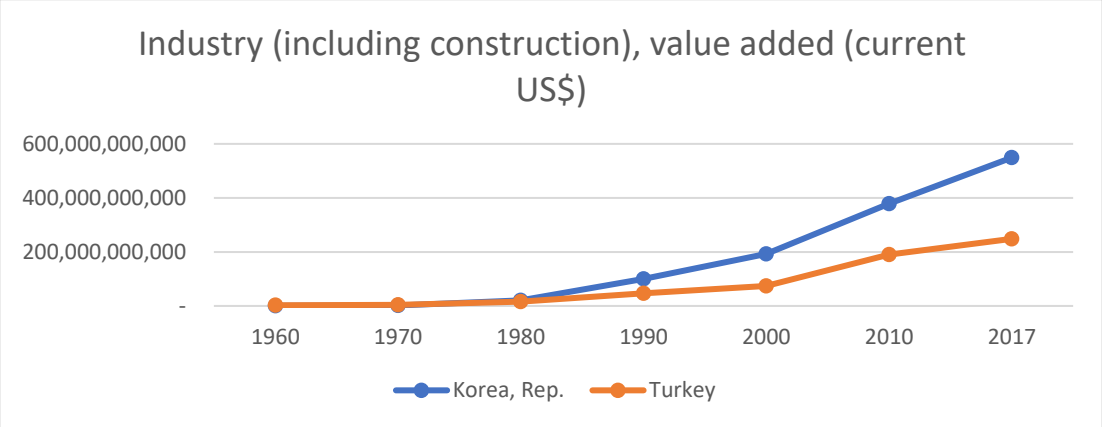


Figure 6. 2 Industry (including construction), value added (current US$)

Table 6. 7 Manufacturing, value added (% of GDP)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	11	13	Industry Revolution 2.0
1970	17	16	
1980	22	17	Industry Revolution 3.0
1990	25	22	
2000	26	19	
2010	28	15	Industry Revolution 4.0
2017	28	18	
1960 - 2017	146%	37%	
2017 GDP	$ 428,610,258,482	$ 153,198,434,001	

Source: World Bank Data, Manufacturing, value added (% of GDP), https://data.worldbank.org/indicator/NV.IND.MANF.CD?locations=KR-TR, Accessed at: 18.01.2019

Table 6. 8 Trade in goods and services (BoP, current US$)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1976	-254,000,000	-2,849,000,000	
1980	-5,277,100,000	-4,461,000,000	Industry Revolution 2.0
1990	-2,809,200,000	-4,482,000,000	
2000	14,658,200,000	-10,682,000,000	
2010	33,677,000,000	-39,576,000,000	Industry Revolution 3.0
2017	85,416,500,000	-39,005,000,000	
1976 - 2017	33729%	-1269%	Industry Revolution 4.0

Source: World Bank Data, Trade in goods and services (BoP, current US$), https://data.worldbank.org/indicator/BN.GSR.GNFS.CD?locations=KR-TR, Accessed at: 18.01.2019

Table 6. 9 Exports of goods and services (current US$)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	$103,762,705	$287,710,645	
1970	$1,030,074,704	$756,521,739	Industry Revolution 2.0
1980	$18,490,854,913	$3,550,856,151	
1990	$70,786,848,649	$20,138,041,278	
2000	$196,621,454,340	$53,091,138,836	Industry Revolution 3.0
2010	$540,896,025,383	$157,844,709,209	
2017	$659,615,510,844	$211,408,285,409	Industry Revolution 4.0
1960 - 2017	6356%	734%	

Source: World Bank Data, Exports of goods and services (current US$), https://data.worldbank.org/indicator/NE.EXP.GNFS.CD?locations=TR-KR, Accessed at: 18.01.2019

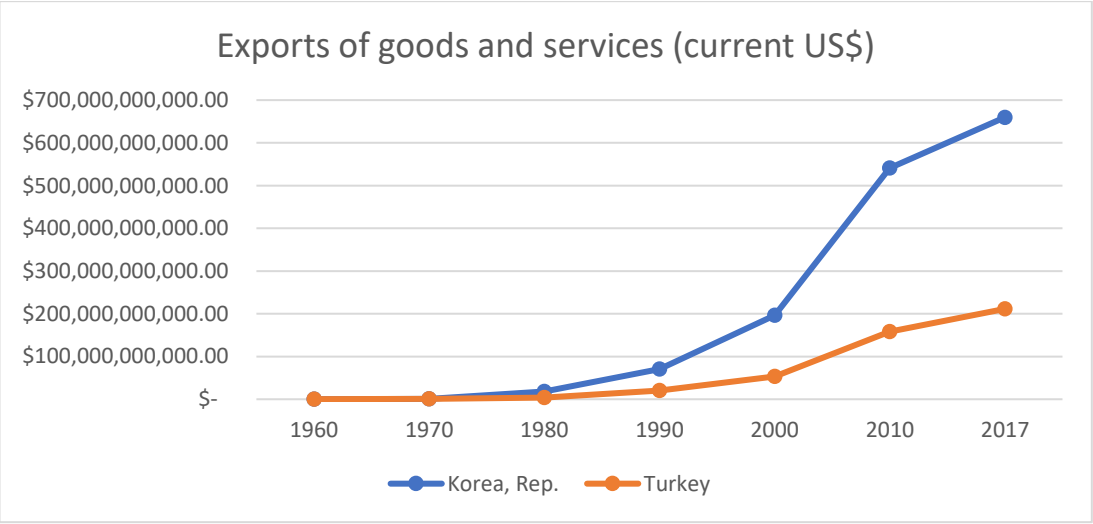


Figure 6. 3 Exports of goods and services (current US$)

Especially developed countries have seen science and R & D activities together with information as a key to rapid development. Industry revolutions began with a discovery every period. The discoveries that took place during these periods were realized much more rapidly, especially in the Industrial Revolution 3.0 and beyond. The discoveries have occurred due to both technology and education. In particular, it

would be appropriate to examine the phenomenon of education in detail. R&D is one of the cornerstones of the knowledge economy. R & D are the scientific studies of businesses in a country within the framework of a specific plan to create new inventions. The first of the methods in R & D activities are to reveal further information that will carry science and technology forward.

To maximize or secure a competitive advantage in the international market, technology, R&D activities and innovation have been and will remain at the heart of these targets. Based on the research, technologies of the Fourth Industrial Revolution are showing positive returns and new opportunities for growth. As nations continue to renovate or build out required policies for their regional industries, and global applications must be increased in other operations to generate the appropriate conditions for the future of technology productions. The differences at table 6.11, will remarkably simplify South Korea's work for the internet of things, advanced robotics, artificial intelligence, and additive manufacturing. If Turkey does not intend to open its eyes against the requirements of current Industrial Revolutions, the macroeconomy will always suffer due to the being behind the times.

Table 6. 10 Researchers in R&D (per million people)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1996	2,211	304	
2000	2,345	365	
2005	3,777	577	Industry Revolution 3.0
2010	5,380	890	
2014	6,899	1,157	Industry Revolution 4.0
1996 - 2014	212%	280%	
Total population % - 2014	0.01	0.0014	

Source: World Bank Data, Researchers in R&D (per million people)
https://data.worldbank.org/indicator/SP.POP.SCIE.RD.P6?locations=KR-TR,
Accessed at: 18.01.2019

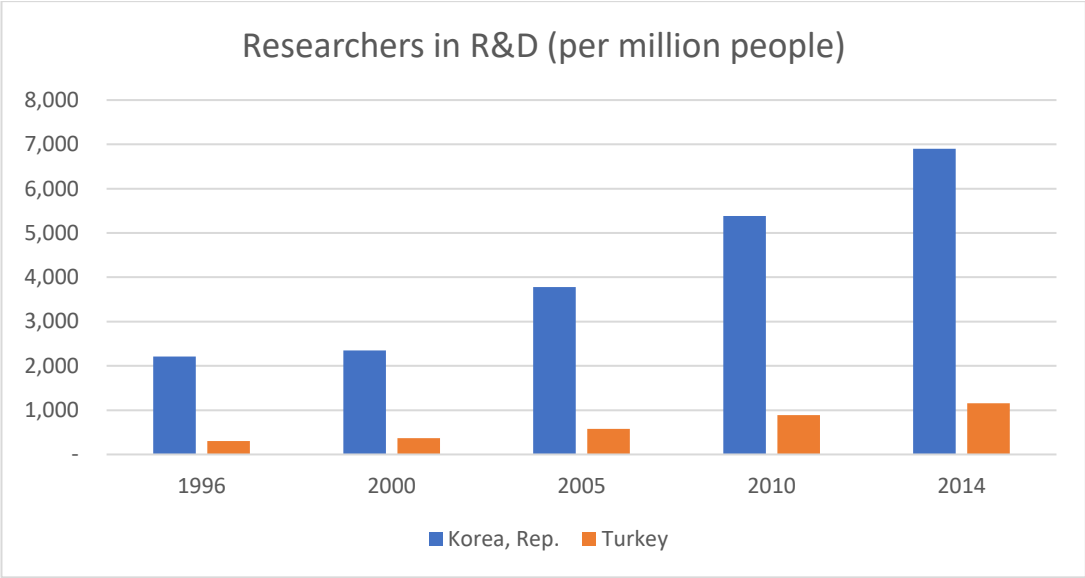


Figure 6. 4 Researchers in R&D (per million people)

In South Korea, where education is the utmost importance, human capital is one of the subjects frequently emphasized. The enormous amount of the investment made in the field of human skills development exposed the significant progress in economic growth figures. This growth has emerged as a result of a close relationship between human capital and education investments. The higher the number of well-educated people grown in line with the requirements of high technology manufacturing, it brought more productivity, and growth rates have been increasing the country.

Table 6. 11 Research and development expenditure (% of GDP)

Country Name	**Korea, Rep.**	**Turkey**	**Industrial Era's**
1996	2.24	0.45	Industry Revolution 3.0
2000	2.18	0.48	
2005	2.63	0.59	
2010	3.45	0.84	Industry Revolution 4.0
2014	4.28	1.01	
1996 -2014	91%	123%	
2014 - (% of GDP)	$ 65,445,138,000	$ 8,557,741,100	

Source: World Bank Data, Research and development expenditure (% of GDP) https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=KR-TR, Accessed at: 18.01.2019

Patents are as crucial as the R & D and innovation for export-oriented countries. Patents are one of the criteria of having a competent status in technology. The number of patents received by a country is one of the criteria for success achieved as a result of technological developments. Patents are closely related to the level of development of the country. When the patents were taken are examined worldwide, it is seen that most of them are in developed countries. South Korea has a very remarkable background in the patent applications.

Table 6. 12 Patent applications, residents and non-residents

Country Name	**Korea, Rep.**	**Turkey**	**Korea, Rep.**	**Turkey**
Indicator Name	**Residents**	**Residents**	**Nonresidents**	**Nonresidents**
1963	2,455	55	103	484
1970	1,202	89	644	547
1980	1,241	134	3,829	527
1990	9,082	138	16,738	1,090
2000	72,831	277	29,179	3,156
2010	131,805	3,180	38,296	177
2016	163,424	6,230	45,406	618
1963 - 2016	6557%	11227%	43983%	28%

Source: World Bank Data, Patent applications, residents and non-residents,

Especially since the 1980s, with South Korea's information and communication technologies with a five-year development plan in the right place at the right time and application Turkey has started to increase economic differentiation between them. South Korea, which has made rapid progress in science and technology, has become one of the leading countries in high technology manufacturing. In Turkey, many plans and projects with government agencies in this area could not have resulted as expected.

Absolutely, Turkey knows what the importance of the essential elements of high technology and knowledge-based information economy as well as South Korea; increase the number of skilled workers in the country. In the case, if education sources would have covered as needed by Turkey, it would inevitably come to closer to South Korea.

Table 6. 13 Scientific and technical journal articles

Country Name	Korea, Rep.	Turkey
2003	23,201	13,354
2004	27,399	15,831
2005	31,647	17,841
2006	36,747	19,547
2007	41,522	21,523
2008	44,301	21,735
2009	46,021	24,447
2010	50,935	25,584
2011	54,717	26,808
2012	57,374	28,501
2013	59,206	31,147
2014	62,691	31,674
2015	64,523	33,113
2016	63,063	33,902
Total population % - 2016	0.126126	0.04237775

Source: World Bank Data, Scientific and technical journal articles
https://data.worldbank.org/indicator/IP.JRN.ARTC.SC?locations=TR-KR,
Accessed at: 18.01.2019

A GDP and GDP per capita examination between selected both countries shows that South Korea reached the same level as Turkey in the late 1980s and surpassed outpaced it during the time. In this part, try to understand why the convergence activities of both selected countries differ by comparing them regarding GDP outcomes. The economic data indicate that Turkey has focused on nearly high consumption and low investment with the low market and construction works.

However, South Korea's precise education policies and the more important point is that the creating of a highly motivated and educated populace is mainly engaged for driving the country's high technology targets and rapid economic development; even, without almost no natural resources and in its small territory. In line with the industry-oriented export strategy of South Korea has made a significant positive impact on Foreign Direct Investment, Current account balance and GDP, as well.

Therefore, South Korea - an unconventional country with an export-led oriented that has caused its economic development history with a national revenue and technology productivity level much higher than Turkey. Thus, the selected county South Korea would be a significant example for Turkey to learn.

As a significant remark, this study highlighted that the current resources of growth in Turkey might bring a more potential increase in the future. The economic conditions are continually interpreting according to today's requirements made by South Korea 50 years ago, an example of the prosperous export-led economy might have developed. Unless the share of high-technology products manufactured, exports will be very low in Turkey.

Table 6. 14 Gross savings (% of GDP)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1976	26	34	Industry Revolution 2.0
1980	25	29	
1990	39	22	
1993	38	19	
2000	34	21	Industry Revolution 3.0
2010	35	21	
2017	36	25	Industry Revolution 4.0
2017 GDP	$ 552,510,690,339	$ 216,035,090,625	

Source: World Bank Data, Gross savings (% of GDP),
https://data.worldbank.org/indicator/NY.GNS.ICTR.CD?locations=TR-KR,
Accessed at: 18.01.2019

Table 6. 15 Current account balance (BoP, current US$)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1976	-310,000,000	-2,029,000,000	Industry Revolution 2.0
1980	-6,845,000,000	-3,408,000,000	
1990	-2,403,600,000	-2,625,000,000	Industry Revolution 3.0
2000	10,444,300,000	-9,920,000,000	
2010	28,850,400,000	-44,616,000,000	
2017	78,460,200,000	-47,378,000,000	Industry Revolution 4.0

Source: World Bank Data, Current account balance (BoP, current US$),
https://data.worldbank.org/indicator/BN.CAB.XOKA.CD?locations=TR-KR,
Accessed at: 18.01.2019

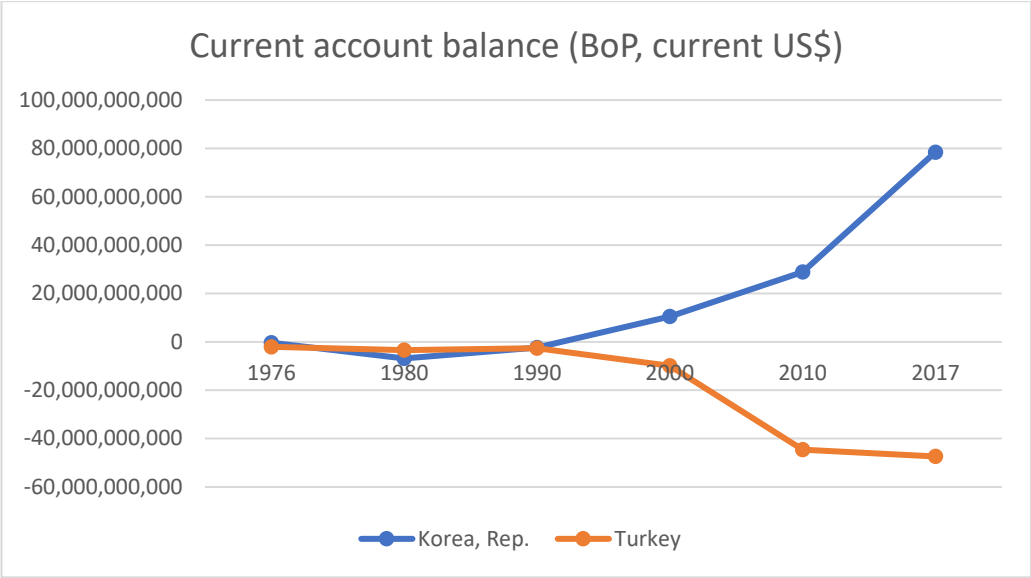


Figure 6. 5 Current account balance (BoP, current US$)

Table 6. 16 Foreign direct investment, Net (BoP, current US$)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1976	-75,000,000	-10,000,000	Industry Revolution 2.0
1980	-4,200,000	-18,000,000	
1990	87,600,000	-700,000,000	Industry Revolution 3.0
2000	-6,667,300,000	-112,000,000	
2010	18,782,500,000	-7,617,000,000	
2017	14,623,000,000	-8,204,000,000	Industry Revolution 4.0
1976 - 2017	19597%	-81940%	

Source: World Bank Data, Foreign direct investment, Net (BoP, current US$), https://data.worldbank.org/indicator/BN.KLT.DINV.CD?locations=KR-TR, Accessed at: 18.01.2019

Table 6. 17 GDP (current US$)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	$ 3,957,873,926	$ 13,995,067,818	Industry Revolution 2.0
1970	$ 8,999,227,202	$ 17,086,956,522	
1980	$ 64,980,820,835	$ 68,789,289,566	Industry Revolution 3.0
1990	$ 279,349,355,714	$ 150,676,291,094	
2000	$ 561,633,125,840	$ 272,979,390,595	
2010	$ 1,094,499,338,703	$ 771,901,768,698	Industry Revolution 4.0
2017	$ 1,530,750,923,149	$ 851,102,411,118	
1960 - 2017	38576%	5981%	

Source: World Bank Data, GDP (current US$),
https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=KR-TR,
Accessed at: 18.01.2019

Table 6. 18 GDP per capita (current US$)

Country Name	Korea, Rep.	Turkey	Industrial Era's
1960	$ 158	$ 509	Industry Revolution 2.0
1970	$ 279	$ 490	
1980	$ 1,704	$ 1,564	Industry Revolution 3.0
1990	$ 6,516	$ 2,794	
2000	$ 11,948	$ 4,317	
2010	$ 22,087	$ 10,672	Industry Revolution 4.0
2017	$ 29,743	$ 10,541	
1960-2017	18696%	1969%	

Source: World Bank Data, GDP per capita(current US$),
https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=KR-TR,
Accessed at: 18.01.2019

The world has entered a new era; Military, space, science, and most importantly in the field of education are turned into information systems one by one. Information technologies are used as an enormous source of power those who want to keep their place in the country classification. When look at the countries that are advanced in education, can imagine that they use computer technologies in education in a good way. In this circumstance, it would not be the wrong approach to express that the effect of education and science on high technology production process success is at the maximum level. Two main components; Science and technology all describe a successively broad category of activities which are incredibly interdependent. Investment in education within the country should be considered as a factor that will shape the future. Because the development of countries in different fields is a determinant of the education of those countries, it is a whole with the development of the countries (Korkmaz, 2005).

Meanwhile, the world has been encountered the uncontrollable technological advancements, education and science have been playing an essential function for countries which desire to increase their economic growth and accomplishment. The education power of an economic impact to macroeconomic and microeconomic circumstances such as GDP/capita, R&D investments, international competitive trade index. Therefore, it is good to examine the effect of education in Turkey and South Korea in order to explain the positive correlation between education and high technology manufacturing process. As mentioned in the first part, there are remarkable similarities in these countries to compare them in each other. In the 1980s, the per capita income in South Korea roughly equal to the per capita income in Turkey. Technology and education perform a frequently significant role in the economic growth of both developed and developing countries. Especially, education is so crucial for competitiveness and advancement. Decision makers around the world improve government investments and policies to expand their nations' education and science capacities in order to protect their positions in the global market competition. Development and development strategies of countries have been the subject of many studies in the national and international arena.

After this point; the economy development performances followed by South Korea and Turkey's education approach examined; the tools, methods, and instruments whatever they used to develop in the education sense have been evaluated in order explain their welfare differentiations process, and it has been tried to determine how the models are successful and unsuccessful by following an economic policy. The rest of the theme is designed as follows:

i. To provide a brief education overview of Turkey and South Korea
ii. Government expenditure on education, total (% of GDP)
iii. PISA: Programme for International Student Assessment
iv. To present global education index rating data,
v. To recommend the suggestions of findings with conclusions.

6.2. Education Overview of South Korea

South Korea's staring ongoing industrial improvement can emphasize three significant factors: the immediate increase of capital resource, the advancement of human power and the rise in productivity outcome. Notably, the qualified human power defines and distinguishes the development of South Korean education. This development came up form an efficient expanse of the well-planned education system and the contentious structure of public and private sectors, and institutions and internal company educations. Notwithstanding limited natural resources were causing energy dependence, Korea actively strengthened its economy and uprisen from two national destruction circumstances: Japanese colonialism (1910–1945) and the Korean War (1950–1953). What would be the explain nation of South Korea's active economic victory? One explanation could be in the role of human resources, which is a nation's qualification of educated and trained workers that manage economic strength. In this part; The South Korean's state approach was the starting point for the 1960s when it started its development process. The power of education instruments used by the South Korean government for economic development aims, the education strategy followed, and the state's effectiveness in the economy was tried to be put as a primary goal. It has been explored how the South Korean State has developed a robust state mechanism

in economic development through education. This paradigm transition reforms of education in South Korea and the further expansion of this reform in the following years have led to the diminishing of the educated population gap as needed in development plans. As the richness of skilled human capital is directly correlated to education, the advancement of education to the development of South Korea resembles profoundly meaningful. That is why many research on East Asian economies, mostly South Korea, overwhelmingly promote the human capital approach (UNESCO, 2006a).

Therefore, most researchers and observers agree that the significant weapon in the development of East Asian countries is the concentrate on education development. According to the Economist; the essential power of Asian Tiger's competitive advantage is well-trained workforces. The literacy rate of the labor force employed in South Korea's production area is 100%. Technical training has been supported for many years, and its technical formation is also influential. The executive and engineer staff is very well trained, and the education level is reflected in wages; thus families' desire to educate their children is compelling, and the savings made for this purpose are significant (Kim et al., 1995).

South Korea has accomplished to be one of the fastest of economic advancement among its cluster in the world. From 1966 to 1996, its per capita income reached an average of 6.8%; thus it gained a place in OECD Members in 1996. What could be the most significant element to achieve this goal in this period? The South Korean administration prioritizes the country’s education policy because it is also observed as a useful, primary tool for sustaining national economic development. South Koreans have achieved a remarkable improvement in shaping education accessible to their citizens.

Nevertheless, South Korean education policy has been acclimated to the requirements of growth and structural changes in the economy (Kim-Renaud 2005, pp. 5–6). South Korea has encountered great economic extension over the last 50 years and now is one of the biggest economies in the world. Throughout the years 1960–2012, South Korea gross domestic product per capita increased from $1,467 to $21,562 (World Bank, 2014).

South Korea's technology policies can be analyzed under the two phases before and after 1980. During the 1960-1980 period, the first approach was to acquire foreign technology and to use it in specialization. In the first years of this period, the production of imported products by imitation was tried to be accomplished. The information obtained from the imported investment goods has been disseminated throughout the country. Again, during this period, South Korea was trying to develop its research and development centers in this parallel. South Korea changed its technology policy after 1980. In this period, the state emphasized its efforts to build a national innovation system in their boundaries. After 1980, most of the R & D started to be actualized through private sector companies or public-private partnerships. Public research institutions gained significant attention to advanced technologies and have played a bridge role between universities and research laboratories. The South Korean government has changed its policy of having the technology. The paradigm change caused more comprehensive and science-based technology structure in South Korean manufacturing life (Kim et al., 1995).

In 1945, the education scale of Korea was a minor 22%, and less than 20% of children registered the secondary school. The 1948 Education Act contemplated the regulation of an education policy that completely matched the Chinese policy. Financial support from other nations such as the United States greatly encouraged and developed the industrialization of the Republic of Korea, which has had outcomes for the composition of the national education policy. The Ministry of Education has been engaged in all sorts of education in South Korea after 1948. The education ministry has supported many reforms to increase competitiveness. With the beginning of the 1950s, the main idea was on reconstructing the education regularity with tremendous importance on affordable or democratic education structure. National schools, universities and teacher-training institutes were established, and textbooks designed for the primary school. In the 1950s, if low-level proficient workers were demanded in labor-intensive businesses, attempts were organized to offering a massive-scale education operation to provide a hand-operated workforce throughout its ambition for industrialization movement in the country, the South Korean educational practice including its importance on the primary and secondary education system and more

importantly equal access to reach educational resources. Therefore, the education system provided quite well and adequate students of relatively high average quality to the national economy. In this regard, one of the main concentrations of the Korean system was the high expenditure for educational development.

Recognition to the importance of focusing education, it has moved its level of development to the forefront every year. It was extremely beneficial for many educated people to have their master's and doctoral studies in developed countries also to synthesize and adapt foreign firms to the national economy. While South Korea was more rural in the pre-1960 period, the country was transformed into a sudden change in 1970 through educational development. In the process of industrialization of South Korea, each period has completed by its internal dynamics in a fast manner and moved to the next stage. This rapid change is one of the most important results of South Korea's importance to education and science. It has always also received unconditional support from the state to realize the technology development, and the state has been intimately involved at the global level in its industrial development process.

In the 1960s, proficient workers were in outstanding need for light manufacturers, and the perception was changed to developing vocational knowledge at the secondary school grade. As the influence of heavy manufacturers started in the 1970s, engineers who could operate complicated advanced production processes were in need. The number of junior universities doubled or almost tripled during this period.1960s and 1970s witnessed a change in the quantitative enlargement of the student number, educational plants and the quantity of well-trained teachers. The South Korean educational policy mainly supported to industrialization movement throughout the 1961-75 period. Admittedly, the magnitude and ambitions of advancements in educational accomplishment were vital ingredients in Korea's development strategy. Investment in education had a significant impact on the quality of the labor force. Therefore, the number of operating persons holding some secondary or higher education doubled from 16 percent to 32 percent from 1960 to 1970 — the most notable development that the proportion of those having no primary education diminished from 45 percent to 24 percent in the same years. Thus a well-educated, highly productive labor division promoted the development of manufacturing movements, and thus this development resulted in the fast growth of labor potency and

incomes. Growing the number of students resulted in a massive struggle to get acceptance for higher education. In a few years, though, the amounts changed dramatically; registration rates touched 90% for primary school in 1964, and the similar thing happened for middle and high schools in 1979. In the 1980s, industrial competitiveness was standing on "high-level technology" production and IT - information industries shifted to an acute position, and this difficulty pushed the Korean administration to increase education and positive sciences. Korea developed elementary education accompanied by secondary schooling, and right after achieving this discharge the responsibility aimed its importance to the development of higher education. This progression of education policies matches remarkably parallel with economic development aims (UNESCO 2006a).

In the post-1980 period, a new component was added to the education system in South Korea. The name of this component is lifelong or permanent learning approach. The new regulations have begun to be shaped around this understanding, based on the understanding that there is no limit to learning. Besides, vocational education has become another prominent factor along with lifelong learning. As a result of these regulations, it is aimed to increase the education and quality of the general public, and the developments in the path of knowledge economy have been gaining speed.

The course load was mitigated, and it was ensured that the course was directed towards personal needs. Therefore, the rote learning system is abandoned. Different learning activities are created rather than the information in the book. These arrangements are made for the purpose of individuals training who will adapt to the education system that is in continuous innovation. It is aimed to be at the forefront of talents and creativity in the latest curriculum system which is entirely student-oriented. Also, it is stated in the curriculum which characteristics should be in the educated individual. Besides, the performance evaluation has started to be implemented in universities. Also, innovations in the supervision system in the schools have been continuing to find the best way (Levent and Gökkaya, 2014).

The financial and welfare improvement of the country has been a breakthrough point since the 1960s.In South Korea, to be technology produces country idea has been given great importance for welfare. Since the 1960s, technology parks, industry and

technology were tried to collect under one hub in the region, and research centers have established. In a short period, South Korea has mutated itself from an underdeveloped country to a well-industrialized country exporting "high-technology products" (Domjahn 2013, p. 16). The South Korean administration built a powerful public-school system and operated it as the ultimate tool for the country's nation-development project.

Education structure produced a new assortment of policies, doctrines, and abilities that promote the economic welfare structure of the country. Accordingly, there has been faced a slight difficulty that the education system performed a notable character in the nation-development method of South Korea (Lim 2005, p. 17). Education is standing at the heart of South Korea 's long-term improvement policies and strictly connected to industry market requirements; it is including a high pre-eminence for decision makers. Therefore, South Korea's expenditures in the education area, technology infrastructure, and research and development investments as a percentage of GDP are very remarkable and higher than among OECD countries. South Korea's improvement policies, labor market requirements, and education preferences are firmly regulated. Every five years plan, the Ministry of Education, Science, and Technology updated and improved the national curriculum planning curriculum planning, given the fact that reforms in the economic and national conditions **(**Severin and Capota 2011).

The teaching profession is not only a respected profession in South Korea, but it is also a profession choice with a permanent job and desirable working conditions. It is a profession that is preferred by young people because it is respected by country and has a high status in society. Besides South Korea, the education system makes it possible for graduates for minimal people, 5% of their class can start teaching career end of the education periods. This system enables the education profession opportunity and assures sustainable teacher quality for the long run. In South Korea, instructors are chosen from a group of applicants with high educational achievement. Applicants have to answer asking obligations and make well on examining tests to start the education profession life. The South Korean Education Ministry believes that compensating teachers to good wages is imperative for reaching the best people to start teaching, and for encouraging teachers to stay in the profession circle. Therefore, in contrast to

another top education practices, a teacher's wages in South Korea is among the special in the world and improvements constantly over time.

Furthermore, teachers are regularly encouraged to keep them up-to-date of new developments in their fields of knowledge. Also, instructor wages is quite respectable in South Korea and improves over time opportunity, supporting and encouraging instructors to continue to their the profession long-term. In an example, the sub-limit wages for teachers was US$ 28,569, which is higher than the OECD average (US$ 25,727) in 2006. The significant part of the salary is that after 15 years of a teaching career, South Korean instructor wages reach to US$ 49,000, which is also better than the OECD standards (US$ 35,099) (UNESCO 2006b; Severin and Capota 2011).

Table 6. 19 Wages and GNI in South Korea (Unit $ based on PPP)

	Primary	**Middle**	**High**
Salary (A)	43,952	43,800	43,800
GNI (B)	10,841		
A/B	4,05	4,04	4,04

Source: http://siteresources.worldbank.org/EDUCATION/Resources/278200-1121703274255/ 1439264 -1153425508901/ Development_Education_Korea.ppt. Accessed at: 12.10.2018.

Having well-trained teachers are necessary and must respect as there is no replacement for great teachers. The influence of well-educated teachers is essential for the contemporary educational structure and can be associated with favorable societal circumstances, such as a greater aim to produce high technology. Having the excellent teachers is about more than spending a good salary. The best-performing countries bring top talent, encourage teachers entirely their professions, and allow them liberty.

South Korea, in order to provide excellent education opportunities, it continues its efforts to increase schooling rates. The fact that the resources allocated to education are high after doing these studies was necessary. Policies are implemented in order to obtain the desired effect from the training. Behind the success in this field, of course, it is essential to be willing to learning. There is no limit to development in the field of education. It is inevitable that the education pillar of the policies will be updated continuously and shaped according to the requirements of the knowledge economy.

The fact that all the individuals in the society receive mandatory primary education and the literacy rate should close to 100 percent is one of the criteria indicating the success of the knowledge economy. Therefore, a country that started the journey of knowledge economy with education will undoubtedly achieve success in this field (Kelleci, 2003).

The time consequently came for South Korea to rearrange a new paradigm of the education system that encourages excellence, creativity, and lifelong education, moreover that indicates not merely formal education, though overall human resource advancement. The new idea of the rearrangement works would be caused major privatization, decentralization, and diversification of the Korean education system and the increase of competition in the market. Remarkable sections of the government's amelioration plan that are crucial for answering to the requirements of the knowledge-based economy or to be the producer of high technology products include as the following (Dahlman and Andersson, 2000);

i. Extending sovereignty for private secondary and higher education, including revisions in curriculum and courses, and allowing academics to establish their selection and acceptance conditions
ii. Combining the contemporary approach, intensive-additional vocational training courses and Internet-based distance education and training arrangements in order to answer the increasing demands of constant education opportunity
iii. Rebuilding the application of public and private support to highlight advancements to develop the conditions of education at all stages.
iv. Indeed, self-responsibility at the all institutional stages and decentralization to improve internal decision-making ability at schools and academies.
v. Especially, universities should be supported to expand important collaborations with well-known universities, instructors and help faculties for exchange and collective courses.

Apparently, South Korea which is described as a late-industrializing country tends to support great convenience to education opportunities than was usual in their earlier periods of industrial development. What is the remarkable point here is the pertinent

preeminence of South Korea, via the contemporary education system, in this area of social paradigm?

South Korea, which puts great importance on education capability, their strategies have shaped both human capital and education policies through Confucius culture. According to this understanding, knowledge and knowledgeable people became the center. Consequently, South Korea increased its quality of human capital. As a result, in the transition period from learning to teaching, which was expressed by Alice H. Amsden, South Korea was able to use the student period efficiently. In the years when it was recognized itself as a student, it understood the necessity of perceiving the opportunities in front of him and avoided being a dependent country. The next step in teaching period, science and technology, innovation, education, R & D policies have stolen the spotlight of the whole world since it has achieved significant success in these sections. In this period of real maturity, South Korea adopted by some countries as a teacher or stayed as a just role model (Akkemik and Ünay, 2015).

In the this part tried to draw boundaries of main idea around well-planned of education system is a crucial determinant of high technology production capability is well-attested for South Korea which under the favor of the size that a well- educated population in the country, and a generous supply of qualified technicians copiousness, resemble to have been critical power to produce or to be producer of high technology products. South Korea owes its transformation from a developing country to a leading industrial economy over the last fifty years, mainly to the success of rising emerged in studies of education development policies. In the South Korean society, where competition has been intense, families place the high value on education, and children are willing to participate in the learning effort. A dynamic private education sector, which complements public schools, responds quickly to the individual needs of students (Amsden, 1992).

South Korea is a country that was able to realize the importance of innovation activities and realize its economic development in this direction. South Korea has given importance to R&D activities within the framework of science and technology policies and has taken the result of these studies. Regarding the number of patents applied,

South Korea is in a great position. South Korea is the development and advancement of technology development investments, resulted in high technology research and development activities. Moreover, it has understood the importance of supporting entrepreneurs with various incentive methods for the creation of an innovation environment and the development of training methods that will enable the development of a qualified labor force. South Korea's technology policies have been gradually developing. Human resources played an essential role in the development model based on innovation via education development. The development process in South Korea started with technology import. However, investments in education and specific industries supported this process. In the following process, South Korea shifted its exports from labor-intensive products to technological products by intensive capital production (Hong, 2010).

In order to keep up the pace with the technology of the world was realized that the power of sustainable development of innovations and R&D activities. The scientific brain that is going to reveal the innovations activities would not happen without education. Therefore, many countries that have shown enough sensitivity to the subject of education and learning are the countries that have made progress in the information era. Training should now be equipped with the requirements of information technology so that the desired consequence can be achieved. The key to success in the education system is to educate people for the future. For this aim to be planned and implemented, all educational institutions of a country should work in a coordinated manner. Consequences of planned studies, the education system in the country will have a structure that is appropriate to the requirements of the time. A contemporary education system should be designed especially for the realities and needs of the country and the world. Students should have sufficient knowledge about science and technology to be a high technology producer country (Kavak, 2009).

In South Korea, in 1960, everything started with the acceptance and putting the information technology training to the education policies, this education movement was also followed by the enactment of the Law on Science and Support. Following the adoption of the Law on Encouragement of Technological Development, relevant researches have been encouraged to meet the requirements of the industrial needs. In the 1980s, following the 20-year adaptation and implementation of these strategic

actions, South Korea now has reputable and international senior engineers and scientists. After this period when national R&D projects were put into practice, the South Korean economy has taken its current form and now has an economic structure operating within the framework of the demand-oriented technology development system for the world. Having an industrialization model that produces its technology, South Korea has many global brands which can be considered as technology giants. As it can be seen, South Korea's success in directing the education and training system in favor of the sector chosen as the driving force of growth and being integrated with the industry and supported by laws and regulations in this direction has led to success in South Korea. The process of commercialization of knowledge undoubtedly requires a qualified workforce, and the training of qualified workforce is carried out with a well-structured and innovative education and training system. A system of education and training that is focused on the basic sciences and adapted to the potential developments, thus which can be converted according to the demand is applied by the countries that orientate the global path. The characteristic feature of the countries such as South Korea that did not stick the middle-income trap, and reached to higher income level is that they produce high value-added products with high-income elasticity coefficients, their global brands, and correspondingly lower price elasticity coefficients, and therefore export their products and consequently increase their income levels rapidly.

Today, when globalization is developing rapidly, the production of products with this quality is provided by some structural transformations. The economies that could not make the necessary fundamental change and therefore could not produce the products with the mentioned high technology quality has been standing at the heart of the middle-income trap.

6.3. Education Overview of Turkey

It is possible to accept the emergence of education as the birth of the world for every context of problems and solutions. Notwithstanding, in real terms, education has become a science since the 19th century. Education as science seeks to find the rules and principles of planned change and development of individuals' behaviors according to specific goals and to develop techniques to achieve this. In addition, education has

many obvious functions that are intended, predicted and planned primarily social, cultural, economic, political issues such as teaching the society's cultural accumulation to the new generations, teaching the norms and values of the society in terms of socialization, educating the number and quality of the labor required according to changing conditions. Countries should not forget the fact that education is an essential component of economic growth and should not avoid making investments in this field for the future. As indicated above, there is an incredible revolution in the world last three decades as the world goes to the digital industry. It is a system that connects everything to the network and brings it to a smart environment, and this is completely breaking point. Therefore, if people do not give enough importance to science in the schools, they cannot success anything for their nation (Konuk, 2003).

Education is an essential element in order to keep up with the era we are in and to have an essential place in the globalized world. The high quality of education means qualified labor and dynamic society. Individuals in such a society will also contribute to the development of the country when appropriate conditions are met. For this reason, schools that serve as building blocks in education are of vital importance in raising qualified people and increasing the welfare of the country.

Singer (1964) highlighted that education is the most significant dynamism to create differentiation among the countries. According to this approach, the level of development capability of countries is equivalent to the amount of expenditure on education capacity. He also discussed that two essential components of education expenditures in order to explain his assumption on the influence of education. According to this, the first component is not the order of decreasing efficiency with education expenditures, but the would-be law of increased productivity. The second component is that education and development investments are positively interrelated. In this context, the investments made in this field may create unimaginably new opportunities.

Turkey, including a harmonious historical story, is a republic established in 1923. Even though it has a very long story since the Ottoman Empire, this part of the study concern right after the foundation of the Turkish Republic since the educational policies improved rapidly. Mustafa Kemal Ataturk who is the founder of modern Turkey was

trying to design for modernization and to develop to educational institutions. In parallel with these developments, the Ministry of National Education was established. Many necessary actions were realized. On 3 March 1924, secularized education policies were established. Primarily, it is imperative to highlight that religious schools were shut down with the related notice, and positive science structure of education was set up. The most significant paradigm transition in the society associated with the transition from the Arabic alphabet to the Latin alphabet, it was adopted and used in 1928. This critical change touched the Turkish Educational System profoundly. Quickly after that state schools and education programs were started to teaching life with its new Latin alphabet. Therefore, it is essential to emphasize that still the principles of Atatürk, and his picture still hung on the classroom wall to give the messages about the importance of reaching the level of contemporary civilization to all students (Güvenç, 1998).

Education helps the individual discover his / her potential and creative power; provides human development, increases the sensitivity and harmony of the society and the world in which it lives, develops awareness of citizenship, and provides the skills, and knowledge equipment required by national and international labor markets. In addition to this, especially applied education increases the capacity of individuals to apply what they have learned to real life, enables them to use new information and technologies effectively and to be more productive according to the conditions of the day. Education is perhaps the product of long-term productions, but it is becoming the necessary investment of the economy as a tool that prepares the human resources that provides the social and economic development of a country.

The purpose of this part to remind to Turkey should understand and accept well-structured education policies as a significant element of its cultural, financial, health and other relevant actions to develop the welfare of its people, pointing continuing arguments of human rights and encourage the nation’s competitive status in the global market with the knowledge-based economy approach. Turkish economic competitiveness entirely depends on the link between education and the rapidly changing labor market.

Moreover, one argument against this cannot be ignored that Turkey has performed considerably extraordinary improvement in their economy, particularly in the past decade, however the nation keeps distance against other nations in educational achievement, the importance of its education policies, and there are notable inequalities in accessing educational opportunity among socio-economic societies and from East to West. The high population growth rate and the migration from the rural to the cities seriously cause pressure on the education system, and regional differences in the infrastructure of the system have eliminated the opportunity and gender equality in education; it dramatically hampers the education opportunity of girls in the country. Sustaining contemporary education reforms are mandatory for Turkey's future, not only for EU's visa exemption, even more importantly, for Turkey's competitive status in the global knowledge market.

In Turkey, the problems in the field of education have been continuing at a serious level. In the Turkish education system has a lot of problems, which have been still coming and continuing. Especially in the twentieth century, developing technology process, changing lifestyles, and the inadequate instructors of education have been playing a pivotal role in the nation's economy. Besides, Access to education is still problematic for specific socioeconomic groups, the literacy rates are still not at the desired level, the problems experienced in vocational education, a high rate of unemployment among young people who are not involved in business life and vocational skills are insufficient to respond to the needs of the skills even though provided by education. The country has been struggling with many educational issues for a very long time. Not only in Turkey, but there was also no any country in the world to catch the level of contemporary civilization without well-structured and analyzed education policies; thus, development and advancement may stay as a just dream in the countries' development plans.

Nowadays it is indisputable that education has essential effects on economic growth and to be a high technology producer country. Studies on the effect of education on growth have a prominent position in economic theory. A wide range of literature has emerged for this topic.

Many researchers in different research openly express problems in the education system in Turkey. One of these researchers Özyılmaz (2013) highlighted respectively the main problems of Turkish education system without hesitation, the problem of ideological approach to education, the problem of not having experts, the problem of education management, the problem of curriculum development, the question of student personality services, the problem of inspection in the modern sense, the problem of the place of public and private schools in education, the problem of financing of education , the problem of teacher training and employment, the problem of transition to middle and higher education, the problem of education levels, the problem of learning teaching process and the problem of nationalization of education.

Furthermore, Yılmaz and Altınkurt (2011) conducted a study about the problems of potential teacher candidates and the education system as indicated following; the education and examination system of pre-service teachers, central exams, crowded classes, rote learning and teaching education methods, hardware and physical structure insufficiencies, the quality of the current teachers, the teacher assignment system, the low number of teachers, ongoing teacher training system, inequalities in access to education, politics (nepotism), private tutoring centers, financial problems of schools, vocational and technical education, guidance, unified classes, accessibility, centralized structure of the system, unproductive school-family cooperation, violence in schools, superabundant unemployment of higher education graduates. In Turkey, where education policies are always established and structured around the government policies, and therefore the country has an ever-changing education strategy, many problems arising from this permissive constant change, and remain to exist and contribute new issues.

Furthermore physical, infrastructural and hardware deficiencies are another difficulty in Turkish education. In the country, almost every month, many new applications and reforms are implemented such as the reduction of class over crowdedness, physical and hardware, smart boards, tablet, and computer classes. In this regard, the rapid increase in the population of our country, the change brought with new demands or the budget devoted to education, but these developments still were inadequate to meet the expectations of the change. Besides, technological developments and scientific advancement studies are mostly arising in foreign countries such as Europe, America

or Far East countries. Due to the second language learning problem in Turkey causing problem for improvements in science and technology, and reducing to gaining benefit from information technology. Today, the information societies have preferred English as the communication language. Turkish students should increase the capability of learning foreign language skills to follow up the requirements of the era (Gedikoğlu, 2005).

The Turkish education system did not get worst suddenly, and it has already had several problems that have been waiting to be solved on the table for the contemporary education system. The new requirements and globalization emerged as a result of rapid changes and transformations in science and technology in the twentieth century, and the system became even more ineffective and inefficient.

During the time Turkey has missed a few points about the power of education such as; countries that need to show sufficient sensitivity to the subject of education and learning are the countries that have made progress in the information age. Training should be well equipped with the requirements of the information technology era so that the desired effect can be achieved. The key to success in the education system is to educate individuals for the future since the revolution duration period has been reducing. In order for this situation to be planned and realized, all educational institutions of a country should work in a coordinated manner. As a result of well-planned courses under positive science, the education system in the country will have a structure that is appropriate to the requirements of the age. A contemporary education system should be designed especially for the realities and needs of the country and the world. Students should have sufficient knowledge about science and technology. Particularly creative aspects of the student should be discovered. The student should be directed to investigate, examined and this approach help him/her to ask a question capability. In fact, it is possible to reproduce what needs to be done. In short, the education system should be focused on the student, and the information should be transferred to the student with the technology required by the time. It will open the doors of the country towards a prosperous future (Kavak, 2009).

The education system which sets the foundation for the formation of a social structure should not be determined by bigoted and superstition both negative effects should be

removed and eliminated without further damage to Turkey, and it is development process. Immediate work should be initiated to provide a compulsory and uninterrupted scientific, secular and democratic education. The new generations that will form the future of our country should be educated by the education system given in the mind, science and art environment.

It is recognized that researches were aiming to determine the problems of the education system and they are emphasized with similar judgments. The point that should draw attention to this argument is that the results of the research conducted by different researchers on similar subjects in different periods are indicative of the fact that the problems have not disappeared from country's agenda over the years. Education has an essential role in the development process for countries. On the one hand, while fulfilling the function of providing workforce in the quality and quantity needed in the development process; on the other hand, it contributes to follow-up, development, and production of modern production technologies with the function of producing and distributing knowledge. Higher education level increased labor productivity; It has a positive effect on the competitiveness of countries and facilitates their globalization aims. Differences in educational approach can cause economic performance differentiation between developed and developing countries would be one of the most important reason.

It is accepted that education is one of the main determinants of economic growth. The positive relationship between the level of education and technological progress affects not only the per capita output, level of human capital as well but also has a permanent impact on the increase in output. Would be good to emphasize that the high level of national income per capita in the national economy is not sufficient for explaining the development of the country. Despite the high level of income, the existence of countries where social problems cannot be solved, it requires a better establishment of the relationship between economic growth and human development. The most critical function in establishing this relationship is the education system. Therefore, education is not only with the economic outcome; it is an important process that contributes to the development of countries with its effects on political, cultural and social fields (Demir-Şeker, 2011).

These explanations complement each other and help to illuminate the phenomenon of the problem of education in Turkey, positioned between the main components of teacher knowledge, finance, school management, educational environment, students as possible to discuss numerous aspects of the examination education quality in Turkey. However, it is primarily structural problems that need to be discussed. There are undoubtedly inequality and low-quality obstacles. First, the education system causes social inequalities and makes it difficult to avoid from the point of disseminating equality of opportunity by reducing inequalities. Second, the problem of quality in education, thus Turkey's growing wealth and prosperity has become the source leads to remain very inadequate because of the majority of the low-skilled labor market.

It is another issue that criticizes the political preferences have been playing the critical role in determining the policies of educational practices process. Even so, it is possible to see that this kind of approach in each political period of Turkish political history, it cannot escape from this dilemma. The main reason for the intensification of the problems in education is the most of government's approach to education policies, and it is unstable practices. Of course, every political power wants to reflect its core values to education, but there are painful truths to be technology addictive. However, the problem is whether these thoughts and values are in line with the change and development trend of this century. Also, the problem of the education system in Turkey, mostly depended on one person's attitude, request and forced top-down approach to a system irreconcilable with the fundamental dynamics of today's mentality, value, and applications. The approach aims to equip the education for short-term party interests. As a matter of fact, the government is a budget allocated to religious schools, and it is more one and a half times than the budget which allocated to educational investments. (Cumhuriyet, 2018).

The most important focus of education according to many activities is that it is related to investing in the future of individuals, companies, and societies. In this respect, education plays a critical role in the transformation of economic and social life, in other words, regarding welfare and quality of life. Therefore, Turkey should understand what are the significant problems in the education systems as mentioned by researchers;

i. Educational aimlessness,
ii. Problems stemming from the curriculum,
iii. The rote education system,
iv. Opportunity Inequality problems,
v. Physical and Material Deficiency problems,
vi. Crowd Classes problems,
vii. School Administrators problems,
viii. Teachers problems,
ix. Students problems,
x. Exams problems,
xi. The consistency of Guidance problems,
xii. Pre-school Education problems,
xiii. Vocational High Schools problems.

Turkey should prefer contemporary approaching to the problems in the field of education and management at all levels of education, educating has to encourage Turkish young people for hopefully and happily, looking at the future with confidence, ensuring their well-being, creating a social justice and peace environment, etc. In order to achieve equality of opportunity in education for all citizens, it is essential to educate generations that have adopted democratic values, secularism and underlying philosophy of the Republic which is our core value.

In this framework, it should be the primary objective of education policy to ensure equal access to quality state education as a product of the fundamental rights and social state understanding and equal opportunity principle. In the schools, an individual-centered and developmental approach should be adopted rather than a success-oriented and competitive educational approach.

Besides, with the education policies to be developed, it is necessary to meet the needs of the well-trained labor force and to compete and develop our country in the globalized world. Reform in education cannot be realized only regarding fundraising. Holistically courses to integrating into the education system do not comply with the current situation and requirements of society, economy, technology. It must be handled within the framework of its structuring.

Especially the opportunities provided by information technologies should be used quickly and widely in education. This will help to improve inter-regional imbalances, improve the efficiency and quality of education, train labor force appropriate to the needs of economic sectors, increases the effectiveness in areas such as continuing education.

It is necessary to regain respect for the teaching profession, as they are the architect of society. By changing the conditions of examining the teaching profession, also an attractive fee and quality education program should be introduced. Teachers and managers should support with contemporary training and graduate programs in the field of profession.

BBC Capital is published very significant research about China's examination system. It is stated that university entrance exams in China suppress students' creativity and this situation causes China not to make innovative products. The implementation of the examination system in China has a considerable similarity in the examination system in Turkey. During the examination process, university students are channeling to solve the questions in a particular mold as soon as possible. As a result, alternative and creative thinking are being suppressed. In the courses taught in high schools, there is almost no curriculum for the culture of science, and those found are committed without any seriousness. Expecting the importance of science is not a realistic approach to expecting high school students to produce science and technology (Vincent, 2015).

Now the world is facing rapid change in technology, globalization, and increasing competition. In this process, countries should pay the utmost importance because the primary source of this process is education. When we define education as a process that develops people's skills and skills and provides them with knowledge and skills and socialization, the relationship between education and development is understood more clearly.

Unfortunately, Turkey is very weak in science and technology production due to their education policies. Thus, Turkey has been standing in between Industry 2.0 and Industry 3.0, while today the competitor countries are preparing themselves Industry 5.0. Turkey is a country that technology import-based composition. The most

important reason for this situation is the lack of education system in the future. Although there are various objectives related to technology and education in development plans, these objectives have never been achieved in practice. In recent years, Turkish technology consumption has increased wildly, and as a result of technology imports, Turkey's current account deficit and external debt are continually increasing. The problems we are experiencing bring to mind the question of why the technology we use cannot be produced within the country and with national resources. However, especially right after the Industry Revolution 3.0, the high technology production is impossible without well-structured education policies. One of the necessary standard used to determine a country's level of development with the quality of its human resources as it is seen that developed countries have advanced countries that have enough labor force in the expected number and quality.

In contrast, most developing or underdeveloped countries such as Turkey, are experiencing severe problems in raising the labor force needed by their economies. The necessity of increased investment in education in Turkey is a subject continually being discussed. However, educational and political development efforts are still underway, but education investments are not at the expected level (Ereş, 2005).

Technology revolution, developed by information technologies, brings with it radical changes in the economic field. The effects of the technology revolution on economies of scale and global competition increase the importance of education. Every revolution in the past has changed the social and economic roles of people and country. The countries that have established the necessary conditions of the revolutions have become advantageous in the economic field. Countries that cannot establish the necessary conditions of the revolutions have not utilized an economic advantage and have fallen into a market position. These developments are all-important because of the technologies used in the new industrial revolution, in addition to reducing costs and increasing productivity.

Turkey and South Korea in 1950 had the same economic dynamism. There has not been a significant change in these circumstances until the 1970s and 1980s, especially since the 1980s, with South Korea's information and communication technologies with a five-year development plan put in the right place at the right time and application

Turkey has started to open the scissors between them. High-tech sectors include aerospace, computer, electronics, optics, and pharmaceuticals. South Korea, which has taken rapid steps in science and technology, has become one of the leading countries for High-tech sectors today. There was a significant positive correlation between high technology export / manufactured export rate and trademark applications in South Korea. To be more precise, South Korea's primary development started with education policies, and we can see that education was based on everything.

Was it a coincidence that almost all the developing countries that succeeded in the production of high technology were successful in science, especially in education and sciences? Of course not. The visible part of technology is the essential components of education and sciences such as physics, chemistry, biology, and mathematics. Therefore, it is not possible to reduce dependence on foreign sources in technology without reaching competence in education. The goal of high technology manufacturing is fundamental to a country’s economic growth., but how did both countries support this view economically? Moreover, public expenditure on education is essential for developing education and knowledge capabilities. Therefore, it is essential to examine both countries' Government expenditure on education, total (% of GDP) for the connection between public expenditure on education and economic growth and influence on GDP.

Table 6. 20 Government expenditure on education, total (% of GDP)

	K	T	KOR	TUR	KOR	TUR	KOR - TUR
Year	**%**	**%**	**GDP - US$**	**GDP - US$**	**KOR -Total US$**	**TUR -Total US$**	**US$**
1979	**3**	**3**	66,567,975,207	89,394,085,658	2,021,017,068	2,606,016,381	-584,999,313
1981	**3**	**2**	72,425,590,649	71,040,020,140	2,114,074,089	1,568,776,846	545,297,244
1982	**6**	**2**	77,773,431,088	64,546,332,581	4,959,860,430	1,132,730,040	3,827,130,390
1983	**4**	**3**	87,024,427,973	61,678,280,115	3,787,198,740	1,632,994,105	2,154,204,635
1984	**4**	**2**	96,597,434,180	59,989,909,458	3,905,588,783	1,217,333,310	2,688,255,472
1985	**4**	**2**	100,273,097,170	67,234,948,265	4,038,118,064	1,168,617,323	2,869,500,741
1986	**4**	**2**	115,537,126,326	75,728,009,963	4,248,115,353	1,143,167,322	3,104,948,031
1993	**4**	**3**	386,302,839,274	180,169,736,364	14,516,797,030	6,063,558,305	8,453,238,725
1994	**3**	**3**	455,602,962,225	130,690,172,297	13,993,434,672	4,475,916,175	9,517,518,497
1995	**3**	**2**	556,130,926,913	169,485,941,048	16,631,652,107	3,815,315,098	12,816,337,009
1999	**3**	**3**	485,248,229,337	255,884,300,382	16,762,609,501	7,386,458,752	9,376,150,748
2001	**4**	**3**	533,052,076,314	200,251,925,587	20,775,331,234	5,315,367,019	15,459,964,215
2002	**4**	**3**	609,020,054,512	238,428,126,327	23,097,816,048	6,554,246,114	16,543,569,934
2003	**4**	**3**	680,520,724,062	311,823,003,531	28,121,906,790	8,969,994,278	19,151,912,512
2004	**4**	**3**	764,880,644,711	404,786,740,091	31,477,057,945	12,225,369,181	19,251,688,764
2006	**4**	**3**	1,011,797,457,139	552,486,912,846	40,142,357,015	15,196,870,229	24,945,486,786
2012	**5**	**4**	1,222,807,284,485	873,982,246,102	56,472,051,216	38,621,276,756	17,850,774,461
2013	**5**	**4**	1,305,604,981,272	950,579,413,279	64,375,462,531	41,484,235,979	22,891,226,551
2014	**5**	**4**	1,411,333,926,201	934,185,915,467	71,367,201,808	40,834,761,346	30,532,440,461

Source: World Bank Data

It is essential to emphasize public expenditure on education has a significant role in the qualified labor force perspective because of education as directly affecting labor productivity through the creation of skills. While the labor force has been continuously increasing in South Korea and Turkey, it is affected directly by education policies which play an essential role in both accumulating human capital and increasing economic growth as seen on the table. There is a close relationship between human capital, and economic growth, the power of well-educated human power is undeniable for development, especially for young people.

Table 6. 21 Labor force, total per million people

Year	Korea, Rep.	Turkey
1990	19,184,391	19,672,525
1995	21,398,592	20,944,452
2000	22,810,633	21,414,414
2005	24,281,181	22,317,230
2010	25,262,256	25,218,278
2015	27,432,943	29,710,011
2016	27,719,344	30,749,543
2017	27,890,371	31,275,221

Source: World Bank Data, Labor force, total per million people
https://data.worldbank.org/indicator/SL.TLF.TOTL.IN?locations=KR-TR,
Accessed at: 18.01.2019

Table 6. 22 Population ages 15-64 (% of total)

Country Name	Korea, Rep.	Turkey
1960	53	55
1970	55	54
1980	62	56
1990	69	60
2000	72	63
2010	73	66
2017	73	67

Source: World Bank Data, Population ages 15-64 (% of total)
https://data.worldbank.org/indicator/SP.POP.1564.TO?locations=KR-TR,
Accessed at: 18.01.2019

In South Korea, which attaches great importance to qualified staff, thus there are a significant number of universities and colleges in the country. During the creation of these international brands and in today's highly technological world has been shaping by engineers, so every industry needs engineers to make realize their ideas for reality. By using the knowledge of mathematics and science, engineers develop new capabilities and different approach to the world’s technology needs. Therefore, engineers have been making significant enrichment to the aspect of modern society. Because the technology which outcome of the science would not exist without them. To put in another way, both selected countries differentiation on the Tertiary graduates by Engineering and Business may cause the increase of South Korea's high technology export and an increase of Turkey's technology important as seen on the table 6.23.

Table 6. 23 Tertiary graduates in Engineering and Business (% of total)

Tertiary graduates by Engineering		**%**	**Tertiary graduates by Engineering**		**%**
KOR	2005	27	TUR	2005	15
KOR	2010	21	TUR	2010	14
KOR	2011	22	TUR	2011	14
KOR	2012	22	TUR	2012	13
KOR	2013	22	TUR	2013	13
KOR	2014	22	TUR	2014	14
KOR	2015	22	TUR	2015	13
KOR	2016	22	TUR	2016	14
Tertiary graduates by Business		**%**	**Tertiary graduates by Business**		**%**
KOR	2005	15	TUR	2005	23
KOR	2010	16	TUR	2010	30
KOR	2011	16	TUR	2011	40
KOR	2012	16	TUR	2012	40
KOR	2013	16	TUR	2013	40
KOR	2014	16	TUR	2014	38
KOR	2015	16	TUR	2015	38
KOR	2016	16	TUR	2016	35

Source: OECD Data

In South Korea, which shows excellent outcomes in brand creation, it ranks 4th in the world regarding a number of patents and 2nd in the number of patents per capita. They are in the 7th place in the expenditure made for R&D. All things considered, when Turkey is compared with South Korea's economy regarding the importance of high technology manufacturing in this study was found that the level of South Korea's economy reasonably sustainable and wealthy against Turkey. Turkey's education level is insufficient for today's requirements, and it does not help to catch technological developments. Turkey has to consider the power of education as well as in South Korea, one of the essential elements of information and knowledge-based information economy, increasing the number of skilled workers with a well-structured system, known as the individual economy is also of great importance. Industrialization and structural change have not been addressing today's requirement, such as to be high technology producer country.

Therefore, it also essential to examine the success of students with PISA accumulates data, from the most successful to the less successful with six different categories. Turkey has no students in the first level. Even, in the second stage, there is a limited number in the cluster. It is thought that the creative and innovative workforce that transforms the world and technology will mostly emerge from the students in these two clusters. Apparently, the Turkish education system does not help to develop the workforce to take place in this section, as seen Pisa’s result. The scientific performance data of PISA, the International Student Assessment Program, is given in the table below. Research by PISA generally addresses individuals aged 15 years. This study aims to measure and analyze the aspects such as reading comprehension, analysis, solving problems, discovering new information in the science field. South Korea has achieved its economic success in the field of high technology with its science and technology policies and export-oriented industrialization policies. Besides, the active role of the state in the economy, the implementation of effective policies in the education system, directing the capital to the right places and keeping the R & D expenditures as high as possible competitors. Turkey which is remained very insufficient on the education development against South Korea. This study aims to reveal the reasons for the differences between the two countries and to reveal the reasons for the differences between the two countries.

Table 6. 24 Mathematics performance (PISA) Total, Mean score, 2003 – 2015

Location	2003	2006	2009	2012	2015
Australia	524.00	520.00	514.00	504.00	494.00
Austria	506.00	505.00		506.00	497.00
Belgium	529.00	520.00	515.00	515.00	507.00
Canada	532.00	527.00	527.00	518.00	516.00
Czech Republic	516.00	510.00	493.00	499.00	492.00
Denmark	514.00	513.00	503.00	500.00	511.00
Finland	544.00	548.00	541.00	519.00	511.00
France	511.00	496.00	497.00	495.00	493.00
Germany	503.00	504.00	513.00	514.00	506.00
Greece	445.00	459.00	466.00	453.00	454.00
Hungary	490.00	491.00	490.00	477.00	477.00
Iceland	515.00	506.00	507.00	493.00	488.00
Ireland	503.00	501.00	487.00	501.00	504.00
Italy	466.00	462.00	483.00	485.00	490.00
Japan	534.00	523.00	529.00	536.00	532.00
Korea	542.00	547.00	546.00	554.00	524.00
Latvia	483.00	486.00	482.00	491.00	482.00
Luxembourg	493.00	490.00	489.00	490.00	486.00
Netherlands	538.00	531.00	526.00	523.00	512.00
New Zealand	523.00	522.00	519.00	500.00	495.00
Norway	495.00	490.00	498.00	489.00	502.00
Poland	490.00	495.00	495.00	518.00	504.00
Portugal	466.00	466.00	487.00	487.00	492.00
Slovak Republic	498.00	492.00	497.00	482.00	475.00
Spain	485.00	480.00	483.00	484.00	486.00
Sweden	509.00	502.00	494.00	478.00	494.00
Switzerland	527.00	530.00	534.00	531.00	521.00
Turkey	423.00	424.00	445.00	448.00	420.00
United Kingdom		495.00	492.00	494.00	492.00
United States	483.00	474.00	487.00	481.00	470.00

Source: OECD, https://data.oecd.org/chart/5qhQ, Accessed at: 12.12.2018.

Table 6. 25 Reading performance (PISA) Total, Mean score, 2000 – 2015

Location	2000	2003	2206	2009	2012	2015
Australia	528.00	525.00	513.00	515.00	512.00	503.00
Austria	492.00	491.00	490.00		490.00	485.00
Belgium	507.00	507.00	501.00	506.00	509.00	499.00
Brazil	396.00	403.00	393.00	412.00	407.00	407.00
Canada	534.00	528.00	527.00	524.00	523.00	527.00
Czech Republic	492.00	489.00	483.00	478.00	493.00	487.00
Denmark	497.00	492.00	494.00	495.00	496.00	500.00
Finland	546.00	543.00	547.00	536.00	524.00	526.00
France	505.00	496.00	488.00	496.00	505.00	499.00
Germany	484.00	491.00	495.00	497.00	508.00	509.00
Greece	474.00	472.00	460.00	483.00	477.00	467.00
Hungary	480.00	482.00	482.00	494.00	488.00	470.00
Indonesia	371.00	382.00	393.00	402.00	396.00	397.00
Ireland	527.00	515.00	517.00	496.00	523.00	521.00
Italy	487.00	476.00	469.00	486.00	490.00	485.00
Japan	522.00	498.00	498.00	520.00	538.00	516.00
Korea	525.00	534.00	556.00	539.00	536.00	517.00
Netherlands		513.00	507.00	508.00	511.00	503.00
New Zealand	529.00	522.00	521.00	521.00	512.00	509.00
Norway	505.00	500.00	484.00	503.00	504.00	513.00
OECD - Average					496.00	493.00
Poland	479.00	497.00	508.00	500.00	518.00	506.00
Portugal	470.00	478.00	472.00	489.00	488.00	498.00
Russia	462.00	442.00	440.00	459.00	475.00	495.00
Spain	493.00	481.00	461.00	481.00	488.00	496.00
Sweden	516.00	514.00	507.00	497.00	483.00	500.00
Switzerland	494.00	499.00	499.00	501.00	509.00	492.00
Turkey		441.00	447.00	464.00	475.00	428.00
United Kingdom			495.00	494.00	499.00	498.00
United States	504.00	495.00		500.00	498.00	497.00

Source: OECD, https://data.oecd.org/chart/5qhU, Accessed at: 12.12.2018.

Table 6. 26 Science performance (PISA) Total, Mean score, 2006 – 2015

Location	2006	2009	2012	2015
Australia	527.0	527.0	521.0	510.0
Austria	511.0		506.0	495.0
Belgium	510.0	507.0	505.0	502.0
Brazil	390.0	405.0	402.0	401.0
Canada	534.0	529.0	525.0	528.0
Chile	438.0	447.0	445.0	447.0
Czech Republic	513.0	500.0	508.0	493.0
Denmark	496.0	499.0	498.0	502.0
Estonia	531.0	528.0	541.0	534.0
Finland	563.0	554.0	545.0	531.0
France	495.0	498.0	499.0	495.0
Germany	516.0	520.0	524.0	509.0
Greece	473.0	470.0	467.0	455.0
Hungary	504.0	503.0	494.0	477.0
Iceland	491.0	496.0	478.0	473.0
Indonesia	393.0	383.0	382.0	403.0
Ireland	508.0	508.0	522.0	503.0
Israel	454.0	455.0	470.0	467.0
Italy	475.0	489.0	494.0	481.0
Japan	531.0	539.0	547.0	538.0
Korea	522.0	538.0	538.0	516.0
Latvia	490.0	494.0	502.0	490.0
Luxembourg	486.0	484.0	491.0	483.0
Mexico	410.0	416.0	415.0	416.0
Netherlands	525.0	522.0	522.0	509.0
New Zealand	530.0	532.0	516.0	513.0
Norway	487.0	500.0	495.0	498.0
OECD - Average	498.0	501.0	501.0	493.0
Poland	498.0	508.0	526.0	501.0
Portugal	474.0	493.0	489.0	501.0
Russia	478.0	486.0	487.0	

Slovak Republic	488.0	490.0	471.0	461.0
Slovenia	519.0	512.0	514.0	513.0
Spain	488.0	488.0	496.0	493.0
Sweden	503.0	495.0	485.0	493.0
Switzerland	512.0	517.0	515.0	506.0
Turkey	424.0	454.0	463.0	425.0
United Kingdom	515.0	514.0	514.0	509.0
United States	489.0	502.0	497.0	496.0

Source: OECD, https://data.oecd.org/chart/5qhW, Accessed at: 12.12.2018.

Moreover, Turkey is going into the third step. The ratio of students in the lower two sections reaches 43 percent. It is accepted that Turkish students in this situation lack the basic skills needed for active participation for world requirements. Most of these students are students in disadvantaged institutions. PISA scores explain another remarkable point. Turkish students are in the top ten in the world regarding the desire to learn science, the pleasure they receive from learning science and the participation in science-related activities. In this way, the ministry of national education increases the number of low-achieving vocational schools and Islamic divinity students high-school, not science, social sciences and Anatolian high schools, which are successful in science and in general in PISA. The progression discussion in the country has pointed out that political power does not encourage students to go to schools in which science education is in the background (PISA, 2015).

Turkey has not been intended to make paradigm changes in these sectors. Therefore, the low and low - middle technology products are the majority of manufacturing in Turkey, and these products have gradually become permanent at the market. Therefore, structural problems in the industry have gradually deepened, foreign trade gaps have increased, and the dependence of production and exports on imports has increased. The structure of exports is based on low and medium technologies, and this structure has become increasingly permanent in the following years. Production and value-added of the manufacturing industry has been based on low and low-middle technologies production, the number of facilities remains extremely weak for value-added and high technology.

Turkey has been failed to make the structural transformation of production, and exports have been engaging with low and medium technology intensity. In other words, as a result of policies that do not predict dynamic activity such as industrialization and structural change for technology developments, the qualitative transformation has not been realized in the industry, and this situation has become increasingly structural. The restructuring of production has to be on the basis of high value-added/high-tech intensive sectors, but it depends on a new educational system. At this stage of Turkish industry sectors, needs for a new development paradigm that will change the structure of production and foreign trade and this development should be accumulated in the center of economic policies. The most fundamental component of the new development paradigm will depend on industrial policies that will target radical changes in the existing industrial structure with education policies. In other words, external trade, investment, regional development, incentive, and technology policies need to be rearranged to support high technology production process. Notwithstanding, researches within basic sciences is a long, laborious and costly business for Turkey without enough education source. The research activities of the private sector for basic sciences are limited due to reasons such as the high cost of the research activities, the inability to convert the results to immediate return, the uncertainty of the investment results and the risk involved.

In this study, Turkey's development process was compared with South Korea, which has proved itself in this regard, thus considered together. While the analysis was carried out on the data of international organizations such as World Bank, OECD, and PISA the literature was also taken into consideration. It was seen that the reasons for the successive differences between the two countries which started the development process in almost the same period. When the developmental history of countries is examined, the input of sustainable development is science, and the output is technology. The relationship between economic growth and productivity has discussed the subject from classical economists to the present.

Due to this approach in Turkey manufacturing industry technology content did not get out of the traditional sectors, and production and export dependence on imports increased. The structural problems of Turkey's economy reach to gigantic level; moreover, only new developments and the political paradigm can meet today's

requirements. Hence, it is imperative to understand South Korea's economic development approach, they determined a clear long-term goal for their economy, and they quite worked well around their goal.

Today, the importance of muscle power in production is significantly reduced, while the role of machines and brain power is increasing. This structural paradigm transition in production reduces the physical function of people in the production process but allows people to spend more time using to produce new value-added products or production techniques. Therefore, the share of education expenditures which has a direct impact on the produce new value-added and high technology manufacturing have been increasing in the budget over the years. Education is a process that leads individuals to the foreseen goal and brings knowledge, skills and behavior change to the individual. Economic and social impacts on human capital called the effect of education on the well qualified human resources, which is believed to play an essential role in economic growth. Studies in the field of education have shown that education contributes to the growth of national income through the development of skills, productivity and the capacity of the technology manufacturing line. Based on the findings of this study, it can be said that developing countries should focus to the manufacturing of export high-value, high-tech products so that the developing countries can achieve a high and sustainable economic growth rate and close the economic gap between them with the developed countries.

Education is mentioned as an influential component of economic growth and, therefore, it performs an essential task in order to achieve targeted social advancement and gives the opportunity to the nation’s welfare. The critical part it also shows in national development plans to diminishing the rate unemployment and inequality. This research examined the positive correlation between education expenditure, economic growth and the critical indicator of GDP Per capita for South Korea and Turkey. The empirical data of World Bank show a positive and significant long-run relationship between education expenditures, real GDP, GDP Per capita structure. The outcome of the Government expenditure on education, total (% of GDP) meaningfully improves the long-term growth of South Korea's economy.

Therefore, South Korea has had enormous growth over the last 30 years by developing a strategic plan for science, technology, and innovation and creation of global companies. Underlying South Korea's powerful economic improvement has been a consistent attempt to be a high technology manufacture country, and the Korean state began a serious effort to develop science and technology policies for this purpose.

However, Turkey education development process does not show the same impact on economic growth as much as South Korea because Turkish statistics remains insufficient due to the insufficiency resources allocated to education from GDP. Turkey has an essential young population, but it also brings high youth unemployment situation in Turkey and hence education expenditure can be applied adequately to direct that difficulty. Investments in the education area in Turkey, where the young population is considered to be the most critical capital, will enable the increase in global competitiveness and meet targeted economic growth in the long run. On the other hand, the essential indicators of education development will be positively affected; foreign direct investment, value-added manufacturing, account balance, high technology, PISA, GDP, and GDP Per capita, as Korea demonstrated below.

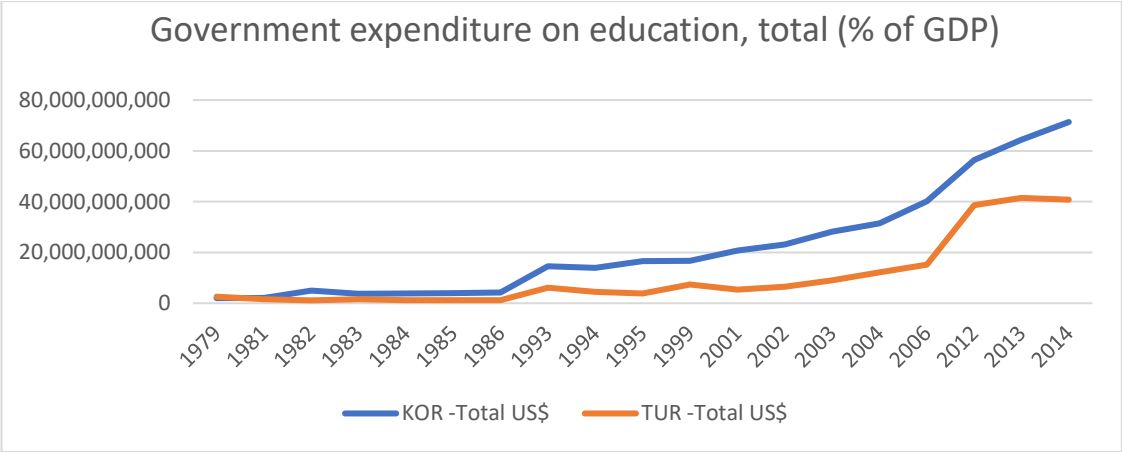


Figure 6. 6 Government expenditure on education, total (% of GDP)

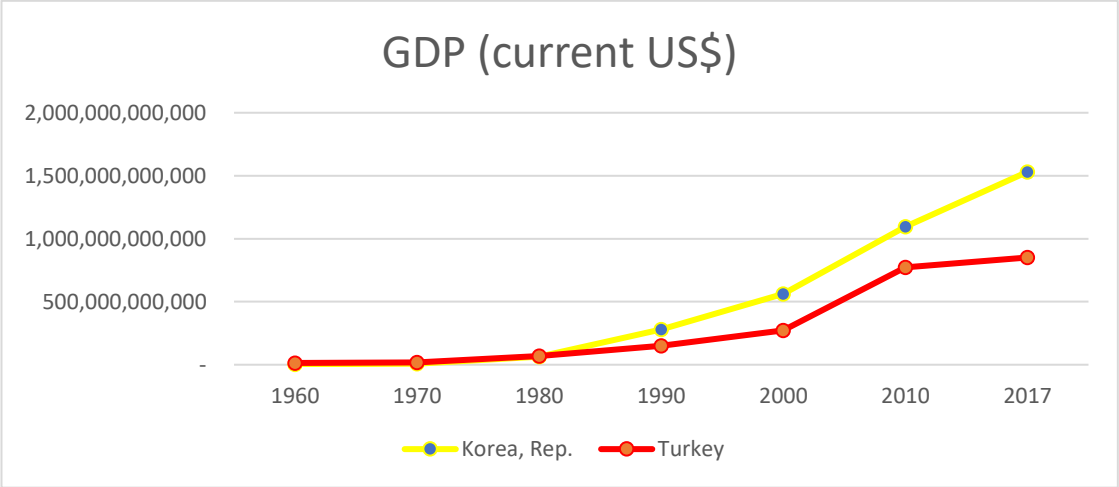


Figure 6. 7 GDP (current US$)

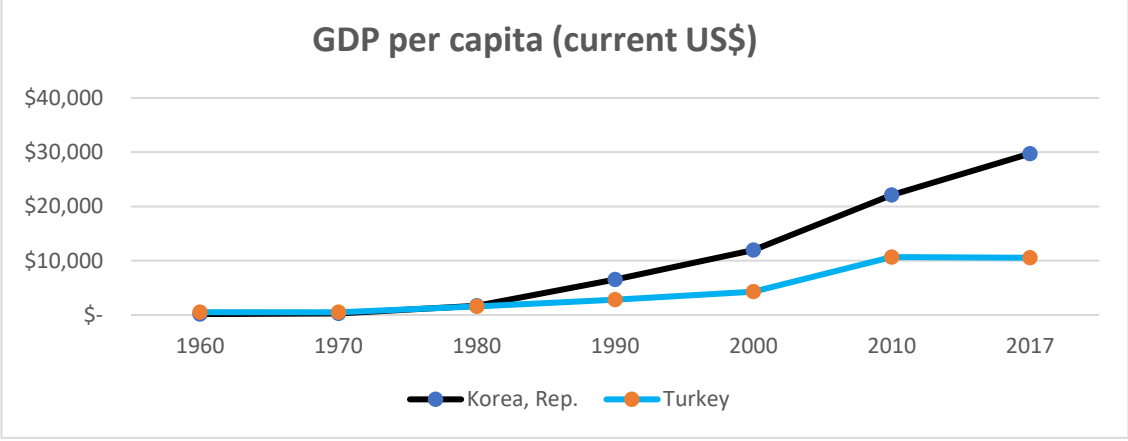


Figure 6. 8 GDP per capita (current US$)

7. CONCLUSION

The arguments given above demonstrate that South Korea and Turkey comparatively examined under subjects of industrial revolutions, science, education and technology acceptance model throughout their historical development process. Respectively, research is opened by informing about Industry Revolutions, instruments of technological development, and the brief economy plus education summaries of Turkey and South Korea, in order to understand the core values of development functions. South Korea and Turkey selected for this research as both countries were standing at the cluster, had similar economic indicators up to 1950s; however, the spectacular mutation emerged on the structure of South Korea in the coming years. Since the 1950s, South Korea has pursued a planned science and technology policies in order to reach their technology targets. Establishment of science and technological infrastructure is aimed by centralized control of technology transfer and development of traditional technologies with their science centers. Besides; South Korea's policies and acceptance of technology-based development strategies have resulted with rapid and sustained economic growth over the past five decades, and it has been providing a wealth of valuable development lessons for other developing countries. It is a well-known fact that about the paradigm changing of market competition, the characteristics of competition also has been evolving. The competition was previously structured on the only cost; now it has evolved as well that customization, speed, and innovation are also indispensable. It is important to emphasize, sustainable development in the period of this new economy developments process depends on producing well-structured strategies. The long-term development target of the countries is made possible by systematically designed and realized policies. South Korea realized well in advance. Thus, it is policies, and acceptance of technology-based development strategies have resulted with rapid and sustained economic growth over the past five decades, and it has been providing a wealth of valuable development lessons for other developing countries. The Industrial Revolutions increased with paradigm changes, creative destruction, efficiency, effectiveness and offered extraordinary possibilities for advancing economic and social achievements, on the same parallel rose the risk of

collapsing if countries are not able to make the required transition in their boundaries. Therefore; education, science, technology, and innovation has increasingly essential contributions in the economic development for all countries, and South Korea has turned to the master of these subjects during the time. South Korea, which attaches great importance to educational development, has grown economically due to its successful education policies so increased the welfare of society. The policies implemented have been updated and adapted to the requirement of science and education. It is critical to indicate that South Korea is determined which sectors should more be encouraged, and which ones will be left behind according to the global economic order. The curriculum, which is one of the critical factors of the education system, is continuously being updated and changed in South Korea according to requirements of their economic targets. The purpose of these updates is constantly kept up to date for student's training methods and changing needs. With this amendment, only the teaching-oriented training of the students was prevented. The course load was diminished, and it was ensured that the course was also directed towards personal needs. It is aimed to be at the forefront of talents and creativity in the latest curriculum system which is entirely student-oriented.

These pillars contributed the economy with the essential design to effectively concern and use education to improve potency and intensify long-term economic development. On the other side, Turkey's efforts in continuing based on cheap labor and export structure intensive sectors, it does not help to protect and enhance its international competitiveness in the market, as it has not understood the requirements of mentioned paradigm transition in every sector. End of the Industrial Revolution 2.0 and the beginning of the Industrial Revolution 3.0 are representing the differentiation of export-oriented industrial strategies for both countries. Starting in the implementation of this period, Turkey was also a critical crossroads in the context of the purposes specified on the above due to their opportunity. However, Turkey has always been as an awaited country but has not always been established its strategic development in the context of technology. Turkish business sectors, universities, ministries have not shown the required respect to education, science, knowledge, information, and technology. The main requirements of high technology, research and development efforts, high technology exports, patent numbers, computer use, internet usage and capital of knowledge have been remaining wholly insufficient in comparison with

South Korea. South Korea has determined the development model through sector-oriented technology production method and has steadfastly protected the route it has drawn despite the economic crises. Therefore, while a new paradigm changes or transition is approaching South Korea, the crash impact has not happened as the structure of the country. With the knowledge of South Korea, the country has the capability to understand the emerging new thing and rapidly absorb it. Hence it is sensible to believe that South Korea has been living a bright economic development and Turkey has lagged behind its economic growth and is still facing big volatility trouble in the same parallel. As indicated tables on the above, while South Korea was attending to the developed countries cluster, Turkey continues to economic development struggle due to the lack of sufficient technology developments. If the first button is incorrectly fastened, then it is not necessary to say that the latter is in the order. This example might be convenient for Turkish education, nepotism, and cultural awareness(corruption)problems. Turkey is obliged to solve both subjects if it wants to succeed in the development process because South Korea began to work with these subjects for the technology development process.

Despite the importance of technology emphasis has not been very successful in practice, there always been a strong emphasis on technology development in all five-year development plans in Turkey. Paradoxically, in order to increase the competitiveness of Turkey, the importance of focusing on projects in the field of education and information and technology and supporting R & D spending emphasized several times in different periods by positive science institutes. Although, the awaited contemporary approach has not been started in the country. However, as the cultural awareness and importance given of technology have always been very high in South Korea, today's technology manufacturing functions; universities, technology parks, R&D campuses, industries, ministries, and science centers are established 40 - 50 years ago. One of the most critical factors in this success is the correctly and jointly implementation of these effective technology policies. One of the essential elements in this success is the successful implementation of these effective technology policies. Today, the per capita income in South Korea is above $ 10K and is ultimately the result of the importance given to this technology.

Should pay attention to this truth Turkey's economic development history would stay unsuccessful or undesirable on the table when compared with South Korea. The most important reason is that the Turkish political institutions collectively have not given a place to science, education and technology subjects on their agendas as needed. In order to take place on the political agenda, there must be a strong social demand. It would appear that the Turkish economy operating model has not turned to effective production structure due to the lack of contemporary and positive science. The approach of obtaining science and technology from developed societies is more dominant rather than creating the same structure in the country.

For sustainable economic development and to increase competitive advantage in the market, Turkey should increase the efficiency of positive science institutes, improve doing business factors, ensure productivity gains through technological innovations and R&D activities. Thus, the characteristic traits of Turkish export can turn to high - middle technology rather than the low - middle low producer in the long run. For these targets, education would be the main contributor to answer today's requirement, regarding the Turkish education system sometimes it would be better to focus what should not do rather than to do so many things every year with different people. Turkey has been deforming their education system with the irrational reforms of the education; this approach should immediately stop in order to be exporter country. If there is a very long to do list on the table, sometimes it can cause to do nothing. The corollary is that the biggest revolution in human history is approaching with the next Industry Revolution; artificial intelligence will evolve or will redefine all the way of doing business for industries; thus, the endless religion discussions in Turkey will not make an excellent contribution for next revolution or in the Global Competitiveness Index.

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