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Impact of digital transformation on sustainable performance

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A B S T R A C T

This study came to examine the impact of Digital transformation on sustainable performance. The research population consisted of employees of Industrial companies listed in Amman stock exchange that is 23 companies. Because of the difficulty of collecting data using a complete census, a random sample of 530 employees was determined. 397 responses were used for the purposes of the statistical analysis of this research. In order to find the impact of digital transformation on sustainable performance, the structural equation modeling (SEM) technique was used. Research results show that digital transformation dimensions had a positive impact on sustainable performance. Big data had the greatest impact. Accordingly, the researchers recommend Industrial companies invest more in manufacturing modern technologies, represented by Digital transformation technologies that give companies the ability to provide high-quality performance and prepare an infrastructure to operate these technologies.

1. Introduction

The world changes over the years, and this change is characterized by technological development with the passage of time, so the development varies from large computers to small computers, and then personal computers, followed by the revolution of electronic chips, smartphones, and other successive and accelerating changes in the world of technology, which thus marked the beginning of the so-called digital revolution (Tariq et al., 2022). Digital transformation is a global phenomenon, yet the regional impact varies greatly depending on the regulatory environment and level of economic development (Al-Nawafah et al., 2022). Manufacturing type has affected the digital technologies used in various industries. Perhaps the most important of these modern technologies is mobile phone consultations and the Internet of Things, which works to attach the various components in our environment using the Internet, which makes it easy to control them using various cloud-computing technologies such as social media, big data, smartphone devices, and others. (Al-Hawary & Obiadat, 2021; Alshawabkeh et al., 2022). People increasingly tend to be digital as they depend on digital technologies in their daily lives (AlHamad et al., 2022; Van Veldhoven & Vanthienen, 2019). Mubarak et al. (2019) pointed to the important impact left by the digital transformation technologies that were covered in the study - which are physical electronic systems, interoperability, and big data. The World Economic Forum developed the Networked Readiness Index (NRI) to shed light on the drivers of ICT performance and the value of ICT dissemination and use for national well-being and prosperity (Al-Abbadi et al., 2022). Managers implement digital transformation for their firms based on a long-term strategy because it is considered one of the most important reasons that contribute to radical changes in the company's business model, and these changes may be at the level of resources, operational methods, or even culture (Henriette et al., 2016).

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Digital transformation contributes to public satisfaction and acceptance through its contribution to reducing costs and effort, improving operational efficiency, and regulating them, in addition to the significant role it plays in simplifying and regulating procedures, in addition to creating new and innovative opportunities to provide services to people. Organizations respond to the dynamic environment by using digital transformation techniques for business, which requires defining strategies and priorities for which financial and leadership support is available, in addition to the participation of all organization employees (Schwertner, 2017). Overall, it has become imperative for organizations to use digital transformation tools and, accordingly, find appropriate ways to adopt them. Organizations suffer from a lack of specialists and experience in the field of digital technologies, which negatively affects their performance.

2. Literature review and Developing hypotheses

2.1 Digital transformation

The term "digital transformation" is one of the modern terms that have been widely used recently and has been defined from many points of view. Indriastuti and Fuad (2020) define digital transformation as the use of technology tools to increase business speed and create new opportunities that help organizations target a larger market .Henriette et al. (2016) see digital transformation as a process of total or partial change that begins with the first use of digital tools, and then it is possible to shift to a comprehensive digital situation in order to create value. Others define "digital transformation" as the use of digital technologies to fundamentally improve business models or processes to improve business performance, while Van Veldhoven and Vanthienen (2019) consider digital transformation as the continuous interaction of business and society with digital tools, which leads to accelerating the change process and increasing its impact. Morakanyane et al. (2017) worked on developing a definition of digital transformation as enhancing digital capabilities and tools that are used to increase customer value by improving business models, developing operational processes, and improving customer experiences. Berghaus and Back (2016) found that digital transformation results from changing the technology used in organizations, including improving current processes and creating digital tools that transform the business model. Vial (2019) developed a conceptual definition of DT as a "process that aims to improve an entity by bringing about significant changes in its properties through combinations of information, computing, communications, and communication technologies".

Researchers can use many measures to study digital transformation, and these measures differ according to the purpose and nature of the research that researchers are dealing with (Rahamneh et al., 2023; Altarifi et al., 2015). Henriette et al. (2016) aimed at better understanding the risks and impacts of digital transformation for businesses, we discovered that the digital transformation represented by digital technologies, user experience, and data analytics are all important aspects of digital transformation (AL-Zyadat et al., 2022; Khalayleh & Al-Hawary , 2022), in their study that aimed to measure the digital transformation formative impact on national sustainability with the Networked Readiness Index (NRI), (Mohammad et al., 2022), measured digital transformation in a study aimed to shed light on the perspectives that constitute the smart factory and propose methods and technical support to enable the achievement of those perspectives with the main components of digital transformation, which are Big Data, Cloud Manufacturing, Internet of Things, Cyber-Physical Systems, Smart Factory, Chen et al. (2017) aimed to propose a hierarchical structure for the smart factory, adopted digital transformation dimensions in the Internet of Things (IoT), big data, and cloud computing, which are included in the manufacturing process. digital transformation dimensions were represented in (Mubarak et al., 2017) study, which aimed to determine the effect of Digital transformation technologies on the performance of Small and Medium Enterprises in Pakistan with Big Data Analysis, Cyber-Physical Systems, Interoperability, and the Internet of Things. Based on the above, the researchers adopted the dimensions of digital transformation represented by cyber-physical systems, smart factory, Internet of Things and Big Data as follows (ur Rehman et al., 2018):

Physical Cyber Systems: The term physical electronic systems express systems of a new generation that have computing and physical capabilities integration that can interact with humans in innovative and new ways (Baheti & Gill, 2011). They have the ability to interact with and extend the capabilities of the physical world through computing and communication. CPS is complex systems with organic integration and in-depth collaboration of computing, communications, and control (3C) in addition to control, which is an essential catalyst for future technological improvements (ur Rehman et al., 2018).

Smart factory: The smart factory is used as one of the solutions to provide adaptive production processes for problems that may appear in the production line that suffers from rapid changes in characteristics and requests. In contrast, it can be seen from the point of view of the cooperation of industrial and non-industrial partners, where intelligence can result from the creation of dynamic organizations (Radziwon et al., 2014).

Internet of Things: To realize the vision of the Internet of Things, the computing paradigm must change to connect common objects and embed intelligence in our surroundings, moving beyond typical mobile computing scenarios that involve Smartphone and mobile devices (Gubán & Kovács, 2017). The Internet of Things uses five basic technologies, including Radio Frequency Identification (RFID), Wireless Sensor Networks (WSN), Middleware, Cloud Computing, and IoT Application Software (Lee & Lee, 2015).

Big data: This term expresses the huge data set that is difficult to store and analyse to produce more operations (Sagiroglu & Sinanc, 2013). Big data is created using any mobile phone, social network, Internet of Things, multimedia, and other applications of size, speed, and diversity. As a result, data analytics should be completely re-examined from the following (3V) perspectives: (Volume Perspective, Velocity Perspective, and Diverse Perspective) (Tsai et al., 2015).

2.2 Sustainable Performance

Organizational performance is one of the broadest managerial terms that can be searched. Many researchers have studied performance to find out the factors that affect it (Al-Khawaldah et al., 2022). Organizations Overall performance can be measured using financial metrics such as return on assets, return on sales, earnings per share, and many more. It is also possible to measure the organizations performance using other non-financial measures that can affect their image, such as the social responsibility activities that organizations practice, such as using green resources, various charitable contributions to the surrounding community, and the commitment to public morals. (Al-Awamleh et al., 2022; Boudlaie et al., 2022; Mukhlis et al., 2022; Adetunji & Owolabi, 2016).

According to Mackey (2008), the "CEO's effect" on the parent company's performance is substantially more important than the influences of industry and companies in some conditions, but it is moderately more important than the influences of industry and companies on business performance in others. Because of the influence of mediating and moderating variables, It was found that there is an indirect relationship between the use of information technology and organizational performance (Mohammad, 2020; Chen & Zhu, 2004). Kao and Hwang (2010) confirm that information technology clearly affects the organizations performance, but indirectly, as it increases fundraising by getting jobs done cheaply, and thus it can be said that it increases profits. The results of Lee and Grewal (2004) show that depending on the Internet as a Communication channel and the electronic alliance formation positively affect the company's performance, and the positive impact of relying on communication channels on the company's performance is further enhanced through the use of slack resources. In their empirical results, Oerlemans and Meeus (2005) identified the importance of proximity, especially for innovative outcomes. He found that intra-regional and intra-regional relationships, in particular with buyers and suppliers, help firms' performance. Moreover, innovation strategy (dis)similarity to his interesting effects on the company's relative performance and sectoral R & D implications influence results in a positive way. The findings of Loukis et al. (2019) show that, in addition to ACAP, the company's adoption of the Software as a Service model has a positive impact on operational and innovation benefits, whereas contractual governance only has a positive impact on innovative benefits and relational governance has no impact on any of these two types of benefits. Although both operational and innovation benefits have a favourable impact on a company's success, the former has a greater impact. Our survey's findings can aid corporate decision-making in terms of optimizing business benefits and company performance.

2.3 Digital transformation and sustainable performance

To gain and sustain a competitive advantage, modern businesses must adapt and absorb new technologies (Lee & Grewal, 2004). Building a distinguishing performance for the organization is the foundation for gaining a competitive edge. The empirical findings Lalic et al. (2017) confirm that the industrial organizations that apply e-learning and the various concepts of smart factories, differ from others, and this means that e-learning is essential in production and is used in industrial organizations. When using e-learning, the results revealed that two smart factory principles are significantly and favourably related to the company's performance. Rahman et al., (2020) proved the importance of Sector 4.0 in boosting and increasing the performance of the service industry in both economies (Canada and Bangladesh), as well as describing the significance of Digital transformation in improving the performance of logistics industries in dissimilar economies.

The study (Lin et al., 2019) revealed that big and private organizations show greater motivation to promote the Digital transformation strategy and that government subsidies do not have any obvious effect on the company's Digital transformation decision. The implementation of Digital transformation can improve the company's financial performance, innovation activities, and inventory returns, but it does not have a significant impact on the efficiency of the supply chain. In addition, the adoption of Industry 4.0 has a positive effect on the degree of information transparency in the company. Ali (2019) discovered that financial risks, supply-demand mismatches, and transportation risks all have a vital negative impact on organizations performance, and that Industry 4.0 introduces innovative practices and dynamic capabilities (cost optimization, visibility, and collaboration) that mitigate these negative effects. Lusarczyk et al. (2020) investigate the impact of the Fourth Industrial Revolution on economies of many countries by examining the cases of Poland, Canada, and Hungary, in order to discover that Industry 4.0 technologies impact the company's performance in the three economies (Hungary, Canada, and Poland), though the magnitude of the effect varies to some extent. By finding an integrated approach to managing supply chains on the widest possible scale, while ensuring the dissemination and exchange of information along the supply chain. It is worth noting that digital transformation technologies will certainly lead to the development of supply chain management performance . Furthermore, by enabling process integration, digitization, automation, and the creation of new analytical capabilities, these technologies enable huge gains in performance within particular supply chain operations such as procurement, production, inventory management, and retail (Fatorachian & Kazemi, 2020). After discussing the relationship of the study variables with each other in the previous theoretical literature, researcher can propose the following:

There is an impact of Digital transformation on the company's sustainable performance. Fig. 1 shows the structure of the proposed study of this paper.

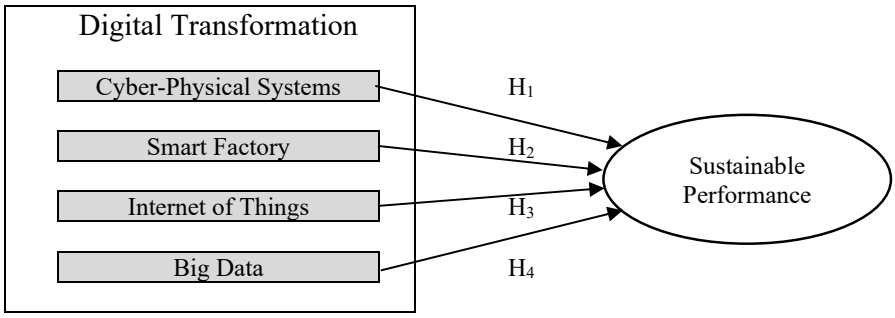

Fig. 1. Research Model

3. Research Methodology

3.1 Sample and data collection

Two main sources were used in gathering data for the current research. The first was the main source, which is research and published scientific books related to Digital transformation and firm performance in order to build the theoretical section of this research. The second was based on a research questionnaire specifically designed for the purpose of research. The research questionnaire was distributed to the research population, which consisted of Industrial companies listed in Amman stock exchange employees in Jordan that is 23 companies. These companies include approximately 10000 employees and are considered an entrepreneurial and major sector of the Jordanian economy. Because of the difficulty of collecting data using a complete census, a random sample of 530 employees was determined according to Sekaran and Bougie (2016). Total responses to the research questionnaire were 412, however, it was found that they contain 15 responses that were not valid for statistical analysis. Hence, the total questioners analyzed for this research were 397, that constitutes a 74.90% response ratio.

The study sample demographic distribution showed that it was 58.6% for males and 41.4% for females. 65.3% were bachelor's degree holders, followed by 27.9% holders of postgraduate certificates, and finally 6.8% holders of diplomas or less. Moreover, 42.7% were within the age group "from 30 - less than 40" which were the majority, group “from 40 - less than 50” which formed 33.1%, and ranked second, then "50 years and older" in the third place with a percentage of 12.4%, and finally 11.8% of those who belong to the age group "Less than 30 years".

3.2 Research instrument

The main research questionnaire was a self-reporting electronic questionnaire; Google Forms was used to design the questionnaire, in order to distribute it via email to Industrial companies' employees. The research questionnaire included an introduction to explain the research objectives and two main parts. The first part is devoted to demographic data (gender, qualifications, and age). The second part was for the major study variables, which were digital transformation and sustainable performance. Researchers determined responses based on the five-point Likert scale. The details of these variables were as follows:

Independent variable: it was a digital transformation whose factors were developed based on (Attiany et al., 2022; Osterrieder et al., 2020; Zulkarnain & Anshari, 2016). This variable consisted of 16 factors distributed over four constructs. Cyber-physical systems included four factors. The smart factory contained four factors. The Internet of things included four factors. Big data consisted of four factors.

Dependent variable: it was sustainable performance whose factors were formulated according to (Al-Khawaldah et al., 2022). This variable consisted of six factors. and it was considered a first-order construct.

4. Research Findings

4.1 Model evaluation measurements

Confirmatory factor analysis (CFA) was used to evaluate the measurement model for the impact of digital transformation on sustainable performance. Convergent validity was measured through the factor loadings values and average variance extracted indicators, while the discriminant validity was determined by comparing the values of AVE with the maximum shared variance (MSV) and comparing the square root of AVE with the correlation coefficients between the research constructs. The reliability of the measurement model was identified by the McDonald's Omega coefficients which are used to measure the composite reliability. Table.1 lists the values extracted for these tests.

Table 1
Validity, and reliability

Constructs	Items	Loadings	AVE	MSV	√AVE	CR
(SPS)	SPS1	0.684	0.528	0.377	0.727	0.817
	SPS2	0.677				
	SPS3	0.813				
	SPS4	0.725				
(SF)	SF1	0.738	0.590	0.462	0.768	0.851
	SF2	0.802				
	SF3	0.811				
	SF4	0.716				
(IoT)	IoT1	0.735	0.549	0.329	0.741	0.830
	IoT2	0.751				
	IoT3	0.776				
	IoT4	0.701				
(BD)	BD1	0.824	0.565	0.409	0.752	0.838
	BD2	0.764				
	BD3	0.685				
	BD4	0.728				
(SP)	FP1	0.653	0.570	0.468	0.755	0.888
	FP2	0.794				
	FP3	0.688				
	FP4	0.758				
	FP5	0.806				
	FP6	0.817				

The results of Table 1 confirm that the factor loadings on their latent constructs ranged within (0.653-0.824), which is greater than the value of 0.50 the lowest value for keeping them (Brown, 2015). Also, AVE values were higher than 0.50 the lower bound for this indicator. Accordingly, suitable convergent validity was discovered (Rimkeviciene et al., 2017). The results indicated that all AVE values were higher than MSV for each construct. Moreover, the square root of AVE exceeded the correlation coefficients between all research constructs. Thus, the measurement model had a discriminant validity (Franke & Sarstedt, 2019). As for the reliability, the McDonald's Omega coefficients ranged within (0.817-0.888), as they exceeded 0.70 which is the minimum value to judge the composite reliability of the measurement model (Zhang & Yuan, 2016).

4.2 Descriptive statistics

In order to measure adoption rates, the digital transformation dimension and the sustainable performance level in Industrial companies in Jordan, values of means and standard deviations reported in Table.2 were used. Furthermore, the table demonstrated the correlation coefficients used to ensure that the dimensions of digital transformation were multicollinearity free.

Table 2
Means, standard deviations, and correlation

Constructs	Means	SD	1	2	3	4	5
1. Cyber-Physical Systems	3.72	0.925	1				
2. Smart Factory	3.64	0.901	0.468	1			
3. Internet of Things	3.58	0.897	0.455	0.514	1		
4. Big Data	3.70	0.953	0.408	0.473	0.507	1	
5. Sustainable Performance	3.78	0.971	0.628	0.609	0.682	0.661	1
Note: all correlation coefficients are statistically significant.							

The results indicated that the sustainable performance level (M= 3.78, SD= 0.971) was high according to the employees in Industrial companies in Jordan. Likewise, the dimensions of digital transformation were adopted at different levels in Industrial companies in Jordan, where cyber-physical systems (M= 3.72, SD= 0.925) was first and big data (M= 3.70, SD= 0.953) the second, and both of them had a high adoption level. For the third rank, it was for smart factories (M= 3.64, SD= 0.901) and the fourth rank was for the internet of things (M= 3.58, SD= 0.897) with a moderate level for both. The correlation coefficients were of a moderate level and did not exceed 0.80 the upper threshold of the permissible correlation between the dimensions of the independent variable (Muda et al., 2022; Harahap et al., 2022). Subsequently, the dimensions of digital transformation were free from the multicollinearity problem.

4.3 Structural model

To test the digital transformation dimensions impact on sustainable performance, researchers used structural equation modeling. This technique is used to identify the causal relationship between the latent variables and to determine the degree of the research model's suitability. Fig. 2 illustrates the used structural model.

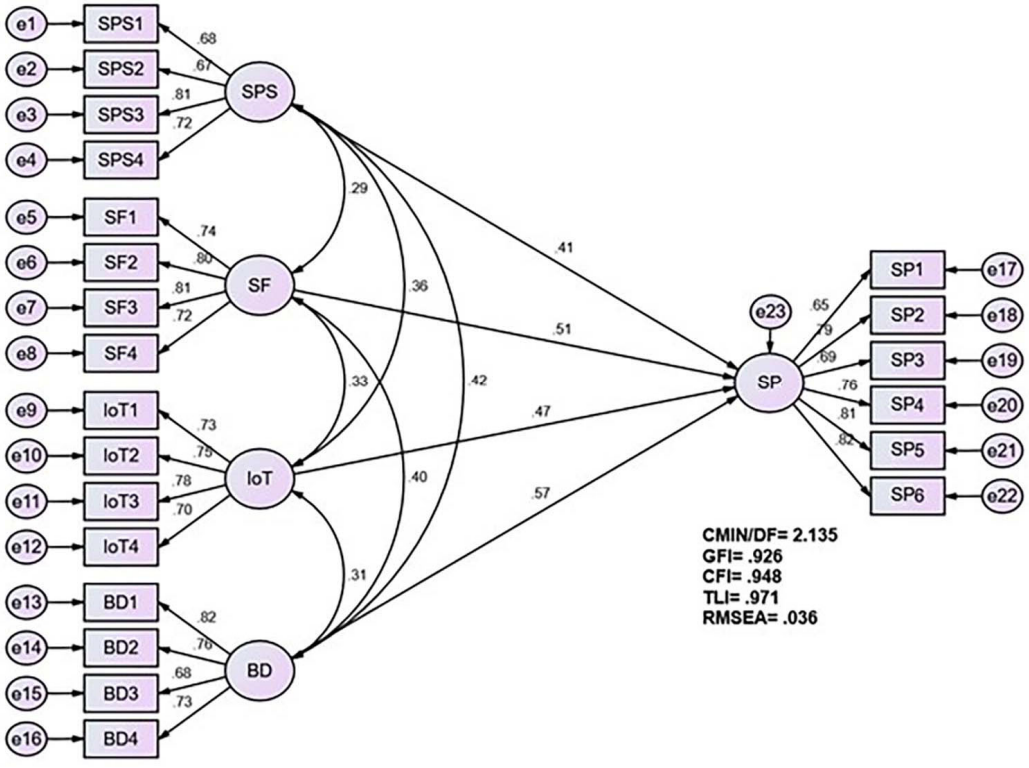

Fig. 2. SEM for testing the impact of digital transformation dimensions on sustainable performance

The results indicated that the chi-square to degrees of freedom ratio (CMIN/DF) was 2.135, thus it was an appropriate value being less than 3 the upper threshold of the indicator (Shi et al., 2019). The goodness of fit index (GFI) values, the comparative fit index (CFI) and the Tucker-Lewis index (TLI) were at the minimum approved limit for these indicators (Villarreal& Jorgensen, 2020). while the value of root mean square error of approximation (RMSEA) was 0.036 which is lower than the upper threshold of 0.08 (Xia& Yang, 2019). According to the results included in Fig. 2, it was clear that the structural model used had a construct validity, and the values of the standardized and unstandardized impact coefficients listed in Table.3 were sound reliable.

Table 3
The summary of the results

Constructs	B	SE	B	t-value	p-value
Cyber-Physical Systems → sustainable Performance	0.471	0.037	0.410	12.729**	0.008
Smart Factory → sustainable Performance	0.604	0.043	0.511	14.046***	0.000
Internet of Things → sustainable Performance	0.534	0.040	0.469	13.350**	0.002
Big Data → sustainable Performance	0.682	0.045	0.572	15.155***	0.000
Note: * $p \leq 0.05$, ** $p < 0.01$, *** $p < 0.001$.					

The results of Table 3 indicate that digital transformation dimensions positively impacted sustainable performance. Big data (β= 0.572, t= 15.155, p= 0.000) had the greatest impact, followed by smart factory (β= 0.511, t= 14.046, p= 0.000) in the second rank, then the internet of things (β= 0.469, t= 13.350, p= 0.002) in the third rank, and finally cyber-physical systems (β= 0.410, t= 12.729, p= 0.008) was last impact rank.

5. Conclusion

It was found that industrial companies adopt digital transformation, where the Internet of Things (IoT) came at the highest level and cyber-physical systems at the lowest level, as it was found that the adoption level of the Internet of Things is high and this is due to the fact that the industrial companies management use the Internet to eliminate customer waiting time,

invests in online connectivity tools to reduce costs, and seeks to achieve efficiency through Internet-based means of communication. big data dimension adoption level was medium, because insurance companies rely on analysing business environment data in setting their strategies, relies on accurate and reliable data in making decisions, seeks to achieve competitive advantage by analysing the business environment opportunities and threats, and depends on experienced employees to deal with the large amount of data. Furthermore, the smart factory dimension has a medium level of adoption. This is because industrial company management uses complex algorithms to solve problems and difficulties, enhances work capacities in real time, tries to foresee and respond swiftly to changes in the business environment, and preserves production capacity by preventing unexpected shutdowns. Finally, industrial companies' management provides computerized resources that contribute to the completion of operations and services, as well as the ability to process data, enhance local data storage, and provide software to deal with the challenges and threats of the business environment, resulting in a medium level of adoption of cyber-physical systems.

It was found that the level of sustainability in industrial companies is high, with the dimension of social sustainability getting the highest level and the dimension of economic sustainability getting the lowest level. Based on the results, it was found that the social sustainability dimension adoption level is high, and this is due to the fact that the management of studied industrial companies provides donations and assistance to charitable organizations to fulfil their social responsibility, focuses on the principles of justice when setting its policies for salaries and wages, and also adopts a strategy of equal opportunities to select its employees. It pays great attention to improving the capabilities and cognitive skills of its employees and sets policies and procedures that help empower employees and involve them in decision-making. Furthermore, environmental sustainability adoption level is high, owing to the fact that industrial company management adopts a comprehensive vision aligned with environmental requirements and promotes an organizational culture that supports the ethics and values of reducing environmental risks. It also incorporates environmental regulations throughout the product's life cycle and is committed to putting them in place. Its activities are compliant with environmental norms and laws, and it fully reports the environmental impact of its operations. Finally, it was found that the dimension of economic sustainability adoption level is high, this is due to the fact that the management of industrial companies implements initiatives to develop the local economy, and sets plans for follow-up and evaluation that ensure the detection of deviations and deal with them quickly, as well as applying modern methods to achieve effectiveness and efficiency in investing resources, takes decisions to rationalize expenditures, and monitors the mechanism for using available resources to reduce waste rates.

6. Discussion

The study results showed the impact of Digital transformation with its dimensions on the sustainable performance. This is because modern industrial technologies have completely changed the way organizations work. It converged many emerging technologies to provide digital solutions and gathered industrial equipment and information systems into one unique information area, allowing them to exchange data and interact with each other and with the external environment, sometimes without human intervention. The technology of cyber-physical systems (CPS) works on the integration of mathematical and physical operations, allowing the elements to interact with each other as a single unit and with the employee in a way that facilitates the monitoring and control of the company through the computer and the embedded interconnection networks.

Employees can now use Internet of Things (IoT) technology to remotely control physical equipment, machines, buildings, and other stuff. IoT technology connects devices to the Internet via sensors, actuators, and software, allowing these objects to collect and exchange data. The idea of the smart factory is based on the existence of an integrated manufacturing system that works without any work force, using modern systems and programs that complete tasks based on data collected from the physical and virtual worlds, which increases accuracy and speed, and as a result improves the company's performance. Big data technology offers new ways to deal with data that is difficult to deal with using traditional databases. It works to produce accurate information of value in a short time, which facilitates and speeds up the process for employees to obtain information and complete the tasks related to it. The modern technological technologies of Digital transformation provided tools for enterprises to increase productivity and enhance economic growth, and they worked on the continuous improvement of the company, focusing on value-adding activities and trying to ensure its sustainability, which contributed to achieving a high competitive advantage and stimulating business performance in companies. This research supports the findings of a previous study (Lalic et al., 2017), which studied the difference between the factories that applied the concepts of smart factories and e learning and how these factories relate to improving performance when using e-learning. Rahman et al. (2020) emphasized the important role that digital transformation plays in improving the performance of service organizations in Canada and Bangladesh and clarified the importance of Industry 4.0 in increasing performance levels in the logistics industries. (Ali, 2019) emphasizes the significant negative impact of financial risks, supply-demand mismatches, and transportation risks on corporate performance, and how Industry 4.0 increases the opportunity for innovation and dynamic capabilities (cost optimization, vision, and collaboration), which may contribute to reducing the negative impact. (Lin et al., 2019) revealed that implementing Industry 4.0 can improve a company's financial performance, innovation activities, and inventory returns, but does not have a significant impact on supply chain efficiency, research (Ślusarczyk et al., 2020) found There is an impact of Industry 4.0 technologies on the performance of firms in the economy (Hungary, Canada, Poland), however, the magnitude of the effect varies somewhat. The implementation of enabling Industry 4.0 technologies is projected to lead to significant performance improvements in supply chain management, as (Fatorachian & Kazemi, 2020) has shown. Furthermore, these

technologies allow for significant improvements in particular supply chain operations such as procurement, production, inventory management, and retail sales.

7. Managerial implications and suggestions for other studies

The results of the study assure the impact of Digital transformation on the company's sustainable performance. Therefore, the researcher recommends Jordanian pharmaceutical companies invest in manufacturing modern technologies, represented by Digital transformation technologies that give companies the ability to provide high-quality performance and prepare an infrastructure to operate these technologies. The modern technologies used in the company and the constantly updated technologies used. The study dealt with Digital transformation and company's performance, further research may study Digital transformation and sustainable development, supply chain, process efficiency, business strategy, value chain, or customer service. Another research may use an intermediate variable in-between such as the investment in the fourth industry technologies size or company's available infrastructure quality, the study also examined Digital transformation with its technologies. Another study could include interoperability on the dimensions or use other technological tools such as computing, Cloud Computing, and other Digital transformation technological tools. This study searched the pharmaceutical companies, and therefore, another study can be addressed to search the industrial organizations, the banking sector, educational organizations, telecommunications companies, or health organizations.

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