

Türkiye'nin Dijitalleşme Performansının BM Sürdürülebilir Kalkınma Endeksi Çerçevesinde Değerlendirilmesi

Assessment Of Türkiye's Digitalization Performance Within the Framework of The UN Sustainable Development Index

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Öz

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Bu çalışmanın amacı, Türkiye'de 2000'li yıllarda hızlanan dijitalleşme süreci ile aynı dönemde gözlenen Sürdürülebilir Kalkınma Hedefleri (SKH) endeksindeki gelişmeler arasındaki ilişkiyi incelemektir. Çalışmayı motive eden temel soru, artan dijitalleşmenin sürdürülebilir kalkınmaya olan etkilerinin niteliğidir. Çalışmada nicel veri analitiği yöntemleri kullanılmıştır. Türkiye'ye ait dijitalleşme ve SKH endeksi zaman serisi verileri toplanmış, tanımlayıcı ve çıkarımsal istatistiksel analizler uygulanmıştır. Elde edilen bulgular, 2000'lerden itibaren Türkiye'de dijitalleşme göstergelerinde kaydadeğer artış olduğunu göstermektedir. Aynı dönemde SKH endeksinde de yükseliş gözlenmiştir. İki değişken arasında pozitif yönlü bir ilişki saptanmış olmakla birlikte, nedensellik bağlamında kesin yargıya varmak için daha detaylı analizlere ihtiyaç olduğu anlaşılmıştır. Çalışma, Türkiye'de dijitalleşme ve sürdürülebilir kalkınma ilişkisi konusunda farkındalık yaratması ve gelecek araştırmalara yol göstermesi açısından önem taşımaktadır.

Anahtar Kelimeler: Sürdürülebilirlik, Veri Analitiği, Dijital Dönüşüm.

Abstract

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The aim of this study is to examine the relationship between the accelerated digitalization process in Türkiye in the 2000s and the developments in the Sustainable Development Goals (SDG) index observed in the same period. The main question motivating the study is the nature of the effects of increasing digitalization on sustainable development. Quantitative data analytics methods are used in the study. Time series data on digitalization and the SDG index for Türkiye are collected, descriptive and inferential statistical analyses are applied. The findings show that there has been a significant increase in digitalization indicators in Türkiye since the 2000s. In the same period, an increase is also observed in the SDG index. Although a positive relationship is found between the two variables, it is understood that more detailed analyses are needed to make a definitive judgment in terms of causality. The study is important in terms of raising awareness of the relationship between digitalization and sustainable development in Türkiye and guiding future research.

Keywords: Sustainability, Data Analytics, Digital Transformation.

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1. INTRODUCTION

Digitalization, in the most general terms, refers to the process of adopting and using informatics and information technologies in all areas of society. With the proliferation of technologies such as the Internet, mobile devices, cloud computing, artificial intelligence, and the internet of things, digitalization has accelerated both at the institutional and individual levels (Kohnke, 2017:71). Digitalization is transforming many areas from economy to trade (Degryse, 2016:33), education to health (Sætra & Fosch-Villaronga, 2021), and public services to employment (Fernández-Macías, 2018).

Digitalization can play an important role in achieving SDG. Sustainable development is a holistic approach that balances economic growth, social welfare and environmental sustainability (Waas, Hugé, Verbruggen & Wright, 2011:1639). Digitalization acts as a catalyst for these goals by optimizing resource use, facilitating access to services, and increasing efficiency (Bleicher & Stanley, 2017:67). However, inclusive and sustainable policies are needed to harness the potential benefits of digitalization.

A limited number of studies in Türkiye holistically address the relationship between digitalization and sustainable development (Demirkıran et al., 2022; Taş, Örk and Veysikarani, 2021; Konu, 2020). Other studies have focused either on digitalization or sustainable development (Atmaca and Karaçay, 2020; Karasoy and Babaoğlu, 2020; Akçakaya, 2017). There is a significant gap in the literature regarding the analysis of the current situation by examining the interaction between these two concepts. The purpose and main motivation of this study is to examine the relationship between digitalization and sustainable development goals in Türkiye and to present the current situation through descriptive and exploratory analytical methods. Thus, by presenting the conceptual framework on the subject, it aims to contribute to the literature and raise awareness among the relevant parties. Accordingly, the study aims to address the following research questions:

RQ1: How does Türkiye's sustainable development performance compare to the average of the OECD and other groups of nations categorized by their level of economic development?

RQ2: Which indicators should be focused on to examine the relationship between sustainability and digital transformation?

RQ3: Does a statistically significant correlation exist between the rise in digitization witnessed in Türkiye since the 2000s and the changes in the sustainable development index during the same timeframe?

In the other sections of the study, the conceptual framework and related studies, methodology, findings, conclusions and implications for future studies are presented respectively.

2. CONCEPTUAL FRAMEWORK AND RELATED WORKS

2.1. Digital Transformation in Türkiye

Digital transformation is a multidimensional process in which developments in information and communication technologies radically change the way organizations function, their production processes, operational activities, and the nature of the products and services offered to their stakeholders (Daidj, 2019:99). It also involves the redesign of business models, value chain activities, decision-making mechanisms, employee profiles and organizational culture through the adoption and integration of new technologies (Dwivedi & Paul, 2022:1250; Gunasekaran & Ngai, 2004:277). This transformation process requires an innovative redefinition of traditional ways of doing business using digital technologies. Thus, organizations aim to increase both their internal operational efficiency and the quality of the products and services they offer to their external stakeholders.

When the digitalization efforts in the public sector in Türkiye are examined, it is seen that e-government applications were initiated in 2010 (Tamer and Övgün, 2020:1), while systematic efforts

to analyze public data using big data and advanced analytical technologies started to be implemented as of 2018 (Avaner and Çelik, 2021:14). However, the digitalization process observed in the private sector and at the level of individuals follows a course independent of the digital transformation activities carried out by the state. The level of digitalization of the private sector and individuals is shaped by factors such as adaptation capacity to digital technologies at the societal level and access to these technologies. Türkiye has experienced a significant increase in internet access and internet usage rates, which are components of digital transformation. By 2022, the share of households with access to the internet reached 94%, while the share of individuals using the internet was 85%. The number of broadband subscribers exceeded 80 million (TURKSTAT, 2022).

The digitalization process in Türkiye showcases the prominent role of technology-based innovation, as seen by the dynamic changes occurring in both the business world and the public sector. To implement digital business models, firms must enhance their technological infrastructures and also revamp their strategic goals. Specifically, the Turkish corporate world has begun to embrace emerging technologies such as artificial intelligence, the internet of things, and blockchain in order to enhance their competitive edge and establish a strong presence in the global market (Soylu, 2018:45). Within this particular framework, the private sector has witnessed digitalization trends that have prompted inventive endeavors focused on enhancing consumer experience, augmenting operational efficiency, and cultivating novel business models.

The digitalization in Türkiye has substantial effects on the economy, finance, and e-commerce (Ustaömer, 2019:19). Specifically, e-commerce has experienced substantial growth during the process of digital transformation. This incentivizes firms to build a more efficient online presence and provide a diverse range of products and services to consumers on digital platforms. Simultaneously, the widespread use and growing utilization of digital payment technologies expedite the metamorphosis of the financial industry (Akin, 2020:16). Developments such as access to the internet and technology have accelerated digitalization in Türkiye. E-commerce and digital payment systems are becoming widespread. In 2022, the e-commerce rate reached 46% (TURKSTAT, 2022). Within the scope of public digital transformation, steps are being taken to digitalize critical infrastructures as well as e-government applications. However, Türkiye is far behind the OECD average in areas such as workforce with digital skills, R&D expenditures, innovation capacity, and fiber internet infrastructure (Sachs, Lafortune, Fuller & Drumm, 2023).

The process of digitization in Türkiye is causing a transformation in business models and value chain activities, leading conventional sectors to adopt digital ecosystems. Mobile banking applications, digital wallets, and fintech solutions are significant advancements in the financial sector, enabling quicker and more convenient access to financial services for consumers (Aktuğ, 2020:489). Türkiye's digitization endeavors in this context are focused on attaining sustainable development objectives in terms of financial accessibility and e-commerce, with the aim of bolstering economic expansion. The advancements in this digital ecosystem carry substantial potential to enhance the country's competitiveness and attain a more efficient standing in the global market.

Another crucial aspect of digital change in Türkiye is the digitization of the education sector. An essential requirement for staying in line with the future digital economy is having a workforce equipped with digital skills (Radmard & Atik, 2019:1357). Within this framework, the collaboration between educational institutions and sectors seeks to equip students with digital competencies and facilitate their ability to adjust to the utilization of technology. Furthermore, Türkiye's attainment of lasting success in its digital transformation journey relies on augmenting investments in research and development, endorsing pioneering initiatives, and fortifying the entrepreneurial ecosystem (Kasa & Arslan, 2020:1811). By doing so, Türkiye can effectively harness its full potential in digitization, both domestically and on the international stage.

In order for Türkiye to accelerate its digital transformation, policies such as digitalization of education, qualified human resources, strengthening the entrepreneurship ecosystem, increasing R&D investments, and encouraging innovative business models are needed.

2.2. UN Sustainable Development Index and Indicators

The Sustainable Development Index (SDI) is a composite index that measures the extent to which countries are achieving their SDG. At the United Nations Sustainable Development Summit in September 2015, an outcome document entitled "Transforming our world: The 2030 Agenda for Sustainable Development" (UN, 2015). This document provides an international framework to guide global development efforts. The document addresses global challenges such as poverty reduction, eliminating inequalities, climate change, ensuring peace and justice, and innovative production. A total of 17 SDG and 169 sub-goals have been set. Member states have committed to make progress towards these goals by 2030 (UN, 2017). The United Nations General Assembly has developed and adopted a comprehensive list of 244 SDG indicators (UN, 2017). This list of indicators provides a framework for monitoring Member States' progress towards the 17 SDG set out in the 2030 Agenda for Sustainable Development (Fig 1).

Figure 1. UN Sustainable Development Goals



Source: Sachs et al. 2018

From 2015 to 2019, the world made partial progress towards the SDG, but there was still a long way to go (Sachs et al., 2023). Unfortunately, the outbreak of the Covid-19 pandemic in 2020 and other concurrent global crises led to a halt in progress towards the SDG (Qadeer et al., 2022:2). In the last few years, progress towards the goals has slowed considerably and in some cases even regressed. Worldwide progress on sustainable development was severely hampered by 2020 (Zhao et al., 2022:2).

2.3. Relationship between Digitalization and Sustainable Development Indicators

Digitalization is recognized as one of the key components of sustainable development (Mondejar et al., 2021:13). The proliferation of information and communication technologies contributes positively to many sustainable development goals.

Applications such as digital financial services and e-commerce will increase women's access to economic opportunities. This contributes to the goal of Gender Equality. Ojo (2022) examined the extent to which digital financial inclusion facilitates women's economic empowerment in Ghana, Kenya, Namibia and Lesotho. All the initiatives highlighted in the study were found to have a positive impact of digital financial inclusion on women's economic empowerment. Yu & Cui (2019) investigated how the success of rural e-commerce affects the evolving gender entitlement and hierarchy in a competitive market economy in China. They found that female store owners and operators have a significant impact on the expansion of e-commerce in rural China.

Distance education and digital learning tools are expected to expand access to quality education. This contributes to the goal of Quality Education. In their study, Zhang et al. (2020) focused on the development of a widely applicable e-learning model consisting of seven successive levels of professional and personal development. It was concluded that education for sustainable development will contribute to the creation of a resilient and sustainable society through a systematic approach and provide new foundations, quality, values and goals to the education and training system.

Smart cities and digital infrastructure improvements make cities more livable and sustainable. This supports the goal of Sustainable Cities and Communities. Depiné et al. (2017) aimed to investigate the application of design thinking in the development of smart cities. As a result, it was seen that design thinking will create a sustainable quality in human life. Clement et al. (2023) focused on the localization of SDG in their study on smart cities. They concluded that for cities using smart city strategies to promote a fundamental shift towards a more sustainable urban model, attention should be paid to the inclusion of initiatives that address issues that are often not addressed.

The UN has developed some indicators to monitor the contribution of digitalization to sustainable development. Indicators such as internet usage prevalence, digital skills level, e-commerce volume are within this scope (Hidalgo et al., 2020:2). This study focuses on the relationship between statistics such as the proportion of households with access to the internet, the proportion of individuals using the internet, the proportion of individuals using e-government services and the proportion of e-commerce in Türkiye and the SDI.

3. MATERIAL AND METHOD

This section provides an overview of the data sources utilized in the study and the methodologies employed to acquire these data. As the research adheres to ethical rules and relies on secondary data, there is no need to seek approval from an ethics commission. In addition, the methods used in data analysis are described. In particular, descriptive-analytic methods such as descriptive statistics and data visualization techniques and exploratory analytic methods such as association rules were introduced. The data were summarized, visualized and analyzed using these analytical approaches. In this way, key features, trends, patterns and interesting relationships in the dataset are revealed.

3.1. Data Collection and Ethical Principles

In this study, various secondary data sources were utilized. The United Nations' Sustainable Development Report 2023 is a comprehensive report that evaluates the progress made by all United Nations member states in line with the SDG and was used as the main data source in this study. In addition, data on indicators related to digitalization were compiled from statistics published by the Turkish Statistical Institute at regular intervals and included in the study. Thus, the study utilizes up-to-date and reliable data sources that are directly related to the subject.

In this study, qualitative or quantitative research techniques such as questionnaires, interviews, focus groups, observations and experiments, which are primary data collection methods, were not used. The data of the study were obtained from reliable and valid secondary data sources related to the subject. Considering the nature of the data used in the study and the way it was collected, ethics committee approval was not required. Because the study does not collect data directly from the participants, only secondary data available in the literature are analyzed. Therefore, there is no violation in terms of research and publication ethics.

3.2. Data Analytics

The purpose of this study is to examine Türkiye's digitalization process and the relationship between improvements in this process and the SDG Index. For this purpose, a descriptive and exploratory data analytics methodology is adopted. Descriptive data analytics techniques were used to identify digitalization indicators and SDG Index trends in Türkiye, while exploratory data analytics

techniques were used to examine the relationships between these two variables. Thus, by applying statistical and visualization techniques to quantitative data, it is aimed to obtain insights into the structure of the relationship between the digitalization process and the SDG Index in Türkiye.

First, the raw data collected for the purpose of the study were cleaned, combined and transformed to make them suitable for analysis. In this study, both descriptive and exploratory analyses were used together. First, descriptive analyses were used to reveal the general view of the data set, and then exploratory analyses were used to investigate the relationships between variables. Quantitative analyses such as descriptive statistical analyses, comparative analyses, and correlation analyses were performed on the prepared data set to answer the research question. In addition, the data were transformed into graphs and tables using visualization techniques. Thus, it was aimed to obtain comprehensive and versatile information on the subject. All applied analyses and results are reported in detail in the findings section of the study. The findings are interpreted in the light of the literature and the theoretical framework of the study.

4. RESULTS

When the general view of the data in the Sustainable Development Report 2023 is analyzed, summary information on the ranking of countries is presented in Table 1.

Table 1. SDG 2023 Summary

Country	2023 SDG Index Score	2023 SDG Index Rank	Regions used for the SDR	Population in 2022
Finland	86.8	1	OECD	5538263
Sweden	86.0	2	OECD	10517669
Denmark	85,7	3	OECD	5867977
...
Algeria	70.8	71	MENA	44543592
Türkiye	70.8	72	OECD	85091633
El Salvador	70.7	73	LAC	6323795
...
Chad	45.3	164	Sub-Saharan Africa	17449262
Central African Republic	40.4	165	Sub-Saharan Africa	5500295
South Sudan	38.7	166	Sub-Saharan Africa	10829532

Source: Summary data compiled from the SDG 2023 Report.

The SDG Index is based on the 17 sustainable development goals set by the United Nations. For each goal, a score between 0 and 100 is assigned and the country's performance level in that goal is quantified in this way. Then, each goal is given equal weight and the arithmetic average of the 17 goal scores is calculated and this numerical value gives the total SDR Index score of the relevant country. Thus, each of the 17 core goals for sustainable development is equally influential on the total score in the index. Thanks to this calculation methodology of the index, a multidimensional and holistic approach to sustainable development is adopted. Descriptive statistics on the 17 core goals are presented in Table 2.

Table 2. Descriptive Statistics for indicators of the SDG INDEX 2023

	SDG Index Score	SDG1	SDG2	SDG3	SDG4	SDG5	SDG6	SDG7	SDG8
max	86.761	100.000	83.401	97.115	99.762	94.022	95.058	99.551	93.383
Q3	74.948	98.951	67.264	85.524	95.644	76.137	76.044	74.364	79.626
median	69.377	93.301	61.028	75.438	84.773	65.870	67.878	68.613	73.158
Q1	60.547	55.779	54.007	51.860	61.418	51.046	55.237	47.521	66.427
min	38.676	3.155	19.806	12.953	1.232	13.055	32.600	8.697	39.535
s.d.	10.264	31.067	10.589	20.293	23.112	16.350	14.049	20.303	10.560
	SDG9	SDG10	SDG11	SDG12	SDG13	SDG14	SDG15	SDG16	SDG17
max	99.129	100.000	99.858	98.811	99.925	90.395	97.849	93.845	94.027
Q3	74.713	84.613	86.499	94.085	96.711	72.992	76.585	73.716	71.647
median	48.169	69.701	76.852	84.566	90.903	65.412	66.296	60.909	60.805

Q1	30.206	41.608	59.970	68.592	72.543	57.648	56.607	49.029	50.855
min	1.655	5.493	13.826	37.729	1.289	36.579	26.478	29.438	29.350
s.d.	26.482	27.257	18.161	16.044	21.112	11.430	14.133	15.471	12.953

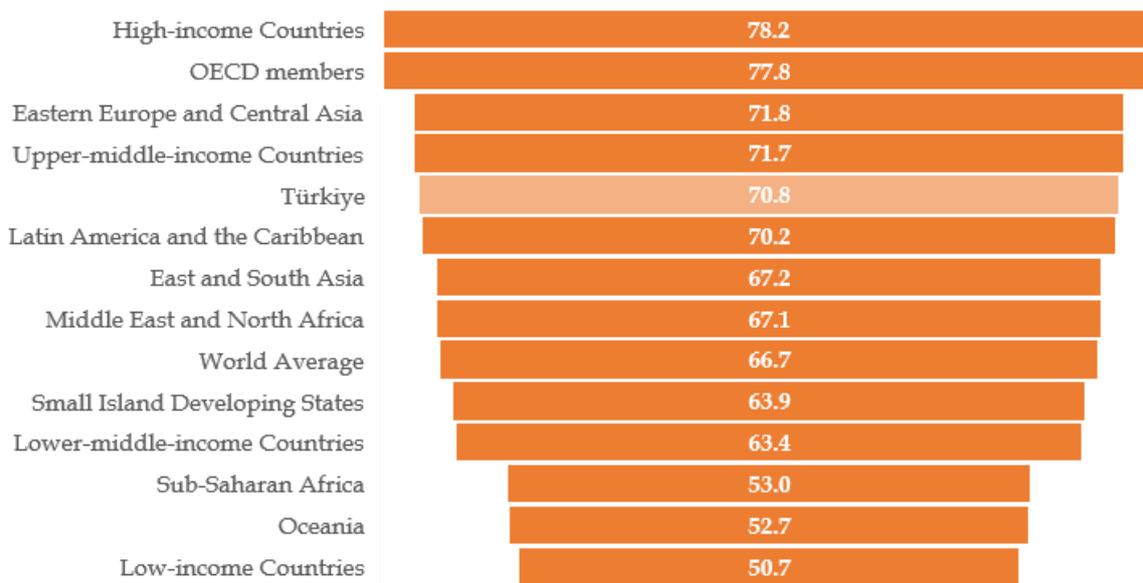
Source: Summary data compiled from the SDG 2023 Report.

The median value for the SDG Index overall score is 69.377. In other words, half of the countries have an SDG Index score below 69.377. The highest value is 86.761, while the lowest value is 38.676. The standard deviation is 10.264.

RQ1: How does Türkiye's sustainable development performance compare to the average of the OECD and other groups of nations categorized by their level of economic development?

In the Sustainable Development Report 2023, the Sustainable Development Index is scored according to specific country groups as well as countries. These groups are categorized as World average, OECD Members, High-Income Countries, Upper Middle-Income Countries, Lower Middle-Income Countries, Low-Income Countries, Eastern Europe and Central Asia, Latin America and the Caribbean, East and South Asia, Middle East and North Africa, Small Island States, Sub-Saharan Africa and Oceania. Thus, Türkiye's sustainable development performance is compared with these groups and presented in Figure 2.

Figure 2. Grouped SDG Index Scores

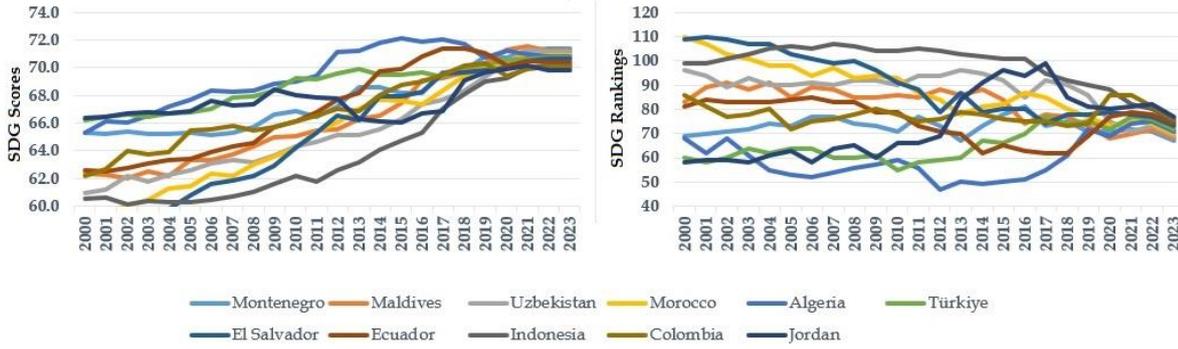


Source: Compiled from Sachs et al., 2023. Türkiye is ranked among OECD members.

The analysis shows that Türkiye's 2023 SDI score is 7 points below the average of OECD countries of which Türkiye is a member. At the same time, it was also found that it was not above the averages of countries in the high and upper-middle-income groups and countries in the Eastern Europe and Central Asia region. On the other hand, Türkiye's score is 4.1 points above the global average. In light of these findings, it is concluded that Türkiye's performance in the field of sustainable development lags behind country groups with similar levels of development, but is above the global average. Therefore, Türkiye needs to make further progress in the area of sustainable development, especially when compared to the OECD, high-income countries and countries in its geographically close region.

In this study, five countries ranked above and below Türkiye in the 2023 SDI scoring were identified and their index performances between 2000 and 2023 were analyzed comparatively (Figure 3).

Figure 3. Scores and rankings of the five countries above and below Türkiye



Source: Compiled from Sachs et al., 2023.

This comparative analysis aims to reveal the historical trends in sustainable development in countries with higher and lower index scores than Türkiye. It is believed that the findings obtained will shed light on the evaluation of Türkiye's possible future index performance. Thus, inferences can be made about the possible policies and strategies that the country should follow in line with its sustainable development goals.

The analysis shows that Türkiye's 2023 SDI score has generally moved in the direction of increase in the range of 66.2-70.8 points in the last 24 years. However, the same positive momentum with the change in other countries is not seen in the rankings. While the ranking obtained in 2010 was 55, the ranking obtained in 2023 was determined as 72. With this information, it can be concluded that most of the countries are making a significant effort for the SDG Index.

An analysis of Türkiye's SDI scores over the last 24 years reveals a general upward trend. However, when compared to other countries, Türkiye's acceleration does not provide the expected rise in its position in international rankings. Ranked 55th in 2010, Türkiye dropped to 72nd place in 2023. Although these data indicate that the performance in the index is an important area of development for countries, it can be concluded that Türkiye's efforts towards sustainable development are not in line with international standards and competitive.

RQ2: Which indicators should be focused on to examine the relationship between sustainability and digital transformation?

The following indicators should also be taken into account when examining the relationship between sustainability and digital transformation (Esses, Csete & Németh, 2021:5):

- SDG1: No Poverty.
- SDG2: Zero Hunger.
- SDG3: Good Health and Well-Being.
- SDG4: Quality Education.
- SDG8: Decent Work and Economic Growth.
- SDG9: Industry, Innovation and Infrastructure.
- SDG11: Sustainable Cities and Communities.
- SDG13: Climate Action.

The effect of the score obtained from these indicators on the overall score obtained by countries is very important (Table 3). Based on this information, indirect effects of digitalization can be observed.

Table 3. Impact of indicator scores on the 2022 SDG Index

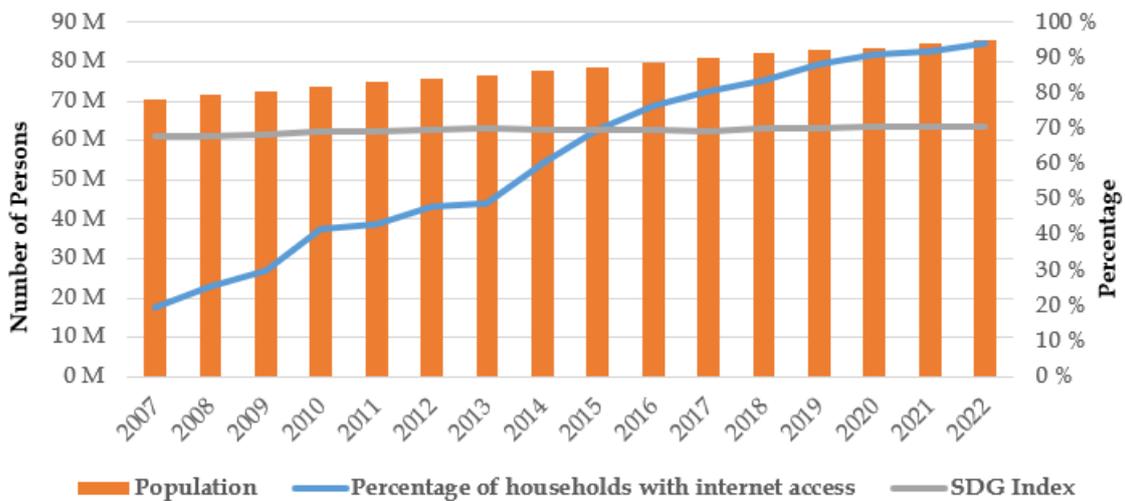
	SDG1	SDG2	SDG3	SDG4	SDG8	SDG9	SDG11	SDG13
Number of Countries with Positive Impact	110	40	101	125	64	88	51	131
Number of Countries with Negative Impact	56	126	65	41	102	78	115	35

Source: Compiled from Sachs et al., 2023.

The scores obtained by taking the equally weighted average of the 17 indicators in the Sustainable Development Goals Indicator Index (SDG Index) allow for easy comparisons between countries (Sachs et al., 2023). In the SDG2 (no hunger), SDG8 (decent work and economic growth) and SDG11 (sustainable cities and communities) indicators, the overall scores of 75.9%, 61.5% and 69.3% of the 166 countries analyzed, respectively, are negatively affected. This indicates that the vast majority of countries have significant room for improvement in these indicators. In the case of Türkiye, SDG2, SDG8 and SDG13 (climate action) indicators have a negative contribution to the overall score.

Türkiye has experienced significant developments in the field of digitalization in recent years. With the spread of information technologies, internet usage rates and the number of mobile subscriptions have increased significantly.

Figure 4. The population of Türkiye, Percentage of households with Internet Access and SDG Index

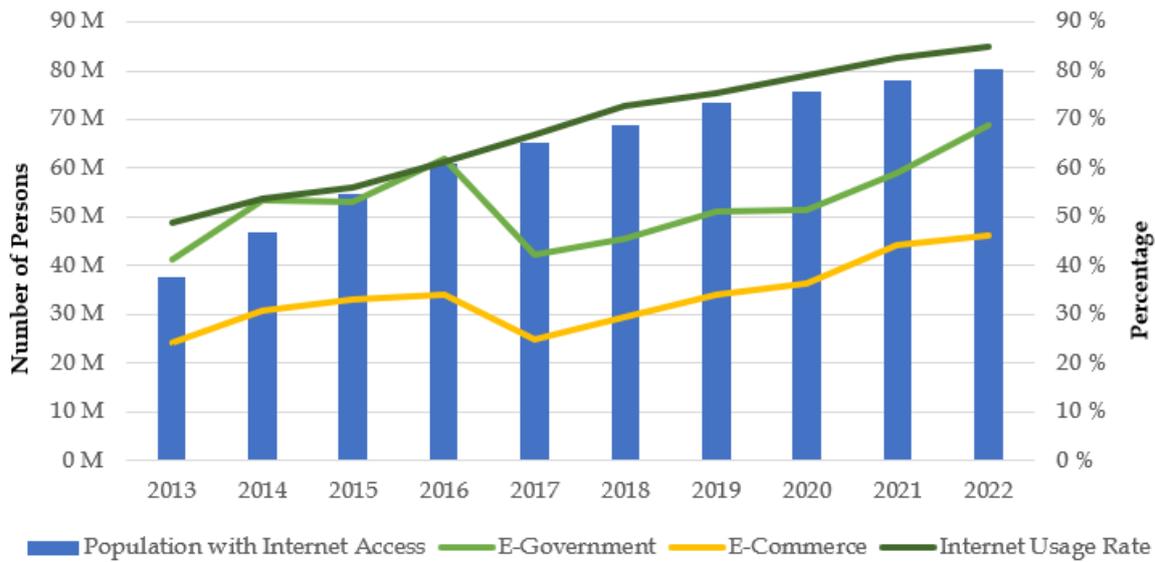


Source: Compiled from Sachs et al., 2023 and TURKSTAT, 2023..

The data in Figure 4 shows the change in the percentage of households with internet access in Türkiye between 2007 and 2022. While only 19.7% of households had internet access in 2007, this percentage increased to 94.1% in 2022. The largest increase occurred between 2014 and 2015, when the share of households with internet access rose from 60.2% to 69.5%. Internet access in Türkiye has increased rapidly, especially with the widespread use of smartphones. The share of households with internet access has increased every year since 2007. By 2022, almost all households in Türkiye (94.1%) have internet access. This rate is close to the level of developed countries. The data shows that internet infrastructure and access opportunities are improving rapidly in Türkiye. While there is a positive correlation between the increase in SDG Index scores and the increase in internet access rates, more extensive academic analysis is needed to determine the exact role of internet access in this increase. There is evidence that increased internet access may be positively related to the SDG targets. The relationship between the two variables is correlational and does not indicate causality.

In Türkiye's digitalization process, the proportion of the population with internet access, the prevalence of internet usage, the use of e-government services and the development of e-commerce are important indicators (Figure 5). Academic analyses on these indicators can provide a better understanding of the level of digitalization and the digital divide in Türkiye.

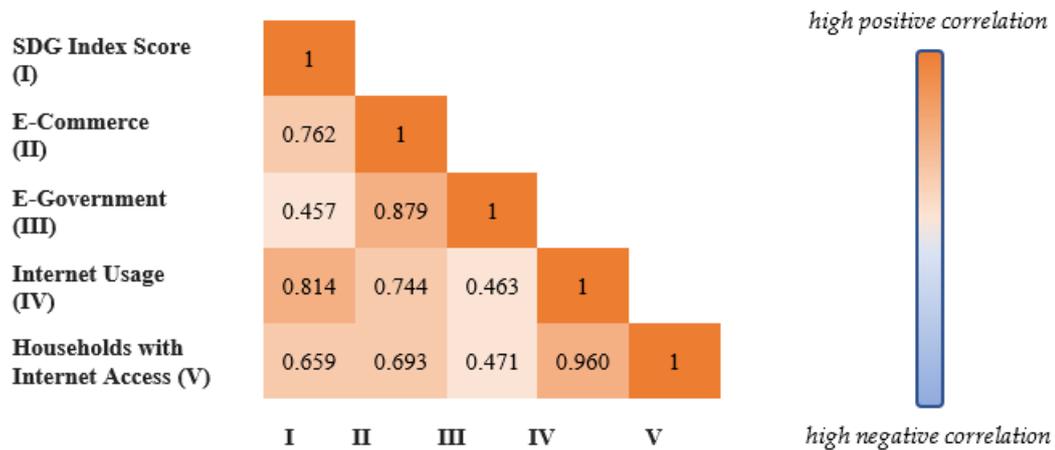
Figure 5. Key indicators in the digitalization process



Source: Compiled from TURKSTAT, 2023.

RQ3: Does a statistically significant correlation exist between the rise in digitization witnessed in Türkiye since the 2000s and the changes in the sustainable development index during the same timeframe?

Figure 6: Correlation between SDG Index and other parameters



Source: Created by the author.

When statistical data are analyzed, it is observed that there is a positive relationship between these indicators. As the proportion of the population with internet access increases, the prevalence of internet use and the use of e-government services also tend to increase. Similarly, the volume of e-commerce shows a parallel development with these indicators. We can examine the direction and strength of the linear relationship between digitalization indicators and SDG Index scores by calculating the Pearson correlation Coefficient (Figure 6).

According to the data of the Turkish Statistical Institute for 2023, when the Internet access rates of enterprises with 10 or more employees are analyzed, it is seen that the rate, which was 85.4% in 2007, has gradually increased. The 93.0% Internet access rate in 2011 showed a continuous upward trend and reached 96.0% by 2023 (TURKSTAT, 2023). These data indicate that enterprises in Türkiye have made significant progress in adopting ICT and digitalization processes. Almost all enterprises with 10 or more employees have Internet access.

4. CONCLUSION

This study examines the relationship between the digitalization process in Türkiye and the SDG. As a result of the findings, it is observed that digitalization in Türkiye has increased significantly in the last 15 years. With this development in digitalization indicators, especially internet access, it was determined that the country's SDG Index scores also increased in the same period. Indicators such as the increase in internet access, the rise in digital literacy rates, and the spread of e-government applications prove this development. However, when the SDG Index is analyzed, it is understood that Türkiye's digitalization performance is not sufficiently reflected in the field of sustainable development. It is important to effectively use the opportunities offered by digitalization in areas that will contribute to indicators such as health, education, productivity, and reducing inequalities in the SDG Index. Therefore, in order to increase the positive effects of digitalization on sustainable development in Türkiye, it is critical to develop policies integrated with the sustainability dimension of digital transformation.

An analysis of Türkiye's position and scores in the SDG Index reveals that the score gap between Türkiye and its immediate neighbors is quite small. For example, while the score difference with Jordan, which is five places below Türkiye, is only 0.9, the difference with Montenegro, which is five places above Türkiye, is 0.6. This indicates that Türkiye's position in the rankings is quite sensitive. Small score differences indicate that steps to be taken in the field of digitalization have the potential to significantly improve Türkiye's ranking. On the other hand, the small score gap with the lagging countries brings with it the risk that Türkiye could fall to the lower rungs of the ranking if sufficient efforts are not made. The close scores in the ranking constitute both an opportunity and a threat for Türkiye. This situation reveals the urgency of concrete steps and improvements focused on sustainable development in the field of digitalization.

In conclusion, there are multidimensional interactions between digitalization and sustainable development in Türkiye and interdisciplinary research is needed to understand these interactions. Although there is a positive relationship between these two variables, it is understood that more detailed analyses are needed to make definitive judgments in terms of causality.

5.1. Managerial Implications

The findings of this research reveal the multidimensional relationship of the digitalization process in Türkiye with sustainable development goals. In light of the results, it is possible to draw some important conclusions for both policy-makers and decision-makers. These implications include suggestions for effectively managing digitalization in line with the country's sustainable development goals:

- Policymakers should adopt a holistic perspective on digitalization and consider its multidimensional relationship with SDG.
- When preparing digitalization strategies and action plans, their compatibility with sustainable development goals should be considered.
- To maximize the benefits of digitalization, policies and projects that reduce inequalities and the digital divide should be prioritized.
- Efficiency and sustainability should be increased through digital transformation in many areas such as education, health, agriculture and transportation.
- Measures should be taken to reduce the environmental footprint of digital technologies and green computing should be encouraged.
- Integrated policies and strategies on digitalization should be developed by increasing coordination among public institutions and with the private sector.

- Data-based indicators and indices should be developed to monitor the impact of digitalization on sustainable development.

In conclusion, the research findings reveal the importance of adopting a holistic and sustainable perspective on digitalization, considering multidimensional interactions and interdisciplinary approaches when developing policies and strategies.

5.2. Implications for Future Research

The findings and conclusions of this study offer some important implications for future research. In order to examine the relationship between digitalization and sustainable development in Türkiye in more depth, it would be useful to focus on the following issues:

- Studies to test the causal relationships between digitalization and sustainable development,
- Comparative analysis covering different Countries,
- Studies examining the impacts of digitalization on different dimensions of sustainable development,
- Studies assessing the compatibility of digitalization policies with SDG.

In conclusion, although the results obtained are instructive for future studies, it is understood that there is a need for interdisciplinary and multifaceted research to fill the gap in the literature.

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