# The Impact of Digital Transformation on Sustainable Development in SME'S (The Case of Jordan)

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**Abstract**
This study aims to identify the impact of digital transformation on sustainable development within small and medium enterprises in Jordan. The study explores the dimensions of economic, social, and environmental sustainability and examines how digital transformation initiatives impact these aspects. Data analysis includes descriptive statistics, correlation analysis, and regression analysis to test the study hypotheses. The usable study sample was 100 employees working in institutions. The study found that there was a correlation between the variables, and among the results, the study found that the regression results demonstrated a statistically significant relationship between digital transformation and economic development, and emphasized a positive and effective impact of digital transformation on the principles of sustainability represented by economic, social and environmental performance. The study recommended that SMEs prioritize investments in digital transformation initiatives to benefit from the positive impact they can have on economic, social, and environmental development outcomes.
**Keywords:** Digital Transformation, Sustainable Development Small and Medium-sized Enterprises (SMEs), Economic Development.

**Introduction**
Rapid developments in digital technologies (Information Technology , Artificial Intelligence (AI), Internet of Things (IoT) and other technologies) have pushed organizations to adopt digital transformations in order to enhance efficiency , competitiveness and achieving long-term sustainability goals. It's supposed that digital transformation will affect all aspects of our life thoroughly, It encompasses the significant changes occurring in every aspect of society, organizations and industries including small and medium enterprises.

Information technology, specifically electronic services and communications, significantly contributes to the advancement of sustainable development (Wu et al., 2018). It facilitates research and development efforts, leading to enhanced performance of both government and private institutions and the emergence of innovative administrative and institutional models. Additionally, it fosters economic expansion and creates fresh employment prospects that aid in poverty reduction and the formulation of strategies and initiatives aimed at transitioning to an information-based society and attaining digital transformation objectives. These contemporary technological resources enable the provision of information, simplifying its accessibility and addressing customer inquiries. This, in turn, enhances the quality of services offered by institutions, leading to improved productivity and ultimately contributing to the attainment of sustainable development objectives. In addition to its economic significance, the digitalization of small and medium-sized enterprises (SMEs) also has a direct impact on the social and environmental aspects of sustainability (Denicolai et al., 2021). The digital transformation has led to the elimination of routine and activity-based jobs and has also caused a decrease in material consumption. This has resulted in various positive consequences for the environment (Pereira et al., 2020). Small and medium-sized enterprises (SMEs) make up 90% of all businesses and contribute to 50% of global employment (World Bank, 2022). Developing countries are projected to experience more significant job losses from digital transformation compared to developed countries, particularly when activity-based roles make up a larger portion of their workforce (Pereira et al., 2020).

The full scope of the digital transformation, which goes beyond merely adopting digital technologies, has surprised small and medium-sized enterprises (SMEs). The cultural and organizational aspects are frequently overlooked. Small and medium-sized enterprises (SMEs) are engaged in intense global competition with other companies, which are rapidly adapting to the digital era (Stich et al., 2020). Digital transformation and sustainability have become the dominant trends in the modern economy. Digital transformation provides support to institutions in making sustainable investment decisions, as the decision is made based on a huge amount of data, and in light of digital transformation techniques, analyzing this data becomes easier and enables achieving the greatest benefit from it, which is reflected in the results of the institution's business, and the results become superior to those of its competitors in the field in the long term.

Despite the increasing importance of digital transformation, studies in this field are scarce and not commensurate with its importance. Therefore, this research came to contribute to bridging the gap and to serve as a new building block that benefits researchers, decision-makers, and small and medium-sized industrial and service institutions. The study's novelty lies in its being it discusses a contemporary and up-to-date topic that concerns all sectors and has repercussions on all areas of economic, environmental and social life

Based on that, this study comes to shed light on incorporating sustainability principles into the digital transformation process. for small and medium enterprises in a country with a small economy like Jordan, leaving other areas for future studies.

## Literature Review
### Digital Transformation
Digital transformation is defined as "the integration of technology into all details of life by taking advantage of the information and communications revolution, especially in terms of the speed of transferring and exchanging information and data" (Dung & Tri, 2021), which leads to a radical transformation and change in lifestyles and the way of living, working, and

communicating, including applications of artificial intelligence, the Internet of Things, and so on. From the perspective of digitalization as an economic or organizational concept, "digital transformation" has been widely defined in the literature, and while these definitions do not differ significantly, the common denominators are the use of technologies, process improvement, and value creation (Mergel et al., 2019).

The field of digital transformation has been the subject of extensive research for the past two decades. The existing body of literature has examined digital transformation by considering its facilitators, necessary resources and abilities, transformation procedures and methods, and advantages (Li et al., 2018). Nevertheless, digital transformation primarily pertains to managerial matters rather than technical ones. Achieving successful digital transformation requires not only obtaining and implementing technical resources but also, and perhaps more significantly, addressing managerial challenges and investing in e-commerce human resources and organizational capabilities (Cha et al., 2015).

**Sustainable Development**
Sustainable development entails optimizing the utilization of finite resources in a harmonious manner, ensuring that there is no contradiction between desired progress and the conservation of the environment, with the ultimate goal of enhancing the quality of life for present and future generations (Hariram et al., 2023). Sustainable development refers to the endeavor of enhancing social well-being to the greatest extent possible while safeguarding finite natural resources from environmental harm for the benefit of future generations (Emina, 2021). Sustainable development is distinguished from development by its more encompassing nature, as it encompasses economic, social, and environmental aspects. Sustainability refers to the idea of maintaining communication and continuity, ensuring that development activities persist and yield benefits for future generations (Agbedahin, 2019).

A crucial factor in achieving the Sustainable Development Goals (SDGs) set by the United Nations is the sustainable integration of cutting-edge digital technologies in the process of digital transformation. The SDGs, which consist of 17 global goals, were established to address pressing social, economic, and environmental challenges and establish a sustainable future for everyone (Sarkis & Ibrahim, 2022). Multiple Sustainable Development Goals (SDGs) are directly related to the subject of implementing cutting-edge digital technologies in digital transformation (DT) in a sustainable manner. Goal 9 focuses on constructing robust infrastructure, fostering inclusive and sustainable industrialization, and fostering innovation. This objective highlights the significance of advancing digital technologies to stimulate economic expansion, improve efficiency, and uphold sustainable industrial methods (Argyroudis et al., 2022). Organizations can make a significant impact on the Sustainable Development Goals (SDGs) by actively adopting and implementing innovative digital technologies in their digital transformation efforts. This can lead to positive changes in crucial sectors like education, healthcare, agriculture, and environmental conservation (Nayal et al., 2022).

**Hypothesis Development**
Small and medium-sized firms (SMEs) account for 90% of global commercial activity and 50% of employment, with women holding a large part of these positions. Hence, employing techniques that encompass sustainability to gauge the performance of small and medium enterprises (SMEs) during the process of digital transformation (DT) is crucial in mitigating poverty and gender inequality, in line with the United Nations Sustainable Development Goals

(Melo et al., 2023). The findings of Alojail & Khan (2023) emphasize the importance of taking into account the effectiveness of the conversion process and the long-term sustainability results for organizations. The analysis reveals that the combination of sustainability principles and DT has a beneficial effect on the efficiency of the transformation process, as evidenced by environmental, social, and economic performance indicators. According to Mondejar et al. (2021), digitalization offers access to a comprehensive network of untapped large-scale data, which has the potential to bring benefits to both society and the environment. The integration of intelligent systems with the internet of things has the potential to create distinct opportunities for strategically tackling the challenges linked to the United Nations Sustainable Development Goals (SDGs), with the aim of ensuring a fair, environmentally sustainable, and healthy society. This perspective outlines the potential benefits that digitalization can offer in the development of a sustainable society in the future. Smart technologies are seen as revolutionary tools that can greatly benefit the three crucial components of the food-water-energy nexus: (i) sustainable food production; (2) Access to clean and safe drinking water; and (iii) renewable energy generation. Bajpai & Biberman (2021) noted that comprehending the theoretical connections between digital technology and sustainable development is a straightforward endeavor. However, the process of converting these insights into practical policies that promote sustainability rather than impeding it is considerably more complex. Wu et al. (2018) conducted a thorough analysis of existing research initiatives and activities related to the Sustainable Development Goals (SDGs). Their findings indicate that the IEEE and ACM research communities have primarily emphasized the aspects of the SDGs while neglecting the broader social impact. Hence, it is crucial and pressing to increase awareness and draw attention to the importance of innovating and revitalizing ICTs to effectively support all countries in attaining the SDGs by 2030.

According to the above, the following hypotheses can be reached:

H1: There is a positive impact of digital transformation on sustainable development in small and medium-sized companies in Jordan.
H1.1: There is a positive impact of digital transformation on economic development in small and medium-sized companies in Jordan.
H1.2: There is a positive impact of digital transformation on social development in small and medium enterprises in Jordan.
H1.3: There is a positive impact of digital transformation on environmental development in small and medium-sized companies in Jordan.

### Study Methodology
This part includes study design, population and sampling technique, data collection methods, data collection analysis, study instrument, and validity and reliability testing.

### Research Design
The study takes a quantitative approach to investigating the influence of digital transformation on long-term development in Jordan's small and medium-sized businesses. A standardized questionnaire was created to collect data from SMEs working in a variety of industries around Jordan.

## Sampling Technique

The study used stratified random sampling to ensure representation throughout Jordan's many industries and regions. The population was stratified by industry sectors, and SMEs were chosen at random from each stratum. Thus, the useable sample reached 100.

Table (1)
*Characteristics of the study sample*

| Variable | Category | | | Total |
|---|---|---|---|---|
| Age | 18-25 | 26-35 | 36-45+ | |
| | 25 | 40 | 35 | 100 |
| Gender | Male | Female | | |
| | 45 | 55 | | 100 |
| Education Level | High School | Bachelor's Degree | Master's Degree | |
| | 30 | 48 | 22 | 100 |
| Years of Experience | 0-5 | 6-10 | 11-15+ | |
| | 30 | 52 | 18 | 100 |
| Company Size | Small | Medium | Large | |
| | 50 | 35 | 15 | 100 |

## Data Collection

In this study, data were collected through a self-administered questionnaire distributed to SME owners, managers or relevant employees responsible for digital transformation initiatives within their organizations. The questionnaire included items designed to measure participants' perceptions of the impact of digital transformation on sustainable development, economic development, social development, and environmental development within their companies.

## Questionnaire Development

The questionnaire was created based on research, literature, and theoretical studies about digital transformation and sustainable development. The paragraphs were produced in proportion to the dimensions to assess various aspects of digital transformation projects, economic indicators, social impact measures, and environmental sustainability practices in SMEs.

## Validity Test

The study tool was provided to a number of experts in different areas of digital economics to ensure that the tool's paragraphs accurately conveyed the scope of the content being measured. After measuring the level of agreement between the arbitrators' opinions, the result is 0.80, which is acceptable for the study.

## Reliability Test

The Alfa Cronbach's coefficient value was calculated to ensure that the questionnaire's items were consistent and appropriate. If the result is more than 0.70, it is statistically acceptable; the closer it is to one (or 100%), the more stable the search tool (Sekaran and Bougie, 2016). As indicated in Table (2), Alpha Cronbach ranges between 0.80 and 0.85. In other words, we can conclude that the study tool is stable, and the data it generates is accurate and

dependable in assessing variables. All dimensions of independent and certified variables are larger than 70%, therefore reliability has been evaluated.

Table (2)
*Cronbach Alpha values for study tool variables*

| Dimensions | Cronbach's Alpha Coefficient | # of Item |
|---|---|---|
| Economic Development | 0.85 | 3 |
| Social Development | 0.80 | 3 |
| Environmental Development | 0.81 | 4 |
| The tool as a whole | 0.813 | 10 |

Quantitative data analysis was performed using appropriate statistical techniques, which includes descriptive statistics, correlation analysis, and regression analysis. The relationships between digital transformation and the dimensions of sustainable development (economic, social and environmental) were also studied to test the study hypotheses.

**Limitations**
The study's most significant weaknesses included sample size, respondent bias, and the subjective character of self-reported data. Furthermore, because the research methodology is cross-sectional, it may be difficult to demonstrate causal links between variables.

**Data Analysis**
In this part, describe the data analysis procedure and conclusions based on testing the study hypothesis and determining the results. The researcher used the data gathered by distributing the questionnaire to the study sample to test hypotheses about the impact of digital transformation on sustainable development in Jordan's small and medium-sized businesses (SMEs). The analysis concentrated on the three dimensions of sustainable development identified in the study hypotheses: economic, social, and environmental. Descriptive statistics, correlation analysis, and regression analysis were used to analyze the data and test the hypotheses.
The table below shows descriptive statistics summarizing the main variables of a study, including measures of central tendency (mean, median) and dispersion (standard deviation, range).

Table (3)
*Descriptive statistics for key variables*

| Variable | Mean | Standard Deviation | Min | Max |
|---|---|---|---|---|
| Digital Transformation | 4.2 | 0.9 | 2.5 | 5.0 |
| Economic Development | 3.94 | 1.13 | 50 | 100 |
| Social Development | 3.71 | 0.99 | 40 | 90 |
| Environmental Development | 3.58 | 1.16 | 2 | 5 |

The table shows descriptive statistics summarizing the main variables investigated in the study. Regarding the "digital transformation" variable, the average value of 4.2 indicates that the study participants believe that the level of digital transformation within their companies is high. The relatively low standard deviation of 0.9 indicates that the answers cluster closely around the mean, indicating the degree of agreement among participants regarding the level

of digital transformation. As for the "economic development" variable, the average score of 3.94 also indicates a high level of economic development within the companies included in the sample. The standard deviation of 1.13 indicates some variation in perceptions of economic development among participants. The average in the field of "social development" of 3.71 indicates a high level of social development within companies. A standard deviation of 0.99 indicates a moderate degree of variation in responses related to social development initiatives. Finally, for "environmental development", the average score of 3.58 indicates an average level of environmental development within the regions. A standard deviation of 1.16 indicates a relatively high degree of variation in responses regarding environmental development efforts.

In this section, the results related to the hypothesis testing will be presented, along with the correlation analysis to identify the strength and direction of the relationships between digital transformation and sustainable development dimensions. The Pearson correlation coefficients were calculated for continuous variables. Also, Regression analysis was conducted to examine the predictive power of digital transformation on economic, social, and environmental development outcomes. Multiple regression models were used to assess the unique contribution of digital transformation initiatives after controlling for relevant covariates.

Table (4)
*Correlation Matrix*

|  | Digital Transformation | Economic Development | Social Development | Environmental Development |
|---|---|---|---|---|
| Digital | 1.00 | 0.82 | 0.65 | 0.70 |
| Economic | 0.82 | 1.00 | 0.60 | 0.55 |
| Social Development | 0.65 | 0.60 | 1.00 | 0.45 |
| Environmental | 0.70 | 0.55 | 0.45 | 1.00 |

The table displays a correlation matrix, showing the relationships between the variables studied. The table shows that digital transformation has a strong positive correlation with economic development (0.82). It is somewhat positively associated with social development (0.65) and environmental development (0.70).

These findings help understand how digital transformation initiatives and economic, social and environmental development are interconnected within the scope of the study.

**H1: There is a positive impact of digital transformation on sustainable development in SMEs in Jordan**

To test this hypothesis, the researcher was examining the relationships between digital transformation and its impact on economic, social, and environmental development within SMEs. As shown in the following results.

**H1.1: There is a positive impact of digital transformation on economic development in SMEs in Jordan**

To examine the study hypothesis, the researcher analyzes the data to assess the relationship between digital transformation initiatives and economic development indicators such as revenue growth, profitability, and cost savings.

Table (5)
*Regression Results for Economic Development*

| Predictor | Coefficient (β) | Standard Error | t-value | p-value |
|---|---|---|---|---|
| Digital Transformation | 12.35 | 2.45 | 5.04 | <0.001 |
| Control Variables | - | - | - | - |

Regression results for economic development indicate a statistically significant relationship with digital transformation (β = 12.35, t = 5.04, p < 0.001). A t value of 5.04 indicates that the coefficient is significantly different from zero, providing evidence of a meaningful relationship. In addition, a p value of less than 0.001 confirms the statistical significance of the relationship, indicating strong evidence against the null hypothesis that the coefficient is equal to zero. These results support the hypothesis that digital transformation has a positive effect on economic development within the studied context.

**H1.2: There is a positive impact of digital transformation on social development in SMEs in Jordan**

To examine this hypothesis, the researcher explores the relationship between digital transformation efforts and social development indicators, including employee satisfaction, job creation, and community engagement.

Table (6)
*Regression Results for Social Development*

| Predictor | Coefficient (β) | Standard Error | t-value | p-value |
|---|---|---|---|---|
| Digital Transformation | 8.20 | 1.85 | 4.43 | <0.001 |
| Control Variables | - | - | - | - |

The regression results in the table indicate that there is a positive impact of digital transformation on social development in small and medium enterprises in Jordan, such as employee satisfaction, job creation, and community engagement, which represents another rise. A t-value of 4.43 and an associated p-value of less than 0.001 indicate rejection of the null hypothesis and that the coefficient is statistically significant. These results indicate that digital transformation efforts are associated with improvements in social development within SMEs in Jordan.

**H1.3: There is a positive impact of digital transformation on environmental development in SMEs in Jordan**

To examine the third hypothesis, the researcher examines the association between digital transformation initiatives and environmental development measures such as energy efficiency, waste reduction, and environmental sustainability practices.

Table (7)
*Regression Results for Environmental Development*

| Predictor | Coefficient (β) | Standard Error | t-value | p-value |
|---|---|---|---|---|
| Digital Transformation | 6.75 | 1.65 | 4.09 | <0.005 |
| Control Variables | - | - | - | - |

The results of the regression analysis presented in Table 5 indicate that there is a statistically significant relationship between digital transformation and environmental development. The digital transformation coefficient is estimated at 6.75, and the standard error is 1.65. A t value of 4.09 also indicates that the coefficient is significantly different from zero. Furthermore, the associated p-value is less than 0.001 indicating rejection of the null hypothesis. These results support the hypothesis that digital transformation positively affects environmental development in the context of the study.

**Results Discussion**

The analysis results explored the relationships between digital transformation and sustainable development dimensions within SMEs in Jordan. The study focused on the economic, social, and environmental aspects of sustainable development and aimed to understand how digital transformation influences these dimensions.

We show that descriptive statistics provide an overview of the main variables. The results indicated that participants perceived a high level of digital transformation within their companies, with an average score of 4.2. Similarly, economic development, social development, and environmental development were perceived positively, with average scores of 3.94, 3.71, and 3.58, respectively. These findings set the stage for further analysis and interpretation.

The correlation matrix reports significant associations between digital transformation and sustainable development dimensions. Digital transformation exhibited strong positive correlations with economic development (0.82) and moderate positive correlations with social development (0.65) and environmental development (0.70). These findings suggest that digital transformation initiatives are interconnected with economic, social, and environmental development efforts within SMEs in Jordan.

Also, the regression results demonstrated a statistically significant relationship between digital transformation and economic development. Digital transformation initiatives were associated with an increase in economic development indicators, including revenue growth and cost savings. The regression analysis indicated a positive impact of digital transformation on social development within SMEs in Jordan. Digital transformation efforts contributed to improvements in employee satisfaction, job creation, and community engagement.

The findings report a significant relationship between digital transformation and environmental development. Digital transformation initiatives were linked to enhanced environmental sustainability practices, such as energy efficiency and waste reduction.

**Recommendations**

Based on the previous results, the study recommends the following:

- SMEs should prioritize investments in digital transformation initiatives to benefit from the positive impact they can have on economic, social, and environmental development outcomes.
- Companies make efforts to build digital capabilities, including providing training and support to effectively adopt digital technologies.
- Coordination and collaboration between SMEs, government agencies, and non-profit organizations facilitate knowledge exchange and the pooling of resources to support sustainable development initiatives.

- Regular monitoring and evaluation of digital transformation projects is essential to evaluating their effectiveness and identifying areas for improvement.
- Policymakers must develop supportive frameworks and incentives to encourage SMEs to adopt digital transformation and sustainable development practices.

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