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ISTANBUL AYDIN UNIVERSITY

INSTITUTE OF GRADUATE STUDIES

COMPARATIVE ANALYSIS OF COMPETITIVE DYNAMICS IN SERVICE SECTOR BETWEEN TURKEY AND EUROPEAN UNION

MASTER'S THESIS

Süreyya SLEIMAN

Department of Business

Business Administration Program

November, 2023

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APPROVAL PAGE

DECLARATION

I gratefully attest that all the data in the research I submitted for my master's thesis, " Comparative analysis of competitive dynamics in services sector between Turkey and European Union," was collected and presented in compliance with academic standards and ethical principles. I have not falsified any of the data I used, and this study was written in compliance with the thesis writing guidelines.

Süreyya SLEIMAN

FOREWORD

I am grateful to God for enabling me to complete this course of study and progress in my quest for knowledge. I feel it is my responsibility to convey my sincere gratitude to all the helpful ones who have helped me in this way; without them, I could not have finished my research. Many individuals inspired me to prepare for and finish this difficult project.

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In addition, I would like to express my sincere gratitude and appreciation to my parents for their unwavering support and encouragement throughout my academic career. Without their help, this achievement would not have been possible. I shall always be appreciative of your affection.

Lastly, I just wanted to say thank you to everyone that supported me when I was writing my master's thesis.

November, 2023 Süreyya SLEIMAN

COMPARATIVE ANALYSIS OF COMPETITIVE DYNAMICS IN SERVICE SECTOR BETWEEN TURKEY AND EUROPEAN UNION

ABSTRACT

This study provides a comprehensive analysis of the competitive dynamics in Turkey's and the EU's service industries, focusing on Industry 4.0. It examines Turkey's needs in the digital industries' service sector, considering variables like investment, research and development, and technological developments. The study also examines the influence of economic dynamics, geopolitical factors, and differing policy frameworks on the competitive standing of both areas in the global service sector. Turkey faces challenges in its digital service sector, including a digital divide, regulatory complexities, cybersecurity threats, and a skills gap. To address these challenges, Turkey needs a multifaceted approach, including streamlined regulations, cybersecurity measures, and comprehensive training programs. By addressing these issues, Turkey can position itself as a global player in the digital economy. The study highlights Turkey's unique advantages, difficulties, and future growth potential in relation to the EU market.

Keywords: Digital Technologies, International Trade, Industry 4.0, competitive dynamics within the service sectors

HİZMET SEKTÖRÜNDE TÜRKİYE İLE AVRUPA BİRLİĞİ ARASINDAKİ REKABET DİNAMİKLERİNİN KARŞILAŞTIRMALI ANALİZİ

ÖZET

Bu çalışma Endüstri 4.0'a odaklanarak Türkiye ve AB hizmet sektörlerindeki rekabet dinamiklerinin kapsamlı bir analizi sunmaktadır. Türkiye'nin dijital endüstrilerin hizmet sektöründeki ihtiyaçlarını yatırım, araştırma-geliştirme, teknolojik gelişmeler gibi değişkenleri dikkate alarak incelenmiştir. Çalışma aynı zamanda ekonomik dinamiklerin, jeopolitik faktörlerin ve farklı politika çerçevelerinin küresel hizmet sektöründeki her iki alanın rekabetçi konumu üzerindeki etkisini de incelemiştir. Türkiye, dijital hizmet sektöründe dijital bölünme, mevzuattaki karmaşıklıklar, siber güvenlik tehditleri ve yetenek açığı gibi zorluklarla karşı karşıyadır. Bu zorlukların üstesinden gelmek için Türkiye'nin, kolaylaştırılmış düzenlemeler, siber güvenlik önlemleri ve kapsamlı eğitim programları dahil olmak üzere çok yönlü bir yaklaşıma ihtiyacı vardır. Türkiye bu sorunları çözerek kendisini dijital ekonomide küresel bir oyuncu olarak konumlandırabilir. Çalışma, Türkiye'nin AB pazarına ilişkin benzersiz avantajlarını, zorluklarını ve gelecekteki büyüme potansiyelini vurgulamıştır.

Anahtar Kelimeler: Dijital Teknolojiler, Uluslararası Ticaret, Endüstri 4.0, Hizmet Sektörlerindeki Rekabet Dinamikleri.

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LIST OF ABBREVIATIONS

BCG : Bostan Consulting Group

PESTLE **:** Political, Economic, Social, Technological, Legal, Environmental

ROA **:** Return on Assets

ROE **:** Return on Equity

SWOT **:** Strengths, Weaknesses, Opportunities, Threats

LIST OF TABLES

I. INTRODUCTION

A. Scope of Study

The dynamics of international trade, Industry 4.0's development, and the integration of digital technologies have drastically changed the competitive environments in the service industries in Turkey and the EU in recent years. This combination of circumstances has brought about revolutionary changes that have affected how companies, trade, and the service sectors operate in these areas.

The emergence of Industry 4.0 has enabled the spread of digital technology, resulting in unparalleled progress in data-driven decision-making, automation, and communication. These developments have affected the operational paradigms of the service industries in Turkey and the EU significantly, despite geographical barriers.

This study aims in the context of Turkey and the EU particularly, this thesis seeks to explore and analyze the complex interactions among digital technologies, the dynamics of international commerce, the development of Industry 4.0, and their combined effects on the competitive dynamics within service sectors. It focuses on many service industries that have seen significant changes as a result of the combination of these powerful forces, including finance, tourism, telecommunications, investment, R&D and technology development, healthcare, and professional services.

The advent and swift assimilation of digital technologies have fundamentally transformed the ways in which services are provided, advertised, and used, therefore altering conventional business frameworks and commercial exchanges.
Concurrently, the development of Industry 4.0 has brought about a paradigm change marked by heightened automation, connectivity, and data use, which is altering the c ompetitive environments of service businesses.
The competitive dynamics in service sectors have changed significantly under this fr amework.
Market structures, technical advancements, regulatory frameworks, and socioeconom

ic variables have all emerged as critical variables affecting competitiveness both insi de Turkey and between it and the EU.
These powerful factors have not only affected traditional service industries but have also spawned innovative service providers and business models.

This study explores the relationship between digital technologies, international trade dynamics, Industry 4.0 evolution, and competitive dynamics in service sectors, focusing on Turkey and the EU. It provides insights into the challenges and opportunities faced by businesses, policymakers, and stakeholders in the evolving landscape of service-oriented industries in these regions amid digitization and global integration.

B. Purpose/Importance

The study on "Digital Technologies, International Trade, Industry 4.0, and Competitive Dynamics within the Service Sectors between Turkey and the European Union (EU)" has a broad scope and is significant since it addresses a number of important issues.

This study aims to comprehensively grasp the transformative shifts occurring within service sectors due to the integration of digital technologies, the evolution of Industry 4.0, and the dynamics of international trade. Understanding these shifts is crucial to deciphering the new paradigms shaping service industries in Turkey and the EU.

Analyzing Competitive Landscapes: By exploring the competitive dynamics, including regulatory frameworks, market structures, technological advancements, and socio-economic conditions, the study seeks to analyze and compare the competitive landscapes in service sectors between Turkey and the EU. This analysis is vital to uncovering the distinct factors that influence competitiveness in each region.

Finding Strengths and Difficulties: In light of digital developments and the dynamics of international commerce, this study attempts to pinpoint the special advantages and difficulties that the service industries in Turkey and the EU face. In order to successfully solve issues and capitalize on strengths, it is imperative that both areas acknowledge these aspects.

Encouraging Decision-Making and Policy: Policymakers, governmental organizations, and industry players in Turkey and the EU can benefit from the insights gained from this study. Trade agreements, investment plans, policy creation, and regulatory frameworks can all be influenced by this data to improve the competitiveness and expansion of the service sector.

Encouraging Strategic Planning: The study's conclusions will help companies, multinational organizations, and other stakeholders plan ahead and decide on ventures, partnerships, and market entry in the service sectors of Turkey and the EU.

This study compares Turkey's digital service sector to that of the EU, focusing on the country's needs in these areas as well as important factors, particularly in the areas of investment, research and development (R&D), and technological advancement. It also assesses how these factors can benefit Turkey in addition to its comparative advantages.

C. Methodology

In pursuit of the study's objective, a comprehensive search of academic databases was conducted to identify pertinent studies and research materials for the literature review and previous studies. I then proceeded to carefully evaluate the results I had acquired, and I produced comprehensive research that included these interpretations. I conducted a thorough search of academic databases to locate pertinent studies and research materials for the literature review and previous studies in order to meet the study's objective. After that, I carefully examined the data I had collected, and I produced lengthy research that included these interpretations.

D. The Literaure Review.

This literature review evaluates Industry 4.0 and compares competitive dynamics in the service sector between Turkey and the European Union. It examines factors that may lead to a competitive gap in digital services and aims to define Turkey's strategic course in the digital industries service sector. The review aims to understand regional differences, identify common trends and challenges, provide policy development insights, facilitate knowledge exchange, and promote cross-

regional learning.

This comprehensive analysis will serve as a foundational resource for stakeholders, policymakers, researchers, and businesses to understand the present state, challenges, potentials, and future directions of digital technology in both regions.

II. DEVELOPMENT OF TECHNOLOGY

A. Science, Technology, and Industry

Advances in technology open wider and new horizons for economic development. The benefit of the new product or the existing product developed by the application of the production methods obtained by technological development to the industry may be greater than the expenditures made on R&D (Research and Development) activities for new methods in production. In other words, the expenditures made for R&D activities are in the nature of an investment and the profits to be obtained as a result of these investments will be much higher than the investments made in R&D (Yücel, 1997: 2).

R&D activities, in order to eliminate the uncertainties in scientific and technological fields, to obtain new technical information that will enable the development of science and technology, to research and develop new production methods-processes and production processes, to produce new techniques and prototypes with design and drawing studies, It can be evaluated as the research of new techniques/technology that reduces cost, increases quality standards or performance, and software activities based on new and original design. On the other hand, R & D activities, beyond the development of products for economic purposes and, accordingly, welfare-enhancing processes, the development of new treatment methods, energy, water, environment, food, etc. It also has expansions that can address wider areas such as finding new solutions to the problems encountered in fields, revealing new communication techniques or security tools (Akbulak and Akbulak, 2010: 7-11). In this context, the sum of all these transactions is an indicator of the economic, political and cultural activities of the society, and the increase in these activities is directly proportional to the importance given to science and technology policies. Therefore, no other investment will be able to provide the benefit of an investment in science and technology in an economy in the long run (Yücel, 1997: 2).

Science and technology policies of developing countries mostly consist of importing existing technologies in the world and adapting them to domestic conditions. Because developing new technology is difficult and expensive. On the other hand, a minimum scientific and technological background is essential for successful technology transfer. technology policy; It consists of a set of policies used by governments to promote and manage the process and direction of acquisition of technological capabilities. Therefore, it is possible for the state to intervene in the process of technological change, the direction and speed of technological change for purposes such as productivity increase and economic efficiency.

One of the main dynamics of the growth and development of countries, and perhaps the most important, is seen as the technology factor. Technology can be defined as the body of information, organizational structures, and production methods required to provide a products or service. (Gurak 2006: 10) technology; It defines it as "knowledge necessary for production" or "productive information". Technological development can also be expressed as the emergence of various information that enables to produce output in larger quantities or to produce output of superior quality from a certain source. This second definition constitutes perhaps the most important of the various features of technological development. Additionally, there is a clear link between productivity and technological advancement. Therefore, improved productivity often results from sophisticated technologies (Taymaz and Suiçmez, 2005: 4).

The advancement of technology has a significant impact on organizational structures and techniques of production, as well as social and cultural ramifications. In this context, certain technological advancements also contribute to the construction of long-term economic, social, and political changes that have a revolutionary impact on the course of human history. The transition to the information society is the third and final wave in the socio-economic development process, with the agrarian revolution constituting the first wave and the industrial revolution the second. (Toffler, 1992: 82). The information society is more conscious of technological innovations and has wider possibilities. This shows that the change and transformation that the information society will bring to humanity will be deeper and more fundamental than the industrial society. It is a necessary and inevitable fact that every society that wants to have an active and respected place in the world of the

future adapts to the change process (Erkan, 1994: 11).

Producing affordable, high-quality goods is a prerequisite for a company to be able to compete and survive on the global stage. The modernization and advancement of industrial technologies are essential for the creation of affordable, high-quality items. Gurak highlights the need for technological advancements, which are the results of human brain labor, in order to boost productivity over the long run (Gurak, 2006).

B. Technological Development Theories.

The terms "information society" and "information and communication technologies" are perhaps the two that are mentioned the most in today's culture. In actuality, modern society now includes computer and internet technology as a normal aspect of existence. The term "information society" also refers to the new type of society where information is heavily utilized in socioeconomic life through modern technologies. ICT stands for "all technologies, including communication and computer technologies, that enable the collection, processing, storage, and transmission of information from one place to another via networks," or "Info Communication" as it was more recently known.". In a clearer way, “information technologies; It covers all technologies (http://www.msxlabs.org) including fax machines, mobile phones, cable television, computers, information networks, videotext, software and on-line databases, as well as microelectronics and data transmission (Misa, 1992: 3).

The Information Society is synonymous with concepts such as "Information Society", "Digital Society" (Gül and Şahin, 2011: 239), "Post-Industrial Society", "Post-Capitalist Society", "Post-Industrial Society" and "Cybernetic Society". It is a comprehensive concept that is used meaningfully (İçyer, 2010: 80). Information society, “although there is no single globally accepted definition; It is a term that defines societies in which the knowledge itself or the activities for the production, processing and distribution of knowledge are accepted as the basic input and power source in the economic, political, social and cultural fields” (http://www.btk.gov.tr). According to another definition, information society; It is a post-industrial society that is shaped on the basis of technology and knowledge and develops by taking its driving force from the dynamism of globalization (Dikkaya and Özyakışır, 2006:

156). Castells establishes an analytical distinction between "information society" and "informational society," despite the fact that the information society is fundamentally the most prevalent use of the term. He claims that because the phrase "information society" emphasizes the value of knowledge in society, it is pertinent to all societies, including medieval Europe. As a result of the new technological conditions that have emerged in the current historical period, the term "informed" or "informational" is based on a specific type of social organization in which knowledge production, processing, and transmission are the primary sources of production and power (Castells, 1997: 21). Although it is accepted that Castells made a correct determination, the concept of information society, which is the common usage of the term, was preferred in this study.

As Yılmaz (1998) notes, "technological emphasis" played a role in the early development of the idea of an information society and may even do so today. The acceleration of information production and dissemination as well as, more significantly, the transformation of information into a "commodity" (commercial good) are acknowledged as developments that contribute to the development of the information society, depending on advancements in communication and electronic technologies (Yılmaz, 1998: 150). In other words, the development of the information society phenomenon is tried to be explained through information and communication technologies. For example, according to the analogy of Ceremony, "any society that wants the 'ICT train' to the information society has been put on a journey to take them to the advanced station on the condition that they pay, buy a ticket and act in accordance with the travel rules" (Törenli, 2005: 200). Especially in daily life, using the power of information more and the use of information and communication technologies (ICT) in the processing of information has led to these technologies being mentioned as one of the most decisive indicators of the information society (Tonta and Küçük, 2005: 3). The identification of the information society with the invention of the computer, which is a "technological product" (Yılmaz, 1998: 150), has been one of the reasons why it is described as a technology-based formation or a model of society transformed by the developments in the field of information technologies. On the other hand, "networks" have been referred to as the fundamental component of the information society since they enable the transfer of all types of information, including text, sound, pictures, and

images, from one location to another. In the new economy of the information society, it is also said that there is a linear relationship between economic modernization and information and communication technologies (ICT) (Tonta and Küçük, 2005: 9). In the light of all these, although the information society is characterized as a product of the developments in information technology, as Mevlana says, the change in this new form of society, which is called "post-industrial society" or "post-capitalist society", will be especially in the social structure, state- The relationship between the society and the individual will be determined by knowledge, not material values (Çelik, 1998: 55). Therefore, the information society is not just about technology; At the same time, it can be said that it has developed as a phenomenon in which social and cultural factors play a role. Moreover, what makes this society an informed society; rather than technological tools, it is the information itself that can be accessed by these tools.

A process similar to the radical change that the industrial revolution brought to humanity is being experienced in the information age. In the world, which was exposed to change beyond recognition in the last quarter of the twentieth century, knowledge has become the most important factor causing radical changes (İçyer, 2010: 80). Mankind has made an effort to dominate technology by creating new resources in order to gain a place in this process of change. They have created an information society by forming human communities who have a tendency to raise themselves as individuals who value information, know how to use information and can produce information in a developing and changing social order, seek information and know how to reach it, classify information, store it and evaluate it in an appropriate environment (Numanoğlu, 1999: 332). These communities continue to make substantial technological investments towards becoming an information society. As a matter of fact, there are data showing that the share of investments in information technologies in the GNP in the European Union and the USA has reached a level that almost equals the defense expenditures (Aydınlı, 2004: 9). Therefore, information technology used to collect, process, organize, store, transfer and access information has become a strategic resource in these societies (Aydınlı, 2004: 10). As a result, advancements in information and communication technologies, which have a significant impact on the growth of the phenomenon of globalization, profoundly affect public administration strategies, business practices,

and people's daily lives in addition to having an impact on all spheres of economic and social life and all segments of society. brought about a change. These innovations, which have already had an impact on the twenty-first century, are laying the foundation for a new type of societal change, the development of the information society (DPT, 2006: 1).

By bringing people and civilizations closer together, incredible advancements in information technologies throughout the transition to the information society have reduced the world to a small village. People now have the option to access all types of information whenever and wherever they want thanks to the commoditization of information technology and the emergence of personal computers in the early 1980s. The ability to connect millions of computers worldwide to a network thanks to internet technology also greatly expands access to information and information banks. A person who connects to the internet from anywhere in the world has the opportunity to access the information bank anywhere, as well as the chance to transfer the information he has obtained from there to his computer (Şeker, 2005: 377). By utilizing the technical advantages offered by information technologies, information societies can, on the one hand, guarantee the structural transformation or restructuring of society; on the other hand, they offer the opportunity and resources to produce knowledge using their scientific expertise in the field of information and technology. Information technologies continue to advance in the technological realm as a part of the mutual interactional development process. Information technologies closely follow the new developments emerging in the information society and feel obligated to create innovation in order to meet the needs of this constantly developing and advancing society (Misa, 1992: 4).

1. Technological Development in terms of Classics

The leaders of classical theory, mostly Britons, who lived during the Industrial Revolution could not foresee the consequences of the Industrial Revolution. While working at Glasgow University, Watt worked on the development and improvement of new invention, the Steam Engine. However, Smith could not calculate the value and effect of the steam engine even though he was teaching at the same university (Tezel, 1995:14).

As the founder of classical economics, Smith not only failed to calculate the importance of the steam engine, but also ignored technological innovations in the textile industry and the use of coke in the production of iron. In his book, he talked about the invention of machines that led to less and less use and made labor easier, and the example of these machines belongs to the technologies of the Middle Ages. Smith put the division of labor at the center of his analysis and explained the value of technological development as follows: "The high efficiency of the machines used in the industry and the need for less labor can be shown as the final results of all these developments" (Smith, 2010: 9-11).

According to Ricardo, we can say that technological developments should be taken into account in increasing productivity. According to Ricardo, technological developments are of two types: the first is land-saving technological developments, and the second is labor and capital-saving technological developments. Ricardo mentioned that technological innovations increase capital and labor productivity equally. Technological innovations, instead of the law of diminishing returns, will enable increased productivity in industry. However, Ricardo did not dwell on this causality relationship by not establishing it. He drew a pessimistic picture in the progress of the economy and argued that the law of diminishing returns would always be valid in the long run (Gurak, 2006: 77-78).

The classics generally focused on the problem of economic growth. He also evaluated the developments in the field of technology according to their role in growth. For example, Malthus did not mention advances in technology in his growth model. In his view, technological development has no positive contribution to per capita income and to the average standard of living. Mill, who worked in later periods, similarly worked in the field of development of technology, but did not deal with this issue in his studies on technological development. Only the existing value of physical capital as a personal factor of production is mentioned. He mentioned that although the results of the decreasing outputs of technological development are short-term, long-term results of technological innovation will emerge (Baser, 2011: 32).

2. Technological Development in terms of Marx

According to Marx, technology and technological developments were primarily determined by production systems. The social order is the preliminary issue that will determine the technological level that exists at that time and can exist later. Technology is an element that appears in the system and it should be known that technology is a prominent feature of the system. Because, according to Marx, the development in technology directs the relations of production, which are the vital problems in the system. “The concept of relations of production together with the concept of productive forces constitutes the content of the category of mode of production, which is one of the main categories of Marxist theory (Baser, 2011: 32). While the productive forces constitute the constantly moving, changing and developing side of the mode of production, the relations of production gain meaning depending on their inhibition or development of the productive forces. These two pairs of concepts are not completely separate and autonomous from each other in Marxist theory, there is a connection between them; First of all, the growth of the productive forces determines the growth of the relations of production, and secondly, the relations of production themselves influence the growth of the productive forces. This effect denotes accelerating or decelerating them; eventually, the productive forces determine.” The relation of production is not of harmony but of contradiction. With this in mind, technology is the determinant of the ratio between employee and capital. There are two main reasons for the desire for the continuity of technological development within the system; competition among capitalists and an increase in production and an increase in the demand for labor. According to the first of these reasons; The greatest desire of every capitalist is to wait for technological development in order to produce less costly than others (Smith, 2010: 9-11). The other reason is a necessary technological development in order to save labor due to the increase in wages. As you can see from these situations, according to Marx, technological developments are not accidental, but an internal process compatible with the system. Putting forward the reasons for the changes in societies in the historical process, Marx gave great importance to industrial capitalism and thus to the industrial revolution. Because, according to Marx, the modern bourgeoisie is the main issue of production. Although it was not the industrial revolution that brought about this production; With this revolution, some irreversible developments have

emerged (Marx, 2011: 327-328).

3. Technological Development in terms of Neo-Classics

Technological development is defined by neo-classicalists in economic theory as follows: It is to get more output without changing the production amount or to produce the same amount of output with fewer factors of production. According to the Arrow-Debreu model, technology is in the background, only the outputs of technological development can be followed. It is not possible to talk about an economic structure that represents both a historical and a social process. Therefore, socio-economic reasons cannot be distinguished from technological development (Ansal, 2004: 39).

According to this approach, businesses choose and use the most appropriate of the combined factors and the methods used, taking into account the existing factor prices. On the other hand, it is accepted that the conditions of perfect competition are valid in the economy, and it is known that every business operates according to a similar production function. It does not explain why a large amount of technology with similar efficiency as labor-capital combinations advances in the economic process. In addition, accepting that the product it produces depends only on capital and labor factors, other variables such as the need for qualified labor, the characteristics of the product, the scale of input, and the supply of raw materials have not been taken into account. The contribution of the advances in technology to the economy means that there is only an increase in productivity, in other words, production is done with less input (Yetkiner, 2016: 182).

As a result, businesses will not tend to improve their current methods because they assume that there is an unchanging equilibrium in the economy. In summary, Neo-Classicalists did not examine existing methods from a historical point of view, did not consider the progress of economy and technology in the industrialization process and how they were developed in relation to each other (Smith, 2010: 9-11).

4. Technological Development in terms of J. Schumpeter

Schumpeter described the capitalist growth process in the context of innovative entrepreneur and method progress. Schumpeter has taken technological advances into the focus of his approach. These innovations and advances constitute

the driving force of the economy. Schumpeter shaped technological progress by distinguishing the concepts of innovation and invention. According to Schumpeter, the concept of "innovation" is the operation of an invention or method in economic studies. When evaluated from this perspective, the impact and importance of a technological progress only becomes meaningful when the innovation process is considered. The importance given to this process is also the importance given to the entrepreneur and his technological mobility. J. Schumpeter's concept of innovation does not only address the novelty of a product. This concept; it covers a very broad framework such as managerial, organizational and financial innovation, opening new markets and acquiring new resources (Er, 2013: 82).

Schumpeter (1930) emphasized that the role of the entrepreneur in the innovation process is very important. It is noteworthy that large enterprises began to pay more and more attention to innovations in technology. Schumpeter stated that the value of R&D investments has increased, and he argues that the investments in question are only the work of large enterprises, and this fact compels monopolistic and oligopolistic market structures (Schumpeter, 2012: 93-94).

According to Schumpeter, economic progress can be made through entrepreneurial work that considers technological progress or innovation. Entrepreneurs have realized their innovative possibilities with their own skills and have turned them into an economic importance. They are innovative entrepreneurs who are the leaders of economic growth. The reason this; entrepreneurs take risks and use new technology to support economic studies (Schumpeter, 2012: 93-94).

Modern capitalism has progressed not with wealthy people, but with people who follow innovation and can thus accumulate their capital quickly. While they continued to develop their previous structures and accumulations, they destroyed them with a creative destruction. Therefore, capitalism is an uneven and unbalanced process of progress. It was explained by Schumpeter that the great waves that occurred in the capitalist system were caused by the contexts of innovation in the technological field. The Russian Economist N. Kondratieff put forward the great waves approach, which first emerged in the 1920s. This approach, on the other hand, was analyzed by Schumpeter with the analysis of technological progress (Antoneli, 2009: 619).

In summary, according to Schumpeter's thoughts; It is a rational and qualitative difference that speaks of a departure from existing technologies, without continuity in technological progress. Entrepreneurs will have more income thanks to the innovations they have made, and in this way, it will be accepted as a monopoly concept. As it spreads to a sector over time, the income rate of other businesses will decrease with these innovations and will gradually return to a normal level. This will continue until a different innovation emerges from these innovations by a different entrepreneur. Thus, an internal revolution and a process of destruction will occur in the economy. In this process, technological developments are an internal phenomenon in the economic field and express it as the most important factor that provides the mobility of economic growth (Praag, 1999: 320).

5. Technological Development in terms of New Growth Theories

Two fundamental tenets of the Solow model are proposed by the new growth theory: (i) technical development is exogenous, and (ii) the same technological opportunities exist in all nations. The assumption of fixed returns to a broad measure of capital, which includes infrastructure and human capital, replaces the assumption of declining returns to a restricted concept of capital (containing only physical capital). In an effort to comprehend the factors that contribute to long-term growth based on investments in human capital and new technologies through doing and learning, new growth models treat knowledge and technology as economic products. Contrary to standard neoclassical models by Arrow (1962), there are invention costs in creating new technology and adoption costs associated specifically with the creation of the human capital required to use a new technology. Adoption costs, schooling, on-the-job training, etc. In addition to a direct component in the form of investment expenditures, it has an indirect component such as foresight output. Endogenous growth models can be distinguished based on the costs of invention and costs of adoption (Schumpeter, 2012: 93-94).

The mechanism utilized by new growth models to internalize the effects of technological advancement on growth varies. Early models' (Romer, 1986; Lucas, 1988) underlying mechanisms are dynamic externalities at the aggregate level, i.e., technology is produced internally as a result of private investment choices. Romer (1986) postulates that while a firm's knowledge base expands according to its research and development costs, spillovers from these private investments broaden

knowledge in society. The pool of knowledge functions like a public good when there is no viable patent market. Romer's model has incorporated technological change despite being comparable to the Arrow. Because under Romer's concept, special agents who maximize future earnings are principally responsible for producing new information that leads to long-term progress. Knowledge-generating investments show declining returns. The production of goods from new knowledge shows increasing returns, given, for example, knowledge dissemination due to lack of patent protection. Each profit-maximizing private agent that engages in knowledge creation and so incurs innovative costs faces an optimal upper bound on his investment as new knowledge is produced from investments with diminishing returns (Baser, 2011: 32). As a result, technical change need to be inherently responsive to laws like taxes and financial incentives.

The Arrow (1962) model and Lucas' (1988) model are both comparable. However, investments in human capital rather than physical capital are what lead to spillover effects that raise the level of technology. The concept emphasizes on a broad range of abilities, particularly those that are inextricably linked to the person who obtains them. The amount of time spent on education and the effectiveness with which this time is converted into human capital both contribute to knowledge growth. Depending on whether education is defined as education or learning-by-doing, its efficiency is related to several elements. When it comes to education, effectiveness rises with educational quality, which in turn improves with more general knowledge. Here, doing rather than learning by doing is the mechanism that fosters long-term growth. Long-term growth variations are the outcome of varying rates of human capital accumulation, which are influenced by regional variations in time allocation policies. Productivity is correlated with the sort of process people engage in, and productivity is related to learning-by-doing. "Some activities can be thought of as having a high rate of skill acquisition with them, while others can be thought of as linking routine or traditional activities at a low rate," says a researcher on learning-by-doing. If this is the case, a society's mix of products will have an impact on the growth and accumulation of human capital as a whole." (Lucas, 1993: 258). A country's initial comparative advantage determines the goods it produces and hence the rate of human capital accumulation and growth.

Neo-Schumpeterian growth models employ short-term monopoly profits as a means of internalizing the effects of technical advancement on growth. These earnings drive the development of new technologies. The conditions of imperfect competition in micro manufacturing are introduced in this branch of new growth models, emphasizing the significance of temporary monopoly power as a driving force for the deliberate investment of resources by businesses or entrepreneurs seeking profit in a novel single process. Growth in these models rely on financial incentives for making technology development investments. It's also crucial to remember that the value of (new) information depends more on lead times over rival inventors and copycats than it does on successful patent protection. The foundation of models is the idea that they are created yet have no adoption costs. The costs of invention are fixed-cost expenses, such as the cost of conducting research and development necessary for the creation of novel designs. Inventors sell these novel designs to producers of new products of exceptional quality (Romer, 1990; Grossman and Helpman, 1991: 3). Where such fixed costs are considerable, the neoclassical model's competitive equilibrium solution cannot be maintained because, in this situation, decentralized market valuations of an investment project's economic efficiency diverge from values at the aggregate level. As a result, if at least some of the investment cannot be recouped by monopolistic gains, the investment will not take place.

There are significant ramifications for diversification from the idea that learning is constrained in the absence of any other invention. If the potential for learning-induced productivity improvement in each good is constrained, the amount and variety of activities and the level of technology that the workforce dominates determine the potential maximum knowledge in an economy relative to what is necessary to fully utilize the learning potential involved in the production of a given set of goods (Baser, 2011: 32). Accordingly, if an economy continues to produce the same small range of items, learning-induced productivity improvements are expected to rise. This also implies that the introduction of new technologies and the commensurate grading of skills-related information must go hand in hand in order to fully utilize an economy's learning capacity. Neither the availability of the most recent technology nor a highly qualified workforce alone are sufficient to totally exhaust this potential.

6. Technological Development in Evolutionary Economics Approach

Two names come to mind when evolutionary economics is mentioned. The first of these is Schumpeter and the second is Veblen. Influenced by the theory of evolution and criticizing the balance-centered analysis of Neo-classical economics with a bureaucratic structure, Veblen's effects on evolutionary economic thought are especially on the meaning of technological change. According to Veblen, technology is one of the most important factors determining social change. Technological development causes multifaceted social evolutions by changing both the cultural and organizational structure and the economic structure. Associating technological development with the development of capitalism, Veblen highlights the individual, namely the entrepreneur, as the basis of technological development (Başer, 2011:12).

The spread of evolutionary economics, the foundations of which were laid by Schumpeter and Veblen, took place after Nelson and Winter's book, The Evolutionary Theory of Economic Change, written in 1982. The important element that distinguishes the evolutionist approach from the Neo-classical theory is that it studies how businesses adapt to technological innovations and develop new technologies instead of examining the resource acquisition process (Taymaz, 2001: 12). In this context, evolutionary economics has tried to reveal the technological differences between businesses that the neo-classical theory cannot answer, and technology is defined as a versatile resource between businesses that develops depending on the relationship between the business and its environment (Ansal, 2004:42).

In short, in evolutionary economic theory, technology was not only seen as a process in which inputs were transformed into outputs, but also gave importance to how technological knowledge was applied and developed (Ansal, 2004: 42).

7. Institutionalist Economics Approach

Veblen, the founder of institutionalist economics, greatly influenced economists after his time, by putting technological development at the center of their analysis. For him, technical progress is at the center of social change. Veblen gave importance to the change in the habitual ways of thinking and life of technology that causes institutional change. It is technology that profoundly changes the intellectual structure of modern civilizations. According to Veblen, technological development

will cause social effects with multiple dimensions by changing both the economic structure and the cultural and organizational structure (Ansal, 2004: 42). The institutionalist approach, taking Veblen as an example, argued that technology is the fundamental element in the regulation, use and performance of the economy. Naturally, this approach gave a lot of importance to institutional structures and transformation. It created a new institutional structure that technological development primarily caused institutional change and that they would explain by using the term "techno structure" by damaging the bureaucratic structure. With the importance of technical expertise day by day, "techno structure", which includes the people who have the information needed at the production stage, is the most important factor that accelerates the use of modern technology (Veblen, 1958:144-178). In the institutional approach, four items of technology can be mentioned:

As such, technology includes private property. It is orthodox economics that sees technology as a public product. However, the institutional approach does not accept this idea. Some of the technological knowledge can be recorded in brochures, books, scientific articles and patents. Producing technology may differ in terms of convenience. The evolution of knowledge depends on the past. Technology change is rooted in the past.

8. National Innovation System Approach

The National Innovation System, which takes its foundations from the evolutionary economic approach, comes first among the theories that make the most extensive analysis between economic development and technology. At first, the German economist F. List mentioned the national innovation system approach in his book "Political Economy of the National System" written in 1841. The main problem of List was Germany's success and getting ahead of England, who had successfully completed the Industrial Revolution. The List has been recognized as a whole with its activities in less developed countries (Godin, 2009: 476).

In List's thinking, protecting newly launched industries was not enough. According to him, economic growth and industrialization are formed by the application of a series of economic policies in this life to have more meaning. Researching new technologies, putting them into operation and creating innovations are the main objectives of these policies. List considers that such a national system

depends on the joint work of the educational and scientific organizations of the industrial division. Germany created its own industrial revolution in the 1880s and later. The existence of the most useful technical education and training method in the world is one of the most valuable foundations of this revolution. Previously, Germany analyzed the clues of the new technology it had by transferring, using engineering techniques that depend on this method and contrary to it. Technological progress has been declared as a regional problem for countries after the second half of the 20th century, and national technology and science policies have advanced (Freeman and Soete, 2003). This process, which is explained by these policies, for which all relevant businesses are responsible, is explained in a systematic way. This structure is called the national innovation system. During the Cold War era, national innovation systems of countries were generally used for military purposes. The countries that use their technology investments in the space and war industry are especially the USA and the Soviet Union. However, Japan, which was defeated in the war, has made a lot of breakthroughs in the new powerful technology unit with its civilian technology investments, unlike the countries we have mentioned. In the Soviet Union, almost 70 percent of R&D investments are used in the military field, while this ratio is only 2 percent in Japan (Godin, 2009:476).

The national innovation system approach is also important with its regional feature. Urban and regional innovation systems, with their approach that sees making room in the field of technology as its main goal, are not only nationally; It helps to make regional subsystems and to replace the economic progress that includes innovation (Erkan, 1987: 152-157).

C. Industrial Revolutions and Resources

The industrial revolution refers to the effects of scientific discoveries and technology on the amount of production that started at the end of the 18th century and came to the present day. The production structure and the nation's economy underwent a significant and profound transformation as a result of this revolution. After beginning in England, the revolution later extended to Northern Europe and North America. The revolution gradually expanded across all industries after beginning in the iron and steel and textile industries (Freeman and Soete, 2003). Although steam-powered machinery and transportation (such as ships and trains)

contributed to the Industrial Revolution in the beginning, electric and gasoline-powered alternatives eventually took their place. The Industrial Revolution was brought about by colonialism, steam engines developed with technological advancements, the rise of industrial investments, the emergence of capitalism, the protection of economic and commercial rights, and the rapid growth of the European population (MUSIAD, 2017: 30).

1. Industrial Revolution I

The steam engine was invented in 1763. The founder of this invention is James Watt. This invention is revolutionary for industry 1.0. At the same time, it accelerated economic growth in America. The invention of the steam engine was used by Robert Fulton on ships in 1807. In 1812, steam engines began to be used in locomotives. This process continued with regular overseas voyages in 1840. Commercial telegraph service was first introduced by Samuel Morse in the USA in 1844. Finally, the telephone was invented by Alexander Grahambell in 1876 (Davutoğlu et al., 2017: 544).

Between 1830 and 1860, more efficient demineralization methods and techniques began to be used in England. These methods and techniques also contributed to the increase in coal production. However, the need for excess iron and steel was easily met. Since the 1700s, with the development of science and technology, the England of the period began to have a strong economy. In this period, although the capital accumulation is not fully evident, the awareness of increase is dominant in the society. At the same time, the economic process continued to develop rapidly. As mentioned above, the fact that England had a strong economic structure left the countries of the period behind over time, causing it to take on a colonial structure (Özkan, et al., 2018: 5).

Thanks to mercantilism, the stocks of gold and silver were increased before the industrial revolution and commercial capital was consolidated. This contributed to the acceleration of the industrialization process. In the same period, with the increase in the population of England, studies have started for the delivery of construction products to the domestic markets at lower costs. Since the 19th century, with the increase in population, it was important to realize the revolution in order to meet the need. For this reason, there has been an acceleration in the transition to

private property (Musiad, 2017:30-31).

2. Industrial Revolution II

The economic and social period that emerged as a result of technological innovations in the period from 1870 to 1914 is considered as the second industrial revolution. The 1870 war between France and Russia is considered to be the beginning of imperialism and the second industrial revolution. Since the production of new inventions that emerged in the 17th century gave birth to new stages, the industrial period began in the 1775s. But this revolution was the first step of this ongoing process in production life. The revolution, which was an explosion in weaving and coal mining in the beginning, was followed by other processes at intervals of 20-30 years. The process, which started with the development of spinning machines for the weaving sector at the beginning, covers two industrial cycles as long as the invention of the oil-powered combustion engine towards the end of the 19th century (Görçün, 2017).

At the end of the first stage of the Industrial Revolution, the use of steam power as a means of transportation and the transportation investments dependent on it increased. With the transportation and transportation opportunities created by the newly built railway lines at this time, the distribution of commercial really goods increased, and this situation caused the trade to reach a greater scale. The volume of foreign trade increased with steam trains and ships in a shorter time, with less cost of the products produced (Freeman and Soete, 2003). In addition to this, the increase of similar communication tools such as telephone and telegraph, as well as the spread of cheap steel production technique with the Bessemer technique, made the steel train springs necessary for the construction of the railway cheaper. Considered important in the Second Industrial Revolution is the technological transformation caused by the production of more durable steel than others. Petroleum and petroleum types, the value of chemicals in the field of economy, automotive and electricity sector are other technological developments of this period (Pamuk and Soysal, 2018: 42).

3. III Industrial Revolution

3 Industrial Revolution symbolized the time that started after World War II and extended to the 1980s. As it is known, the 2nd Industrial Revolution steam and coal are energy sources. Electricity was seen as an energy source in the 2nd

Industrial Revolution. However, in the 3rd Industrial Revolution, it was stated that the main energy source was nuclear energy. Theorists who researched the step-by-step differences after the Second World War thought that it gained momentum in the 1970s, and as a result of this research, the 3rd Industrial Revolution was discussed. This revolution was triggered by the use of electricity in mass production. Automation of supply chain and automation of production processes are the most striking features of this period. In this context, the 3rd Industrial Revolution left its place to digital technology in electronic and mechanical technologies in production. However, this revolution is qualitatively different from the first two revolutions. Because the basic structure of this revolution, the communication methods and information processing techniques formed by the spread of the internet, is also micro-electronics, which is the common means of creating these methods. This period is called the digital revolution period (Davutoglu et al., 2017: 547).

Another reason why it is different from the other 2 industrial revolutions is that the production and application of new technology in the 3rd Industrial Revolution almost every day is the most important element in production, R&D studies. Supply chain management, which is one of the valuable elements in the production process, has also entered economic life as a sub-branch of corporate resource planning with the spread of the internet, and it has emerged as a major science due to the increased value of technology today. This period, which started with the advancement of the mechanical-electrical calculator known as Z1 in the first place, continues with the production of computers and then the progress of the internet (Alçın, 2016: 47).

4. IV. Industrial Revolution (Industry 4.0)

In the process of Industry 4.0, it can be explained as replacing human power with machine power and making processes in production self-manageable. The new industrial revolution has emerged as machines become adaptable through new advances in computer and internet technologies (Görçün, 2017). A concept called the Internet of Things is moving to advanced technologies by jumping to the advanced level in production through this new method and by the self-coordination of businesses. Industry 4.0 has taken action on behalf of a new technology project that transfers its place from the production system, which is based on the tradition backed by the German state, to the production system with computer and internet support.

The aim of the project is to ensure growth in resource efficiency and to provide an integration into the production process in the buyers' scope. Industry 4.0 was introduced for the first time at the Hannover Fair in 2011. It was explained at the fair by knowledgeable people that there was a change in production and that the informatics period was taking a contemporary situation and taking production technology to a higher level. By creating the importance of this situation that the German government has made a breakthrough in the industry, a team has been made to act on this event (EBSO, 2015: 7).

Eight stages must be finished for the fourth industrial revolution to succeed. The stages are as follows (Misa, 1992: 5). (1) Establishing the reference hardware architecture and standardization; (2) Managing complex systems; (3) Offering the industry a thorough and high-speed communication infrastructure; (4) Safety and security; (5) Work organization and design; (6) Training and Continuity of Professional Development; (7) Adaptation of Current Law; and (8) Efficient Use of Resources (Kagermann, et al., 2013: 49-50). The goal of the fourth industrial revolution is to increase production's flexibility, cost-effectiveness, speed, and efficiency through the use of smart factories and next generation technologies that can connect with one another. The design, production, and distribution systems that enable mass customization through real-time information exchange will have an impact on Industry 4.0, also known as the internet of things, which affects not only factories but the entire society as a whole. All people, business organizations, industry-state relations, and interstate relations will also be impacted (Schwab, 2017: 41).

Automation is speeding up as a result of the fourth industrial revolution.

Our country has to make and implement the necessary strategic decisions in order to compete with the companies in the world in terms of R&D expenditures and employment of R&D personnel. Especially for Industry 4.0, which is called the fourth industrial revolution, industrial robot production is the basic condition for adapting to the new world order (Xu, et al., 2018: 90). For this reason, it is important to train qualified R&D personnel, to increase the share of R&D expenditures in GDP, and to evaluate the existing and potential resources of universities. Some of the universities in our country have robot laboratories and application and research centers already operating. These include universities such as Boğaziçi University,

Bahçeşehir University, METU, Istanbul Technical University, Hacettepe University, Sabancı University, Özyeğin University, Atılım University, Üsküdar University, and Gebze Technical University. The coordinated work of these centers within the body of universities, their concentration on industrial robot production instead of the same and similar subjects, the development of robots by the researchers within the scope of TÜBİTAK projects will contribute to the development of the industrial robot production industry in our country, which provides high added value (Petrillo, et al., 2018: 1).

D. Industry 4.0 Studies in the World and European Union

The analytical hierarchy process has started to find application in recent years, with the analytical support it provides to decision-making mechanisms in the Industry 4.0 transformation processes of enterprises, as in many other areas in business life. The literature on these uses is summarized below (Xu, et al., 2018: 90):

Luthra and Mangla (2018) listed the barriers to the E4.0 transformation of the Indian manufacturing industry supply chain by prioritizing them with factor analysis and AHP methods. The results of the study show that organizational barriers rank first in importance, while strategic and legal and ethical barriers are important at the second and third levels, respectively.

The Internet of Things and cloud computing technologies constitute an important component of the Industry 4.0 transformation of enterprises. In their 2018 study, Huang et al. used AHP methodology to assess the risks of cloud services used for industrial IoT devices. With this developed model, the reliability, integrity and accessibility of the systems were evaluated.

Ly et al. (2018) used the AHP method in the analysis of the factors affecting the use of the Internet of Things in businesses, and according to the findings obtained from the analysis, he concluded that tangible factors such as security, value and connectivity are more important than abstract factors such as telepresence and intelligence.

E. Industry 4.0 Studies in Turkey

Sevinç et al. (2018) analyzed and listed the difficulties of SMEs in Industry

4.0 adaptation with analytical hierarchy process (AHP) and analytical network process (ANP) methods. According to the results of the study, the most important criterion was the cost criterion, while the organization and environment criteria took the second place with equal weight, and the innovation criterion took the last place.

Erbay and Yıldırım (2019) used AHP and quality function deployment methods to determine which Industry 4.0 technologies are more important for businesses, and to identify the prominent benefits and challenges in the E4.0 transformation process. According to the findings of the study, while the most important Industry 4.0 tools were data analytics, smart sensors and production management software, respectively, the biggest obstacle to E4.0 was the lack of expert knowledge.

III. COMPARING DIGITAL TECHNOLOGIES SERVICE ON FOREIGN TRADE BETWEEN TURKEY AND EUROPE

A. Digital Commerce Infrastructures

With the impact of the digital age, the digitalization of trade around the world is becoming increasingly important. In this process, Europe and Turkey have developed various strategies to strengthen their infrastructure in the field of digital commerce and gain competitive advantage (Goncharov and Inshakova, 2022). Although the European Union (EU) and Turkey are developed at different levels in digital trade, both regions are taking various measures to strengthen their digital economies and compete in international markets. Since Europe is a union covering a wide geographical region, its digital trade infrastructure is extensive, and It is diverse (Vurdu, 2021).

The EU's digital internal market strategy focuses on increasing access to digital services, data and infrastructure. High-speed internet access, broadband usage and advanced telecommunications infrastructure increase Europe's digital trade potential (Azmeh, et al., 2020: 671). Turkey has developed its digital infrastructure and expanded broadband access in recent years. However, it has a newer digital infrastructure compared to the EU. Turkey's transition to 5G technology and fiber infrastructure continues rapidly.

The EU implements various regulations and policies to ensure that digital trade is sustainable, fair and secure. Data protection regulations such as GDPR are an important step in ensuring that consumers feel safe in the digital environment. The EU is also making efforts to establish a digital single market (Kersan-Skabic, 2021). Turkey is updating its digital trade policies and implementing various legal regulations to support digitalization. However, it is still trying to eliminate some deficiencies in the process of reaching the EU's general standards (Pekcan, 2019).

Various countries in Europe are developing their own payment systems or integrating with global payment systems. Within the Eurozone, common payment

systems and digital wallets are gaining greater adoption. Digital payment systems have developed rapidly in Turkey. Electronic wallets and mobile payment applications are popular. Turkey's dynamism in this field contributes to the spread of digital commerce (Bloem, 2014: 11).

The volume of e-commerce within the EU is large and constantly increasing. Amazon, Alibaba and other major e-commerce platforms have a large market share in Europe. The volume of e-commerce in Turkey is gradually growing. An expansion of the market is observed with the entry of local e-commerce platforms and international companies into Turkey (Pekcan, 2019).

Both regions are taking various measures to strengthen their digital trade infrastructures and become more competitive. While Europe has the advantage of being a union covering a wide geography, Turkey is on its way to having a rapidly developing digital economy. The differences between the two regions vary depending on cultural, economic and historical factors. However, the efforts of both regions in digitalization allow them to play an active role in international trade (Vurdu, 2021: 331).

Europe and Turkey's cross-border e-commerce regulations reflect a complex legal framework that is struggling to adapt to the rapidly changing digital commerce environment in both regions. Both parties follow the developments in the digital economy and implement various regulations to protect the security and rights of consumers and businesses. Here are some important points about the European Union (EU) and Turkey's cross-border e-commerce regulations and harmonization processes (Pekcan, 2019: 6).

GDPR (General Data Protection Regulation): The EU enacted the GDPR in 2018, bringing a comprehensive regulation on the processing and protection of personal data. This regulation obliges all companies inside and outside the EU to protect the data of EU citizens.

Digital Single Market Strategy: The EU is pursuing a Digital Single Market Strategy that aims to remove cross-border barriers to digital trade. In this context, a series of regulations and standards are being developed for digital content services and e-commerce transactions (Kersan-Skabic, 2021).

E-Commerce Regulation: The EU aims to remove existing barriers with a series of regulations regulating cross-border e-commerce transactions. The E-Commerce Regulation is designed to facilitate online shopping for consumers, encourage competition between businesses and ensure security (Goncharov and Inshakova, 2022).

Compliance Processes: Businesses in the EU must make significant efforts to comply with GDPR and other e-commerce regulations. These compliance processes are carried out to increase companies' data security, protect customer information and ensure smooth cross-border trade (Borchert, et.al., 2020).

Personal Data Protection Law (KVKK): Turkey has adopted the Personal Data Protection Law, a regulation similar to the EU's GDPR. KVKK provides a general framework for the processing, storage and protection of personal data.

E-Commerce Law: Turkey aims to regulate online commerce with the E-Commerce Law. This law is designed to protect the rights of consumers, promote competition between electronic commerce businesses and ensure the orderly conduct of online commerce (Vurdu, 2021).

Compliance Processes: Turkish businesses must revise internal processes and create the necessary technological infrastructure to comply with the KVKK and E-Commerce Law. This is important to protect customer information and ensure online sales transactions are transparent and fair (Vurdu, 2021).

In both regions, cross-border e-commerce regulations are being developed to ensure that digital trade occurs safely and fairly. In the process of complying with these regulations, businesses have to fulfill various obligations by focusing on data security, consumer rights and competitive advantages.

B. Customs and Digitalization

Europe and Turkey are engaged in a similar effort to transition to digitalization in customs procedures. However, there are differences between the two regions. Here are some comparative points about the customs and digitalization processes of the European Union (EU) and Turkey (Vurdu, 2021).

1. Electronic Customs Declarations and Documentation:

The EU has taken comprehensive steps towards digitalization in customs procedures. The provision of electronic customs notifications, customs declarations and other relevant documents in digital format has accelerated customs processes within and outside the EU. Projects such as the E-Export Return System have contributed to the digitalization of trade (Azmeh, et al., 2020: 671).

Turkey also continues its efforts to digitalize customs procedures. Turkey's Ministry of Customs and Trade aims to reduce paper use and speed up transactions by implementing digital applications such as Electronic Customs Declaration and Electronic Customs Notification.

2. Single Window Systems:

By adopting Single Window systems, the EU has created a system where all trade stakeholders can transmit the necessary information and documents on a single platform. This saves time by reducing paper and coordinating transactions (Kersan-Skabic, 2021).

Turkey is making efforts to develop the Single Window System. Turkey's efforts in this field are aimed at managing trade in a more transparent and effective manner (Pekcan, 2019).

3. Digital Risk Management in Customs:

EU countries are improving digital risk management at customs and focusing on quickly detecting suspicious shipments by examining customs declarations. This is important to improve security and border crossing processes (Goncharov and Inshakova, 2022).

Turkey uses various technologies to strengthen digital risk management in customs. This is an important step to improve the security of trade and prevent smuggling (Vurdu, 2021).

4. E-Export and E-Import:

EU countries have adopted various policies and practices on e-import and e-export in order to develop and promote digital trade.

Turkey has implemented policies and practices that support e-export and e-

import. There are various incentives, especially to increase the participation of SMEs in digital commerce.

5. Education and Awareness:

The EU supports the digitalization process by providing training to customs employees and trade stakeholders on digital customs transactions (Borchert, et al., 2020).

By planning training courses for Turkish customs officials and taking part in other business awareness projects, it spreads knowledge about digitization. (Vurdu, 2021).

Both regions have taken important steps towards digitalizing customs procedures and have similar goals in this process. However, differences in applications and existing infrastructure and policy differences of the two regions are effective in shaping these digitalization processes. Digitalization contributes to faster, safer and more transparent trade.

C. E-Invoice and Electronic Documentation

Although European Union countries generally have a common legal framework, there may be some differences between member states in E-Invoice practices. Many EU countries determine and implement their own legal regulations (Goncharov and Inshakova, 2022). Turkey has a legal framework in the field of E-Invoice and electronic documentation. Turkey's E-Invoice applications are carried out in accordance with the legislation determined by the Ministry of Finance of the Republic of Turkey.

E-Invoice applications in Europe may differ from country to country. While E-Invoice may be mandatory in some countries, it may be optional in others. The use of electronic documents may also vary across sectors and companies. In Turkey, E-Invoice application has become mandatory for taxpayers with a certain turnover. E-Archive Invoice application appeals to a wider range of businesses. Most of the companies in Turkey use E-Invoice and E-Archive Invoice systems (Adaçay, 2007).

Secure electronic documentation systems are generally used in EU countries. The security of electronic documents is usually achieved through digital signatures and encryption methods (Azmeh, et al., 2020: 671). Turkey has made the use of digital signature mandatory in E-Invoice and E-Archive Invoice applications. This is a regulation made to ensure the security and integrity of documents (Pekcan, 2019).

Many businesses in Europe have switched to digital business processes integrated with E-Invoices and electronic documents. In addition, many EU countries are adopting digital transformation strategies to reduce paper use and make processes more efficient (Kersan-Skabic, 2021). Turkish businesses digitalize their business processes and increase their efficiency by using E-Invoice and E-Archive Invoice. Electronic documentation plays an important role in reducing paper usage and speeding up business processes (Vurdu, 2021:331).

The culture and processes of doing business in Europe may differ from country to country. In trade between EU countries, many businesses use E-Invoice systems in accordance with national regulations (Borchert, et.al., 2020). The business culture in Turkey tends to adapt to a rapidly digitalizing economy. Electronic documentation is a strategy adopted by Turkish businesses to increase competitiveness and optimize processes (Pekcan, 2019).

Europe and Turkey have similar legal frameworks regarding E-Invoices and electronic documents, and both regions are taking important steps towards digitalization. However, cultural, business and legal differences cause some differences in the approach of both regions to these technologies.

D. Digital Marketing and Commerce Strategies

Europe is a market consisting of many countries spread over a wide geography. This means diversity with different cultures, language groups and consumer habits. In Europe, digital marketers often develop multi-language strategies and local audience-focused campaigns. Turkey offers a cultural mosaic as it is a country that is a bridge between the Middle East and Europe. Turkey's population is young and internet usage is widespread, offering great potential for digital marketers (Adaçay, 2007).

E-commerce is quite developed in Europe. Most consumers in EU countries have the habit of shopping online. Major e-commerce platforms, especially global players such as Amazon and Alibaba, play an active role in the European market (Kersan-Skabic, 2021). Turkey is experiencing rapid growth in e-commerce. Local e-commerce platforms have become stronger with the young population and the acceleration of the digitalization process. Turkey's e-commerce infrastructure and prevalence is increasing (Sovbetov, 2018: 256).

Digital advertising spending has increased significantly in Europe. A shift towards digital media rather than traditional media is observed (Borchert, et al., 2020). Social media advertising, search engine advertising and programmatic advertising strategies are widely used. Digital advertising expenditures are also increasing in Turkey. Advertising strategies, especially on social media, mobile ads and local digital platforms, are widely used among brands (Gökmen, 202: 31).

Levels of digitalization in Europe vary from country to country, but are generally high. Widespread use of mobile devices, cities' digital infrastructures and broadband access provide the opportunity to reach consumers through various digital channels. Digitalization is progressing rapidly in Turkey. The fact that a large portion of the young population actively uses mobile devices gives digital marketers the opportunity to develop mobile-focused strategies (Hwang, et al., 2006: 3).

Although there is a unified market among EU countries, legal regulations and consumer habits differ from country to country. Digital marketers must adapt to local regulations and understand cultural differences. Considering the local culture and legal regulations in Turkey, digital marketers should follow a special strategy. It is important to understand the characteristics of Turkish consumers and comply with local regulations (Borchert, et al., 2020:5).

Digital marketing and trade strategies of Europe and Turkey are shaped in accordance with the special conditions and consumer habits of both regions. While Europe has a large market and high levels of digitalization, Turkey stands out with its fast-growing digital economy and young population. For digital marketing strategies to be successful, it is important to pay attention to local factors in both regions (Sovbetov, 2018: 257).

E. Digital Export Supports

COSME Program: The EU's COSME program offers various supports to increase the competitiveness of SMEs and adapt to digitalization processes. This program encourages businesses to receive training on digitalization and expand into new markets. Horizon Europe: The EU's Horizon Europe program is designed to fund innovative digital projects. This program offers support to businesses and research institutions working in digitalization, artificial intelligence, and other high-tech fields. Single Market and Free Trade Agreements: The EU aims to promote digital exports of member countries through its single market and free trade agreements around the world. Common regulations and standards help EU countries export their digital products and services to a wider geography (Goncharov and Inshakova, 2022).

Digital Transformation Office (DDO): Digital Transformation Office in Turkey provides support to the digitalization processes of SMEs. DDO helps them develop digital strategies, provides access to digital technologies and supports the development of e-commerce. Turkish Exporters Assembly (TIM): TIM offers various supports to businesses exporting in Turkey. It aims to increase the competitiveness of exporters through training and consultancy services, especially on digitalization. E-Export Platforms: Turkey has created various e-export platforms to encourage SMEs to make digital exports. These platforms make it easier for businesses to enter international markets and contribute to the development of digital commerce (Pekcan, 2019).

The EU provides various training programs and resources to increase the capacity of SMEs in digitalization. This helps businesses improve their digital marketing strategies and adopt new digital commerce models (Azmeh, et.al., 2020:671). Turkey also offers various programs on training and capacity building. SMEs can access a variety of training resources to improve their digital business skills and be competitive in international markets (Pekcan, 2019).

The EU provides various financial support and incentives to develop the digital infrastructures of member countries. It aims to increase access to technologies such as high-speed internet access, e-invoice systems and digital payment infrastructures (Goncharov and Inshakova, 2022). Turkey has implemented various

projects to strengthen digital infrastructure and support the use of technology. Support is provided in areas such as high-speed internet access, e-commerce infrastructure and digital payment systems.

Both regions have various strategies regarding digital export support. While Europe has the advantage of common standards and intra-union free trade in a wide geography, Turkey encourages digitalization with local programs and trainings that especially support SMEs. Support in the two regions aims to help businesses gain a competitive advantage in digital commerce (Adaçay, 2007).

F. Future Digital Commerce Trends

E-commerce in Europe has gained great momentum with the change in consumer habits and the acceleration of the digitalization process. E-commerce subcategories such as mobile commerce, cross-border e-commerce and marketplace platforms are becoming increasingly important (Kersan-Skabic, 2021). In Turkey, e-commerce is strengthened by rapid population growth and digitalization trends. Especially the growth of mobile commerce in Turkey is remarkable. Businesses aim to gain competitive advantage by strengthening their digital commerce strategies.

Europe is taking a leading role in sustainability and green business (Borchert, et al., 2020). Green supply chains, environmental impact assessments and carbon neutral trading practices are a focus for businesses in Europe. Turkey also shows an increasing awareness of sustainability. Green energy, recycling and environmentally friendly production trends are among the strategic goals of Turkish businesses (Tatoglu, 2005: 623).

In Europe, artificial intelligence (AI) and automation are used particularly in areas such as logistics, customer service and personalized marketing. Businesses aim to increase efficiency and reduce costs by using AI and automation tools (Kersan-Skabic, 2021). Turkey is taking steps to gain competitive advantage by adopting artificial intelligence and automation. Especially in the production sector, automation plays an important role in increasing efficiency and quality (Pekcan, 2019).

Digital payment systems, mobile wallets and cryptocurrencies are increasingly used in Europe. The EU is developing various regulations and standards to promote digital payments and facilitate cross-border payments (Goncharov,

Inshakova, 2022). Digital payment systems are rapidly becoming widespread in Turkey. As the use of mobile payment applications and cryptocurrencies increases, the Turkish government is taking various steps to encourage digital payments.

In Europe, data security and privacy are of great importance, especially with regulations such as GDPR (General Data Protection Regulation). Businesses adopt various security measures to protect customer data and increase their reliability (Azmeh, et al., 2020). Turkey has updated national regulations with a greater focus on data security and privacy issues. Companies implement various security measures to protect customer information and offer a reliable digital commerce environment (Pekcan, 2019).

Both regions have similar strategic goals in adapting to the digital commerce trends of the future. Issues such as the development of e-commerce, sustainability, artificial intelligence, digital payments and data security are key areas that businesses focus on both in Europe and Turkey. However, both regions are adapting to these trends within their own conditions and regulations (Tatoglu, 2005: 623).

G. Problem with Digital Commerce in Turkey

Some common problems associated with digital commerce in Turkey (Kadı, F., & Peker, C. (2015).

Payment Security Concerns: Online payment security remains a significant concern in Turkey. Consumers are often cautious about sharing their financial information online due to fears of fraud and unauthorized access. Addressing these concerns is crucial for building trust in digital commerce platforms (Avcı, et al., 2021).

Limited Digital Payment Adoption: While digital payment methods have been gaining popularity, there is still a significant portion of the population that prefers traditional payment methods. Limited access to credit cards and concerns about the security of online transactions contribute to the slow adoption of digital payment solutions.

Regulatory Challenges: The regulatory environment for e-commerce in Turkey has undergone changes, and businesses may face challenges in complying with new regulations.

Navigating complex legal requirements and ensuring adherence to consumer protection laws can be demanding for digital commerce operators.

Logistics and Delivery Issues: Efficient and reliable logistics are crucial for the success of digital commerce. Turkey's diverse geography and varying infrastructure quality can pose challenges for timely and cost-effective product deliveries, especially in remote areas (Birol, 2021).

Consumer Trust and Confidence: Building and maintaining consumer trust is essential for the growth of digital commerce. Issues such as counterfeit products, inaccurate product descriptions, or poor customer service can undermine consumer confidence in online shopping platforms.

Cross-Border Trade Challenges: E-commerce businesses in Turkey may face challenges when engaging in cross-border trade. Regulatory differences, currency exchange issues, and varying consumer preferences across different regions can complicate international e-commerce efforts.

Limited Digital Literacy: Some segments of the population, particularly older individuals and those in rural areas, may have limited digital literacy. This can impact their ability to access and navigate online shopping platforms, limiting the overall market potential for digital commerce.

Competition and Market Saturation: The digital commerce market in Turkey is becoming increasingly competitive. While this offers consumers more choices, businesses may find it challenging to stand out and differentiate themselves in a saturated market.

Cybersecurity Threats: With the increasing prevalence of digital transactions, the risk of cybersecurity threats such as data breaches and hacking attempts also rises. Businesses need to invest in robust cybersecurity measures to protect customer information and maintain trust.

Government agencies, corporations, and other interested parties must work together to address these issues in order to foster an atmosphere that will encourage the expansion of digital commerce in Turkey. To promote a more favorable e-commerce ecosystem, it also entails ongoing efforts to raise digital literacy, upgrade infrastructure, and simplify rules.

IV. DIGITAL TECHNOLOGY

A. Significance of Digital Technology in Both Turkey and the EU

The significance of digital technology in both Turkey and the European Union (EU) holds profound implications for numerous aspects of economy, governance, innovation, and societal interactions. Within the contemporary global landscape, digital technology serves as a pivotal force, reshaping industries, economies, and societal frameworks. Its transformative prowess becomes especially pronounced in regions like Turkey and the EU, where the progression of digitalization stands as a cornerstone for economic growth, competitiveness, and societal advancement (Çilan, et al., 2009).

In Turkey, akin to many emerging economies, digital technology assumes a pivotal role in steering innovation, fostering economic development, and bolstering connectivity. The rapid embrace of digital infrastructure, mobile technologies, and e-commerce platforms has not only empowered businesses but also revolutionized consumer behaviors while facilitating widespread access to information across diverse demographics. Similarly, within the European Union, digital technology acts as a principal catalyst for economic growth, innovation, and competitive advantage. EU member states have consistently led technological advancements, emphasizing digital transformation to propel industries, public services, and societal connectivity into the digital age (Kahraman, et al., 2007: 284).

Both Turkey and the EU acknowledge the pivotal role played by digital technology in shaping the future, fostering innovation, and augmenting global competitiveness. The integration of digitalization has become an integral facet of economic policies, governance frameworks, and strategies for societal development, reflecting a shared commitment to harness technological advancements for inclusive growth, enhanced services, and an improved quality of life (Chmielarz, et al., 2021: 41).

Recognizing the importance of comprehending digital technology's significance in both Turkey and the EU transcends mere economic prosperity; it extends to social integration, innovation ecosystems, and adapting to the evolving needs of a digitally connected world. As both regions continue traversing their digital transformation paths, acknowledging the vital importance of technological advancements becomes paramount in harnessing the potential of digital innovations and cultivating sustainable development for the future (Çilan, et al., 2009: 98).

Understanding the disparities, similarities, challenges, and opportunities in digital technology adoption between regions such as Turkey and the EU holds immense relevance for various stakeholders, policymakers, businesses, and societies at large. This understanding facilitates informed decision-making, enhances competitiveness, guides policy formulation and alignment, identifies growth opportunities, mitigates challenges, fosters knowledge exchange, promotes societal development and inclusion, and aids in strategic business decisions. In summary, it underpins collaborative efforts towards innovation, effective policies, and sustainable growth, paving the way for informed decision-making and strategic planning that harnesses the full potential of digital transformation for societal, economic, and technological advancement (Karabag, et al., 2011: 1347).

B. Overview of Digital Technology in Turkey and the EU

Turkey has been at the forefront of significant advancements in digital technology, showcasing developments in infrastructure, internet penetration, and technological innovations. Presently, the country exhibits a robust digital landscape marked by notable progress in various sectors (Kutlu and Sevinç, 2010:1):

In terms of infrastructure and connectivity, Turkey has witnessed substantial growth in internet usage, particularly in urban areas, contributing to increased internet penetration rates among the population. The prevalence of smartphones and the adoption of 4G networks, along with gradual shifts towards 5G technology in urban centers, indicate a high mobile penetration rate. Efforts to expand broadband access across rural and underserved regions are underway, although disparities between urban and rural areas persist in terms of infrastructure and connectivity (Hazar, 2019: 954).

The technological advancements in Turkey further manifest in its flourishing e-commerce sector, featuring popular platforms like Trendyol, Hepsiburada, and n11.com. The ease and convenience of online shopping have significantly contributed to the expansion of the digital economy. Additionally, the adoption of digital payment systems and mobile wallets has grown, offering users various options for cashless transactions and online purchases (Ismar, et al., 2020: 19).

The country hosts a burgeoning startup ecosystem, particularly prominent in cities like Istanbul. Government support for entrepreneurship and innovation has facilitated the emergence of startups in various tech-related sectors such as fintech, healthtech, and e-commerce. Furthermore, Turkey has taken strides in government digitalization efforts with initiatives like the e-Government Gateway (e-Devlet Kapısı) (www.turkiye.gov.tr), allowing citizens to access a wide array of government services online, streamlining administrative processes. The nation has also prioritized cybersecurity measures to safeguard its digital infrastructure and address evolving cyber threats (Nicoletti, et al., 2020: 12).

Despite these advancements, challenges remain. Disparities in infrastructure and internet access, especially in rural and remote areas, persist, posing hurdles to achieving universal connectivity and digital inclusion. Addressing concerns related to data privacy, cybersecurity, and regulatory frameworks to align with international standards remains an ongoing necessity. Enhancing digital literacy and skills development across demographics also remains crucial to fully harnessing the potential of digital technology in Turkey. As the country continues its digital transformation journey, bridging infrastructure gaps, ensuring equitable access, and fortifying cybersecurity measures will be crucial for sustainable development and inclusive growth in the digital era (Misa, 1992: 6).

On the other hand, the European Union (EU) member states portray a diverse digital technology landscape characterized by regional differences and common trends compared to Turkey. The EU collectively demonstrates varying levels of development, infrastructure, and policy frameworks in digital technology adoption across its member states. This contrast highlights several distinct regional differences and common trends within the EU (Godin, 2009: 477):

Regional Differences (Godin, 2017: 91):

Infrastructure and Connectivity: EU countries generally possess well-established digital infrastructure and high internet penetration rates, although disparities in connectivity between urban and rural regions might exist within some member states.

Regulatory Frameworks: Each EU member state has distinct regulatory frameworks concerning data privacy, cybersecurity, and digital policies, resulting in variations in legal standards and compliance requirements.

Digital Innovation Hubs: Some EU countries host renowned digital innovation hubs and tech clusters, predominantly in Western Europe, fostering a vibrant startup ecosystem and technological advancements. However, discrepancies exist in the distribution of these innovation hubs across regions within countries.

Digital Literacy and Skills: Variances in digital literacy rates and initiatives for skills development may impact the population's engagement with digital technologies across EU member states.

Common Trends (Petrillo, De Felice, 2018: 5):

Strong Digital Infrastructure: Most EU member states emphasize maintaining and expanding digital infrastructure to ensure high-speed broadband access and connectivity for citizens and businesses.

Data Privacy Regulations: The EU has implemented robust data protection regulations, notably the General Data Protection Regulation (GDPR), setting stringent standards for data privacy and user rights.

Digital Transformation Agendas: Member states actively pursue digital transformation agendas, integrating technology into various sectors to enhance efficiency and accessibility in healthcare, education, and public services.

Focus on Innovation and Research: There's a prevalent focus on innovation and research in digital technologies, with investments in initiatives promoting technological advancements and digital entrepreneurship.

Cybersecurity Initiatives: Collaborative efforts among EU member states aim to enhance cybersecurity measures, sharing best practices and collaborating on initiatives to protect critical infrastructure.

Efforts for Digital Inclusion: Collective initiatives aim to bridge the digital divide, ensuring digital inclusion for all citizens, regardless of geographical location or socio-economic background.

While the EU generally boasts advanced digital infrastructure and robust policies, internal disparities persist within member states. Addressing these discrepancies and promoting equitable access, digital skills development, and innovation remains a focal point in the EU's collective efforts to foster a thriving digital ecosystem across the bloc.

Table 1. Comparison of the Status of Digital Infrastructure, Broadband Access and Mobile Connectivity in Turkey and the EU.

	Digital Infrastructure	**Broadband Access**	**Mobile Connectivity**
Turkey	Turkey has been investing in improving its digital infrastructure, focusing on expanding internet connectivity and access, particularly in urban areas. There are ongoing efforts to enhance the digital ecosystem, including the expansion of broadband networks and the implementation of initiatives to promote digitalization across sectors.	Broadband access in Turkey has been expanding, but disparities exist between urban and rural areas. Efforts are being made to bridge this gap, focusing on increasing accessibility to high-speed internet in remote regions.	Turkey has witnessed a rapid increase in mobile connectivity, with a significant portion of the population using smartphones. The adoption of 4G networks is prevalent, and there's a gradual transition towards 5G technology in certain urban areas.
EU	EU member states generally possess well-developed digital infrastructures, with extensive high-speed broadband coverage across urban and rural areas. The EU has placed emphasis on digital infrastructure development, aiming for widespread connectivity and advanced networks to support various digital services and applications.	EU member states have high broadband penetration rates, offering widespread access to high-speed internet. However, there might still be regional discrepancies in broadband availability and quality.	EU member states also boast high mobile connectivity rates, with a considerable percentage of the population using smartphones and accessing mobile internet services. 4G networks are widely available, and there's ongoing deployment and adoption of 5G networks across the region.

Source: (Anıl Bülent, Köksal Emin 2016)

Turkey and the EU have both achieved notable advancements in the develop ment of digital infrastructures, as well as in enhancing broadband and mobile connect ions.

When compared to Turkey, the EU as a whole often exhibits greater levels of mobile and internet connectivity. However, regional differences within EU member states

can still exist in terms of connectivity quality and access (Gökmen, 2012:33). Turkey is actively working to bridge the digital divide between urban and rural areas, focusing on expanding both broadband and mobile connectivity to underserved regions. While both Turkey and the EU prioritize enhancing digital infrastructures and connectivity, the EU generally showcases higher levels of development in these areas. Nonetheless, Turkey's efforts in improving its digital ecosystem, particularly in expanding connectivity to remote areas, signify its commitment to advancing digital technology across the country (Kaynak, Tatoglu, 2005).

Table 2 Analyze Differences Between Internet Penetration Rates, High-Speed Internet Availability and Connectivity in Turkey and the EU

	Internet Penetration Rates	**Availability of High-Speed Internet**	**Initiatives to Expand Connectivity**
Turkey	Turkey has seen substantial growth in internet penetration rates over the years, with a significant portion of the population having access to the internet. However, there might be disparities between urban and rural areas in terms of access and usage.	Efforts have been ongoing to expand access to high-speed internet in Turkey, especially in urban centers. However, rural and remote areas might still face challenges in accessing high-speed connectivity	Turkey has undertaken initiatives to bridge the digital divide and expand connectivity to underserved regions. Efforts include infrastructure development, investment in broadband networks, and initiatives to improve connectivity in remote areas.
EU	EU member states generally exhibit high internet penetration rates, with a considerable percentage of the population having access to the internet. Urban areas often showcase higher rates of internet penetration compared to rural regions, although the overall rates are relatively high across the EU	High-speed internet availability is prevalent across most EU member states, with extensive coverage in urban areas. The EU has emphasized the need for high-speed broadband as a fundamental utility, aiming for widespread availability.	The EU has launched various initiatives to promote connectivity, such as the European Electronic Communications Code (EECC) and the European Gigabit Society targets, aiming to provide gigabit connectivity to all households by a certain timeline. These initiatives focus on advancing high-speed internet infrastructure

Source: Adapted from (Kangoh and Lee 2023)

Comparing the Differences: While both the EU and Turkey place a high premium on increased connectivity, the latter frequently shows higher internet penetration and more accessible high-speed internet, especially in urban areas. Initiatives throughout the EU have emphasized the importance of high-speed internet as a necessary utility and worked to develop ubiquitous gigabit access. With a focus on infrastructure development and initiatives to improve internet connection in underserved areas, Turkey is aggressively tackling the disparities in connectivity

between urban and rural areas**.**

- **The E-Commerce landscape in Turkey and EU**

differences in internet penetration rates, availability of high-speed internet, and initiatives to expand connectivity in both Turkey and the European Union (EU) (Çilan, et al., 2009: 52):

In assessing the landscape of internet penetration rates, availability of high-speed internet, and initiatives to enhance connectivity, discernible differences emerge between Turkey and the European Union (EU). Turkey has experienced commendable growth in internet penetration rates, witnessing a substantial portion of its population gaining access to the internet; however, discernible gaps might persist, particularly between urban and rural areas. Conversely, EU member states generally exhibit higher and more uniform internet penetration rates, although urban areas tend to demonstrate higher rates compared to their rural counterparts. Regarding the availability of high-speed internet, Turkey has been actively striving to expand access, particularly in urban centers, yet challenges persist in rural and remote regions (Kahraman, et al., 2007: 288). In contrast, the EU boasts prevalent availability of high-speed internet across most member states, accentuating its prioritization of high-speed broadband as a fundamental utility. The EU's initiatives, including the European Electronic Communications Code (EECC) and the European Gigabit Society targets, underscore a concentrated effort towards achieving widespread gigabit connectivity, indicative of the EU's robust focus on advancing high-speed internet infrastructure. In comparison, Turkey has been fervently working to bridge the digital divide by investing in infrastructure, expanding broadband networks, and enhancing connectivity in underserved regions. Despite commendable efforts, Turkey faces challenges in certain remote areas, highlighting the complexities in achieving uniform connectivity. Ultimately, while both Turkey and the EU prioritize expanding connectivity, the EU stands out for its higher internet penetration rates, widespread availability of high-speed internet, and targeted initiatives aimed at ensuring extensive and advanced connectivity, whereas Turkey's efforts, though commendable, encounter challenges in achieving uniform access, particularly in remote regions (Chmielarz, et al., 2021: 14).

- **E-commerce Landscape in Turkey:**

Key Players:

- **Trendyol:** One of Turkey's leading e-commerce platforms, offering a wide range of products, including fashion, electronics, and home goods.
- **Hepsiburada:** A prominent online marketplace in Turkey, providing various products and services, known for its diverse offerings and user-friendly interface.
- **n11.com:** Another significant player in Turkey's e-commerce market, offering a variety of goods, including electronics, fashion, and household items.

- **Market Trends:**

- **Growth Trajectory:** Turkey's e-commerce sector has witnessed substantial growth, especially in recent years, driven by increasing internet penetration and smartphone usage.
- **Mobile Shopping:** Mobile commerce plays a significant role, with a considerable portion of online purchases made through smartphones.
- **Diverse Product Offerings:** E-commerce platforms in Turkey offer a wide array of products and services, attracting consumers with diverse preferences.

- **Consumer Behavior:**

- **Preference for Online Shopping:** Turkish consumers have shown an increasing inclination towards online shopping due to convenience, discounts, and a wide range of products available.
- **Rise in Cross-Border Shopping:** Cross-border e-commerce is gaining popularity among Turkish consumers, with increased interest in purchasing from international websites.

- **E-commerce Landscape in EU Countries:**

Key Players:

- **Amazon:** A dominant player in the EU's e-commerce market, offering diverse products and services across member states.

- **Alibaba:** While primarily based in Asia, Alibaba also has a presence in the EU market, especially in cross-border trade.
- **Zealander:** Known for its focus on fashion, Zalando operates in several EU countries, catering to the online fashion market.
    - **Market Trends:**
- **Market Maturity:** E-commerce in EU countries is relatively mature compared to emerging markets, with high levels of internet penetration and established online shopping habits.
- **Sustainability and Ethical Consumption:** There's a growing trend toward sustainability and ethical consumption, influencing consumer choices on e-commerce platforms.
- **Cross-Border Trade:** EU member states engage in significant cross-border e-commerce, with consumers purchasing from various international websites within and outside the EU.
    - **Consumer Behavior:**
- **Preference for Convenience:** EU consumers appreciate the convenience of online shopping, with factors like fast delivery and easy returns influencing their choices.
- **Mobile Commerce:** Similar to Turkey, mobile shopping is prevalent across EU countries, with a substantial portion of purchases made through mobile devices.
- **Emphasis on Trusted Brands:** Consumers in EU countries tend to prefer established and trusted brands when making online purchases.
    - **Comparison Summary:**

In summary, both Turkey and the EU exhibit thriving e-commerce environments, with major firms providing a wide array of goods and services.

• The EU's market is more developed, with established online shopping habits and cross-border trade, while Turkey's e-commerce growth is noteworthy and driven by rising internet penetration.

• Consumer behaviors in both regions exhibit similarities regarding mobile shopping preferences and a preference for convenience, but with subtle differences in factors influencing purchasing decisions, such as brand preferences and sustainability concerns.

Digital Economy Contributions, Growth rates, and Regulatory Frameworks supporting e-commerce in both regions. The comparison between Turkey and the European Union (EU) regarding their digital economy contributions, growth rates, and regulatory frameworks supporting e-commerce unveils several distinctive facets. Turkey's digital economy has showcased notable growth, prominently driven by its burgeoning e-commerce sector, tech startups, and digital services. Conversely, the EU possesses a mature and diverse digital economy that significantly contributes to its member states' GDP through well-established e-commerce platforms, digital services, and technology-driven industries. While Turkey's e-commerce sector demonstrates rapid growth, attributed to increasing internet penetration and consumer adoption of online transactions, the EU's digital economy exhibits relatively stable growth rates within its more established e-commerce market. Regarding regulatory frameworks, both regions exhibit supportive structures for e-commerce (Ekinci, 2014: 4).

Turkey has been actively improving its legal framework, aligning with international standards to ensure consumer protection and data privacy, as reflected in regulations like the Regulation on the Procedures and Principles Regarding Service Providers and Intermediary Service Providers. Comparatively, the EU boasts comprehensive regulations, including the e-Commerce Directive and the General Data Protection Regulation (GDPR), fostering a harmonized legal environment for digital services, consumer rights, data protection, and cross-border trade within the EU's single market. Although both regions contribute significantly to the digital economy and support e-commerce through regulatory frameworks, the EU's more mature and harmonized market exhibits stability, while Turkey's digital economy demonstrates rapid growth potential amid ongoing regulatory enhancements to align with global standards (Karabag, et al., 2011: 1347).

C. Innovation and Startup Ecosystem

Startup Ecosystem in Turkey (Kutlu, Sevinç, 2010: 5):

Innovation Hubs: **Istanbul**: Known as a vibrant hub for startups, Istanbul hosts numerous tech incubators, accelerators, and co-working spaces, fostering innovation and entrepreneurship.

Ankara and Izmir: Other cities like Ankara and Izmir also have emerging startup scenes, contributing to the country's growing entrepreneurial ecosystem.

Government Support: Initiatives: The Turkish government has launched various initiatives to support startups and entrepreneurship, such as incentive programs, funding schemes, and regulatory reforms to facilitate business creation and growth.

Investment Incentives: Programs like the Technology Development Zones (TDZ) offer tax incentives and support services to tech-focused startups.

Startup Ecosystem in the EU: Innovation Hubs (Hazar, 2019: 955):

Berlin, London, Paris: Cities like Berlin, London, and Paris are renowned as major innovation hubs within the EU, hosting a diverse range of startups, tech accelerators, and venture capital firms. Stockholm: Stockholm is notable for its thriving tech scene, particularly in areas like fitness, gaming, and biotech. Government Supported Funding: The EU offers various funding programs and grants to support startups and innovation, including Horizon Europe and the European Innovation Council (EIC), providing financial support and networking opportunities. National Support: Individual EU member states also offer support through funding schemes, tax incentives, and regulatory frameworks tailored to foster entrepreneurship and innovation. Analysis that Turkey: Istanbul stands out as a prominent hub for startups in Turkey, with the government offering incentives and support programs (Nicoletti, et al., 2020):

The EU exhibits a mature startup ecosystem, with several major cities serving as innovation hubs. The EU's funding initiatives and support mechanisms for startups are robust, encouraging innovation and cross-border collaborations. Government Support: Both Turkey and the EU demonstrate commitment to supporting entrepreneurship. While Turkey has shown dedication through various initiatives, the EU's collective efforts across member states and access to substantial funding programs contribute to a more established startup ecosystem. In summary, while both Turkey and the EU offer support for startups and innovation, the EU's more mature

ecosystem, diversified innovation hubs, and access to substantial funding opportunities present a robust environment for fostering entrepreneurship. Turkey's ecosystem shows promise but may benefit from further development and resources to reach the same level of maturity and international recognition as some of the major startup hubs within the EU.

D. Distinctive Advantages in the Service Sectors: Comparative Analysis of Turkey's Strategic

The service sectors of both Turkey and the European Union (EU) constitute vital elements of their economies and industrial frameworks. While neither region lacks a complete factor that the other possesses, certain distinct attributes or emphases within each sector stand out as more pronounced or developed. For instance, Turkey benefits significantly from its strategic geographic location, functioning as a crucial bridge between Europe and Asia (Keskin, et al., 2021: 1242). This geographical advantage plays a pivotal role in facilitating trade, serving as a gateway for logistical operations, and enhancing connectivity among continents. The consequential impact of this unique geographic position on trade facilitation could be considered a vital factor that distinctly favors Turkey. Conversely, the EU has established a highly standardized and comprehensive regulatory framework for data protection, consumer rights, and cross-border trade. Notably, regulations like the General Data Protection Regulation (GDPR) ensure a cohesive legal environment for digital services and data privacy across its member states. This unified regulatory approach stands as a notable strength, fostering trust, aligning practices, and streamlining operations within the EU's single market (Alfawaire and Atan, 2021: 45).

When comparing these elements between both regions, Turkey's advantageous position enabling trade and connectivity stands out, while the EU's standardized regulatory environment supporting harmonized practices remains a distinctive feature setting it apart. The significance of each of these aspects might vary based on specific economic, geopolitical, or market requirements within their respective regions. In the logistics and transportation industry, Turkey exhibits distinct strengths compared to the EU. Its strategic advantages are evident in several key areas (Mahdi and Nassar, 2021: 98).

Geographical Position: Turkey's unique geographic location, bridging Europe and Asia, positions it as a strategic transit hub. This location significantly benefits international trade and logistics networks by connecting diverse continents and facilitating trade routes between East and West (Akman and Yilmaz, 2008).

Strategic Infrastructure: Substantial investments in transportation infrastructure, including modern ports, highways, and railways, have bolstered connectivity for goods movement. Notably, Istanbul's Bosporus Strait plays a critical role in global maritime transportation, granting Turkey a pivotal position in international trade (Keskin, et al., 2021: 1242).

Strategic Partnerships: Turkey has cultivated strategic alliances with neighboring countries and established logistics hubs in cities like Istanbul and Izmir. These initiatives optimize Turkey's role as a trade gateway between Europe, the Middle East, and Central Asia. Efficient Services: Turkey boasts efficient logistics services, providing cost-effective and timely transportation solutions. These services play a crucial role in facilitating trade and meeting industries' requirements, leveraging the country's well-developed transportation networks. From the EU's perspective, while it also maintains a robust logistics and transportation sector, Turkey's unique strengths lie in its strategic location, efficient infrastructure, and specialized focus on transcontinental trade (Alfawaire and Atan, 2021: 45). Despite the EU's well-developed infrastructure and advanced logistics systems within member states, it may not possess the same exceptional and strategic advantage that Turkey holds in facilitating trade between Europe and Asia.

Turkey's position as a transit hub, coupled with strategic infrastructure investments and efficient logistics services, contributes significantly to its competitive edge in the logistics and transportation sector compared to the EU. These advantages distinctly position Turkey to facilitate international trade and connectivity between multiple regions (Berman, et al., 2021: 2).

E. Competitiveness of Turkey Against EU by Technology Level

The subject of this section is the analysis of Turkey's competitiveness against the EU according to the technology level (Akman and Yilmaz, 2008). Before moving

on to the competitiveness findings that we calculated using the Revealed Comparative Advantage approach, it should be noted that there are measurement methods other than the disclosed comparative advantage approach in the measurement of competitiveness of countries. The reason why we preferred the Revealed Comparative Advantages (ACU) approach in this study is that it is a more convenient method for analyzing competitiveness at the sectoral level. In other words, ACU is not the only approach in measuring the competitiveness of a country against other countries, and a competitiveness analysis based on BAT, which is calculated from the observations, gives clues about the tendency of the competitiveness of the country, but does not include all the components of competitiveness (Keskin, et al., 2021: 1242).

The BAT approach bases the competitiveness of the country on the foreign trade parameters (exports and imports), and does not focus on the structural parameters that cause the differentiation of the comparative advantage between countries, and only deals with the results (Mahdi, Nassar, 2021:98). The BAT approach implicitly recommends that developing countries such as Turkey specialize in sectors with low technology content, while developed countries implicitly recommend a foreign trade structure based on sectors with high technology content. Because the peripheral economies have foreign trade surplus in non-technological sectors (food, textile, etc.) with low technology content, while foreign trade deficits arise in sectors with high technology content (due to their foreign dependence) (Alfawaire and Atan, 2021:45).

In other words, the AKU approach implicitly accepts sectoral specialization based on the international division of labor as data, and assumes that peripheral economies can gain competitiveness only if they are integrated into international trade in low-profile sectors where they are advantageous. However, when the development/industrialization experiences of today's developed metropolitan countries and Newly Industrialized Countries (NICs) that have come a long way in industrialization are examined, it is seen that none of these countries have implemented an industrialization policy based on static competitiveness, and that these countries' initial natural resource and labor costs are taken as data. It is seen that they do not base their industrialization on these resources (Mahdi and Nassar, 2021: 98). Industrialized countries did not insist on preserving the advantages they

had at the beginning, they intervened in the economy and followed an industrialization policy based on dynamic competitive power and achieved important developments in exports. With an industrialization strategy that takes international specialization as a given, it becomes almost impossible for a country in Turkey to overcome a semi-industrialized economic formation (Akman and Yilmaz, 2008).

Efficiency level is one of the most basic parameters determining international competitiveness. Although many parameters, especially relative prices (real exchange rate and wage movements), are effective on competitiveness, it should be noted that the most basic condition for a country's long-term competitiveness is closely related to the structural transformations that the country will provide in technology (productivity). Competitiveness based on the devaluation of national currencies is not a healthy method, nor is it permanent. In other words, since a country's pursuit of gaining competitiveness by resorting to devaluation will result in a currency race between countries by resorting to the same path in its rival countries, the chance of success seems to be non-existent in the medium and long term. Another option that a country can resort to in gaining competitiveness is the low wage policy based on the suppression of wages. In particular, the low wage policy based on labor-intensive sectors has an effect on increasing the competitiveness of these sectors in the short term (Alfawaire and Atan, 2021: 45). However, a competitive power policy based on wage suppression has almost no chance of success, just like a policy based on real exchange rate movements: As a trend, wage explosions are followed by wage explosions (cyclical movements are observed), which means that an option based on wage suppression is sustainable in the medium and long term. does not make it possible. In this context, the most basic condition for a country's competitiveness seems to depend on raising the country's productivity level. As a result of the rapidly increasing productivity level, especially in traded sectors such as the manufacturing industry, the competitiveness of the country also increases and settles on a permanent plateau. The increase in the productivity level of the country is closely related to the capital stock. However, the BAT approach does not dwell on the reasons for the parameters briefly mentioned above and have an impact on competitiveness, and calculates competitiveness based on the foreign trade elements that come to the fore as a reflection of the country's production structure (Mahdi and Nassar, 2021: 98). In short, the BAT approach deals with the visible side

of the phenomenon while measuring the competitiveness of any country, and ignores a number of basic elements (such as technology, real wages, exchange rate movements) that affect competitiveness. However, in today's world, the most basic and perhaps the only way for a country to increase its competitiveness is related to the rapid developments it will provide in productivity. The increase in productivity is related to a number of factors such as education, skilled labor, including the country's capacity to produce technology (Keskin, et al., 2021: 1242).

The competitiveness of Turkey in comparison to the European Union (EU) based on technology levels encompasses a comprehensive evaluation of various facets. It involves a thorough examination of key indicators such as Revealed Comparative Advantage (RCA) to ascertain Turkey's strengths in technology-driven sectors vis-à-vis the EU. Analyzing Turkey's innovation index, research and development (R&D) investments, and its commitment to technology adoption and diffusion provides crucial insights into its technological capacity and innovation-driven growth compared to the EU. Assessing Turkey's readiness in digitalization, Industry 4.0 technologies, digital infrastructure, and human capital development in technology-related industries, when juxtaposed against the EU, offers a comprehensive view of its technological competitiveness (Alfawaire and Atan, 2021: 45). Additionally, comparing regulatory frameworks, innovation ecosystems, and support for tech startups between Turkey and the EU sheds light on their environments for fostering technological advancements. Through a comprehensive analysis of these factors, a clearer understanding emerges regarding Turkey's position concerning technology levels in competition with the EU, identifying areas of strength, potential growth, and areas needing improvement (Mahdi and Nassar, 2021: 98).

1. Factors Creating a Competitive Difference between the EU and Turkey

The European Union (EU) and Turkey differ in various aspects that contribute to their competitive differences. The EU is a highly developed economic bloc with a large and integrated single market, a common currency (Euro in the Eurozone), and advanced infrastructure. In contrast, Turkey has a developing economy with challenges such as inflation, a current account deficit, and currency depreciation. The EU is characterized by stable political systems and institutions, fostering political cohesion and cooperation. Turkey has experienced political

instability and governance challenges, impacting investor confidence and economic planning (Berman, et al., 2021: 2).

The EU is a political and economic union of member states, promoting free movement of goods, services, and people. Turkey, on the other hand, has been a candidate for EU membership since 1987 but has not yet joined, leading to different levels of integration and cooperation. Cultural and geographical factors influence the competitiveness of the EU and Turkey. The EU consists of diverse but culturally connected nations, while Turkey is located at the crossroads of Europe and Asia, bringing a unique cultural blend (Keskin, et al., 2021: 1242).

The EU places a strong emphasis on the rule of law, human rights, and democratic principles, which are considered fundamental values for membership. Turkey has faced criticism for issues related to the rule of law and human rights, impacting its relationship with the EU. Turkey has a Customs Union agreement with the EU, allowing for the free movement of goods. However, it does not cover services, agriculture, or public procurement to the same extent. This creates a complex economic relationship with the EU. Population size, age distribution, and workforce dynamics differ between the EU and Turkey. The EU has an aging population, while Turkey has a younger and growing population, potentially influencing labor markets and economic dynamics (Mahdi and Nassar, 2021: 98).

The EU and Turkey have different geopolitical priorities and security concerns. Divergent views on foreign policy, particularly in relation to conflicts in the Middle East, have led to tensions and differences in approach. The EU, with its technologically advanced member states, often has a competitive edge in innovation and research and development compared to Turkey. This impacts economic productivity and the ability to adapt to technological changes. The EU has been a leader in implementing environmentally friendly policies and promoting renewable energy sources. Turkey, while making strides, faces challenges in aligning with EU environmental standards.

The EU generally possesses advanced digital infrastructure, including high-speed internet connectivity and widespread access to digital services. Turkey, while making progress, may face challenges in achieving comparable levels of connectivity, potentially impacting the accessibility and quality of digital services. The EU has established comprehensive regulations concerning data protection,

privacy, and online services through measures such as the General Data Protection Regulation (GDPR). Turkey's regulatory environment may differ, potentially influencing user trust and the attractiveness of the digital services market (Akman and Yilmaz, 2008).

Disparities in digital literacy and skills between the EU and Turkey can impact the adoption and effective use of digital services. The EU's generally higher level of digital literacy may contribute to a more robust digital economy. The EU's larger market size and diverse consumer base provide significant opportunities for digital service providers. Turkey, while having a substantial population, may not offer the same scale and diversity, affecting the growth potential for digital services (Keskin, et al., 2021: 1242).

The EU is home to a thriving innovation ecosystem with numerous startups, research centers, and technology hubs. This fosters continuous development and adaptation of digital services. Turkey's innovation ecosystem may be evolving, but it might not be as mature or extensive. The EU member states often have well-established e-government initiatives, streamlining public services and fostering digital engagement. Turkey's progress in e-government services may vary, influencing the overall digital landscape and user expectations (Mahdi and Nassar, 2021: 98).

The EU generally invests heavily in research and development, driving technological advancements. Turkey's investment levels may differ, impacting its ability to compete in terms of digital innovation and cutting-edge technologies. The EU places a strong emphasis on cybersecurity, and its member states implement robust measures to protect digital infrastructure and user data. Variances in cybersecurity measures between the EU and Turkey could impact the trust users place in digital services (Alfawaire and Atan, 2021: 45).

The EU's regulations on cross-border data flows and data localization, as per GDPR, can affect how digital services operate. Turkey's stance on these issues may differ, introducing complexities for digital service providers operating across borders. The EU has advanced digital payment systems and financial infrastructure. Differences in the sophistication of digital payment methods and financial services between the EU and Turkey may affect the overall user experience and digital business transactions. Digital services often need to cater to specific cultural and

linguistic nuances. The EU's linguistic diversity and cultural variations within member states present a unique challenge. Turkey's specific cultural context and language requirements also play a role in the competitiveness of digital services (Berman, et al., 2021: 2).

F. Industry 4.0 Competition in the European Union and Turkey

Industry 4.0 Competition in the European Union: Advanced Technological Integration: The EU focuses on integrating advanced technologies like the Internet of Things (IoT), Artificial Intelligence (AI), Big Data, and automation into its industrial processes. Embracing smart factories and digital manufacturing is a priority to optimize production, reduce costs, and improve efficiency. Innovation Ecosystems:

Numerous innovation hubs, technology clusters, and research centers across EU member states foster collaboration between academia, industries, and startups (Keskin, et al., 2021: 1242).

Initiatives such as Horizon Europe and European Innovation Council aim to support R&D, innovation, and entrepreneurship.

Europe is at a more advanced level in terms of overall economic development compared to Turkey. This can facilitate companies' adoption of Industry 4.0 technologies by providing them with greater access to resources and capital. Europe invests significantly in research and development (R&D) and innovation, leading the way in the development and adoption of new technologies. Companies in Europe gain an advantage in adopting Industry 4.0 by continuously adapting to evolving technologies.

Europe generally has a high-quality education system. A qualified and specialized workforce makes it easier to adapt to new technologies. Since Industry 4.0 technologies rely on specialized knowledge and skills, the skilled workforce in this field enhances Europe's competitive advantage (Mahdi and Nassar, 2021: 98).

Europe has an extensive and robust digital infrastructure, including high-speed internet connections and broadband networks, enabling the effective use of Industry 4.0 applications. Turkey may have infrastructure gaps in this area.

Strong collaboration and common standards exist among countries in Europe.

Common industry standards facilitate cross-border trade and expedite the dissemination of new technologies. The European Union (EU) provides policies and incentives supporting digital transformation. The EU's digital strategies encourage member countries to embrace Industry 4.0 and create a common digital vision (Berman, et al., 2021: 2).

Europe has industry clusters that strengthen business ecosystems and enable companies to collaborate. These industrial clusters promote innovation and facilitate the more effective development of Industry 4.0 projects. The combination of these factors supports Europe's leadership in the field of Industry 4.0. However, other regions like Turkey can enhance their Industry 4.0 capabilities and gain a competitive advantage by increasing investments in these areas and implementing education and technical skill development programs (Keskin, et al., 2021: 1242).

Digital Transformation Initiatives: The EU Digital Strategy and the European Digital Innovation Hubs facilitate digital transformation by encouraging SMEs and industries to adopt new technologies. Efforts to create standardized frameworks for interoperability and data exchange in various sectors contribute to digitalization (Akman and Yilmaz, 2008).

Industry 4.0 Competition in Turkey: Emphasis on Technological Integration:

Turkey is striving to adopt Industry 4.0 technologies in manufacturing, emphasizing IoT, AI, robotics, and automation to enhance productivity and competitiveness.

Initiatives like "National Technology Move" emphasize digital transformation in industries (Alfawaire and Atan, 2021: 45).

Startups and Innovation Ecosystem:

Turkey has a burgeoning startup ecosystem, particularly in Istanbul, focusing on tech-driven solutions in various sectors including manufacturing and logistics.

Incubators, accelerators, and government-backed initiatives support entrepreneurship and innovation. Government Initiatives: The Turkish Government's Vision 2023 aims to modernize industries by integrating technology and digital infrastructure.

Efforts to enhance digitalization, technological readiness, and innovation

through strategic plans contribute to industrial competitiveness (Mahdi and Nassar, 2021: 98).

Competition Dynamics: Both the EU and Turkey are investing in digital transformation to enhance industrial competitiveness, albeit at different stages and scales. The EU benefits from its robust innovation ecosystems and standardized initiatives, whereas Turkey is rapidly developing its technological infrastructure and fostering innovation hubs (Berman, et al., 2021: 2). The competitive dynamics involve not only adopting technology but also fostering a conducive environment for innovation, R&D, and entrepreneurship, which the EU has more established but Turkey is striving to strengthen. both the EU and Turkey are engaged in a competitive landscape driven by Industry 4.0, focusing on technological integration, fostering innovation ecosystems, and promoting digital transformation to maintain or enhance their industrial competitiveness on regional and glob The service sector plays a crucial role in supporting the industry in both Turkey and the European Union (EU). Here's an overview of the service sector's contribution to industry in both regions (Keskin, et al., 2021: 1242).

European Union (EU): Research & Development (R&D) Support:

Knowledge Transfer: Service industries such as consulting, research, and development firms play a pivotal role in providing specialized knowledge and expertise to industrial companies. Innovation and Technology Adoption: Service sectors contribute significantly to innovation by offering technological solutions, consultancy, and advisory services to industries, aiding in their digital transformation. Logistics and Transportation: Efficient Supply Chains (Alfawaire and Atan, 2021: 45).

Service sectors, including logistics and transportation companies, facilitate the efficient movement of goods across the EU. This supports industrial sectors by ensuring smooth operations, timely delivery, and cost-effective distribution. Financial Services: Capital Investment: The financial service sector provides crucial support to industries by offering capital, loans, and investment opportunities for infrastructure development, technological advancement, and expansion plans. Risk Management: Financial services also help industries in risk management, ensuring stability and offering financial instruments that enable industries to thrive (Akman and Yilmaz, 2008).

IT and Digital Services: Digital Transformation: Service sectors specializing in IT, software development, and digital solutions support industries in their digital transformation endeavors, providing tailored software, cybersecurity, and data management services. Turkey: Consultancy and Advisory Services (Mahdi and Nassar, 2021: 98).

Specialized Support: Similar to the EU, consulting and advisory services in Turkey support industries by offering specialized guidance, strategic planning, and technological consultancy for business development (Keskin, et al., 2021: 1242).

Logistics and Trade: Facilitating Trade: Turkey's strategic geographic location and developed logistics services contribute significantly to industrial sectors by facilitating trade and transportation, especially as a bridge between Europe and Asia.

Financial Support: Funding and Investments: The financial sector in Turkey provides funding opportunities, investments, and financial instruments to support industrial growth and innovation.IT and Technological Services (Alfawaire and Atan, 2021: 45).

Tech Solutions: IT and technology service sectors in Turkey support industries by offering customized technological solutions, software development, and digital transformation services, aligning with the country's modernization goals.

Common Contributions: Knowledge Sharing: Both the EU and Turkey's service sectors contribute to knowledge sharing, offering expertise, and best practices across industries. Innovation Support: Service sectors in both regions foster innovation by providing technological advancements, consultancy, and R&D support to industries.

Facilitating Growth: Overall, the service sectors in both Turkey and the EU contribute significantly to industry growth by offering specialized support, financial services, and aiding in technological advancements and digital transformation (Alfawaire and Atan, 2021: 45).

In summary, the service sectors in both Turkey and the EU are integral to the development and growth of industrial sectors. They provide crucial support through specialized knowledge, financial services, logistical support, and technological advancements, thereby fostering innovation, facilitating growth, and contributing to

the overall competitiveness of industries in these regions (Berman, et al., 2021: 2).

all levels. In both Turkey and Europe, while the service sectors play significant roles in supporting industries, there are areas where improvements or developments could further enhance their contributions: Turkey (Akman and Yilmaz, 2008). Advanced Technological Services: Strengthening specialized technological services such as AI, cybersecurity, and advanced software development could further support industries in their digital transformation. Professional Services Development: Enhancing consultancy, legal, and professional services tailored specifically for industries could aid in strategic planning, compliance, and global market integration. Education and Skill Development: Investing in education and skill development programs focused on service sectors, ensuring a skilled workforce that meets the evolving demands of industries. Europe: Innovation in Financial Services (Mahdi and Nassar, 2021: 98). Further innovation in financial services, especially in providing easier access to funding for small and medium-sized enterprises (SMEs), fostering a supportive environment for entrepreneurial growth (Keskin, et al., 2021).

Digital Transformation Services: Continual advancements in digital services, emphasizing data analytics, cybersecurity, and digitalization support to match the evolving needs of industries in an increasingly digital world. Interdisciplinary Collaborations: Strengthening collaborations between service sectors and industries for interdisciplinary research, development, and innovation to tackle complex challenges. Common Opportunities (Alfawaire and Atan, 2021: 45). Cross-Border Services: Facilitating cross-border service provisions to allow seamless support for industries operating in multiple regions or markets. Regulatory Support: Streamlining regulations and frameworks to foster innovation and growth in service sectors, ensuring a conducive environment for both businesses and service providers. Skill Enhancement and Adaptation: Continuous focus on skill enhancement, adaptability, and training programs to match the rapidly evolving technological landscape. Improvements in these areas could enhance the role of service sectors in supporting industries, fostering innovation, and contributing to the overall economic growth and competitiveness of both Turkey and Europe (Akman and Yilmaz, 2008).

1. Turkey's Development Suggestions

To reach European standards and enhance Turkey's competitive advantage in the context of Industry 4.0, several strategic measures and investments should be considered. Here are key areas that Turkey can focus on (Keskin, et al., 2021):

- Invest in Research and Development (R&D): Allocate significant resources to R&D activities to foster innovation and the development of cutting-edge technologies. Encourage collaboration between academia, research institutions, and businesses to drive technological advancements (Akman and Yilmaz, 2008). Turkey should enhance its R&D efforts in digital industries by fostering collaborations between academia, research institutions, and private enterprises, and utilizing government funding for innovation.
- Enhance Digital Infrastructure: Invest in the development and improvement of digital infrastructure, including high-speed internet connectivity, broadband networks, and data centers. A robust digital infrastructure is crucial for the effective implementation of Industry 4.0 technologies.
- Promote Digital Literacy and Skills Development: Implement comprehensive educational programs to enhance digital literacy and skills among the workforce. This includes training programs focused on data analytics, artificial intelligence, robotics, and other Industry 4.0-related skills.
- Support Startups and Innovation Hubs: Foster a culture of entrepreneurship and innovation by providing support for startups and creating innovation hubs. These environments can facilitate collaboration, experimentation, and the development of new technologies (Mahdi and Nassar, 2021: 98).
- Establish Regulatory Frameworks: Develop clear and supportive regulatory frameworks that encourage the adoption of Industry 4.0 technologies. Address legal and regulatory barriers, ensuring that the business environment is conducive to digital transformation (Akman and Yilmaz, 2008).
- Encourage Industry-Academia Collaboration: Strengthen collaboration between industries and academic institutions to bridge the gap between theoretical knowledge and practical applications. This can lead to research projects, technology transfer, and a more skilled workforce.

- Focus on Cybersecurity: Prioritize cybersecurity measures to protect digital infrastructure and sensitive data. A secure environment is essential for the successful implementation of Industry 4.0 technologies, and adherence to European standards in this area is crucial (Akman and Yilmaz, 2008).
- Implement Smart Manufacturing Practices: Encourage the adoption of smart manufacturing practices, including the use of Internet of Things (IoT) devices, sensors, and data analytics. Implementing these technologies can optimize production processes and improve overall efficiency (Berman, et al., 2021: 2).
- Align with European Standards and Certifications: Strive to align Turkish standards with European ones, ensuring that products and services meet European quality and safety standards. This can facilitate easier integration into European supply chains (Mahdi and Nassar, 2021: 98).
- Participate in European Research and Innovation Programs: Engage actively in European Union research and innovation programs, collaborating with European partners. This participation can provide access to funding, expertise, and networks that support the development of Industry 4.0 capabilities.
- Develop a National Industry 4.0 Strategy: Formulate a comprehensive national strategy for Industry 4.0, outlining specific goals, timelines, and action plans. This strategy should involve all relevant stakeholders, including government, industry, and academia (Alfawaire and Atan, 2021: 45).

By addressing these aspects, Turkey can move closer to European standards in Industry 4.0, enhancing its competitiveness and contributing to the overall economic development and technological advancement of the country.

V. CONCLUSION

Comparing the effects of digital technology services on international trade in Turkey and Europe indicates a dynamic environment influenced by various commercial, regulatory, and infrastructure issues. Europe presents a more developed and comprehensive framework for digital commerce, whereas Turkey is notable for its rapid digitalization and potential demographic benefits.

With a focus on safe, equitable, and sustainable digital commerce practices, both regions have achieved significant progress in harmonizing their regulatory systems with international norms. Nonetheless, variations continue to exist in the degree of advancement, rate of adoption, and actual execution of digital projects, mirroring the distinct attributes and preferences of every area.

Europe's well-established market and infrastructure demand sophisticated approaches suited to a heterogeneous customer base and multilingual settings. On the other hand, Turkey's young population and developing digital economy present tremendous opportunities for innovation and market expansion, necessitating quick adaption tactics in accordance with changing laws and trends.

The pursuit of digital transformation, assistance for small and medium-sized enterprises (SMEs), progress in digitalizing customs, electronic invoicing, and the development of digital export capacities highlight the dedication of both areas to augmenting their digital economies.

Achieving a delicate balance between utilizing global trends and customizing them to fit local conditions, legislation, and cultural quirks is crucial for effective digital commerce strategies. By managing these nuances and building on their different strengths, Europe and Turkey have the potential to significantly influence the future of digital trade in their respective areas and beyond.

Trade's development from its free-market beginnings to its contemporary complexity highlights a path shaped by technological, historical, and economic factors. trading's course has been affected historically by changes from early

monetization and trading routes to later mercantilist regimes and world wars.

With the goal of establishing a liberalized global economic environment, important institutions and agreements were established after World War II. These accords eventually evolved into frameworks for trade facilitation, most notably the World Economic Organization, which was founded in 1994.

The impact of recent technological breakthroughs, namely in the areas of digitalization and artificial intelligence (AI), on international trade has been substantial. Businesses have undergone a digital revolution, necessitating a skillful integration of digital technologies in manufacturing, logistics, marketing, and management. By leveraging digital data, businesses can develop more targeted strategies that boost their profitability and competitiveness.

For nations like Turkey, the emergence of Industry 4.0 offers both potential and challenges. Turkey's industry can achieve better levels of technology production through the strategic integration of digital innovations, technological competency, and flexible working styles. With the goal of increasing technology-intensive exports while lowering dependency on imported inputs, the nation's efforts in digitalization and technology transition programs indicate a sincere commitment to seize these opportunities.

However, there are still issues with Turkey's dynamics of foreign commerce. Despite its initial impact, the Customs Union increased imports from non-EU countries, particularly from countries in Far East Asia. Due to Turkey's export structure's reliance on low- and medium-low technology industries, shipments of high-tech goods to the EU are constrained.

Additionally, Turkey's competitiveness is impacted by a technological deficit with the EU in high-tech industries. In spite of this, Turkey has a competitive advantage over a number of EU members in some areas, indicating its potential for increased competitiveness.

The majority of intra-industry trade between Turkey and the EU is centered on medium-low technology, with a focus on industries like apparel, drugs, and precision instruments. This pattern highlights Turkey's labor-intensive sector-based integration into the global economy and calls for a strategy centered on increasing the technological sophistication of exports.

Turkey needs to implement an industrialization plan that prioritizes high-value industries and technology-driven production if it is to improve its standing in international trade. It is essential to restructure the manufacturing sector around high-value industries in order to boost growth and competitiveness.

In summary, due to a number of economic, governmental, and infrastructure-related considerations, the effects of digital technology services on international trade in Turkey and Europe are complicated. While Turkey offers unique prospects due to its rapid digitalization and demographic advantages, Europe already has a well-established framework for digital trade. Although both areas have made progress toward harmonizing their regulatory frameworks with international norms, differences still exist in the uptake and implementation of digital projects. Turkey's developing digital economy presents opportunities for innovation and necessitates quick adjustments to changing regulations and trends, while Europe's developed market demands sophisticated techniques catering to different client bases and multilingual environments. Notwithstanding these distinctions, all areas exhibit a dedication to digital transformation through supporting small and medium-sized businesses, digitizing customs, improving export capabilities, and embracing global trends while observing regional laws and cultural quirks. Industry 4.0 offers Turkey both potential and challenges. The country's efforts to enhance technology-intensive exports are demonstrated by its efforts to incorporate digital breakthroughs and technology transfer programs. Turkey's high-tech industry is behind the EU in terms of technology, which hurts its competitiveness, but there is room for improvement in several areas.

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