

Importance of Digital Sustainability: Understanding and Managing Tensions

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Abstract

By combining digitalization with sustainability to encourage green growth, digital sustainability is essential to assisting companies in achieving the Sustainable Development Goals. There are substantial gaps in its conceptual framework and measurement, despite its increasing significance. This study uses grounded theory, synergistic effects theory, and a thorough literature analysis to identify three important aspects of digital sustainability: empowerment, leadership, and integration. The analysis's conclusions make it clear that including DT and sustainability principles improves the transformation's efficacy, as demonstrated by economic, social, and environmental performance metrics. The focus on integrating sustainability concepts into the digital transformation process is what makes this research unique. The study's findings show that when organisations' digital transformation objectives coincide with the Sustainable Development Goals (SDGs), long-term sustainability outcomes are improved.

Keywords: Digital sustainability; Bright side; Dark side; Digital technologies; Digital transformation

I. Introduction

Digital transformation (DT) is becoming a crucial factor in the expansion and success of organisations due to the quick advancement of technology (Kraus et al., 2021). The sustainable adoption of cutting-edge digital technology has become a crucial component of firms' digital transformation journeys as they strive to stay competitive and adjust to changing consumer requirements (Rosě and Dias, 2022). The idea of continuous digital transformation entails incorporating digital technologies into corporate operations in a sustainable and responsible manner while taking into account their effects on the environment, society, and economy. Organisations must carefully assess their environmental impact, optimise energy use, and reduce e-waste in order to achieve the sustainable use of these cutting-edge digital technologies (Neumeyer, 2020). By adopting sustainable practices in the adoption of innovative digital technologies, organisations can not only achieve operational efficiencies and cost savings but also contribute to the greater good by reducing their carbon footprint, supporting social development, and driving economic growth. It also entails addressing the social implications of technology adoption, such as privacy concerns, ensuring inclusivity, and promoting digital literacy among employees and customers (Tohènean et al., 2020).

Digital Transformation in the Hypercompetitive World of Today

Rapid technology breakthroughs present organisations with previously unheard-of opportunities and problems in today's hypercompetitive climate. Organisations are using digital transformation (DT) as a crucial tactic to deal with this environment (Hewapathirana and Almasri, 2021). DT entails integrating digital technology into every facet of corporate operations, radically altering how businesses provide value to clients and maintain their competitiveness. DT is now essential for organisations to survive and prosper in this age of continuous innovation and disruption (Hanelt et al., 2021). Businesses may build stronger connections by using DT to better understand their clients and interact with them in a more tailored way. Additionally, it generates new revenue streams like digital marketplaces and e-commerce platforms (Melović et al., 2020). Additionally, by giving workers access to tools and technology that improve teamwork and encourage creativity, digital transformation empowers workers.

Digital Transformation via Digital Technologies

Digital technology has become a revolutionary force, changing how businesses function and revolutionising many facets of our lives. Digital technology is the foundation for organisational innovation and transformation in the context of DT. It makes it possible for companies to develop new value propositions, optimise resource allocation, and simplify operations (Du et al., 2023). Large volumes of data may be gathered and analysed by businesses utilising digital tools and platforms, allowing for data-driven decision-making and

customised consumer experiences. Additionally, digital technology breaks down old boundaries and makes it possible for organisations to swiftly respond to market needs by facilitating collaborative and agile processes (Maran et al., 2023). It has the ability to transform consumer interaction, transform business models, and promote operational excellence. Businesses that successfully integrate digital technology into their digital transformation process will be well-positioned to prosper in the digital age.

Sustainable Development Goals

The sustainable adoption of cutting-edge digital technologies in digital transformation is one of the most crucial elements of achieving the United Nations' Sustainable Development Goals (SDGs). A collection of 17 global objectives known as the SDGs was designed to tackle critical social, economic, and environmental concerns and achieve a sustainable future for all (Sarkis et al., 2022). The sustainable adoption of cutting-edge digital technologies in DT is directly related to a number of SDGs. Goal 9, for instance, strives to establish resilient infrastructure, promote equitable and sustainable industry, and stimulate innovation. This aim underlines the necessity of creating digital technologies to stimulate economic development, boost productivity, and support sustainable industrial practices (Argyroudis et al., 2022). Goal 7 is to guarantee that everyone has access to modern, cheap, dependable, and sustainable energy. The sectors of sustainable development are depicted in Figure 1. Organisations may support these SDGs and promote good change in sectors including education, healthcare, agriculture, and environmental conservation by adopting the sustainable use of cutting-edge digital technology in digital transformation (Nayal et al., 2022).

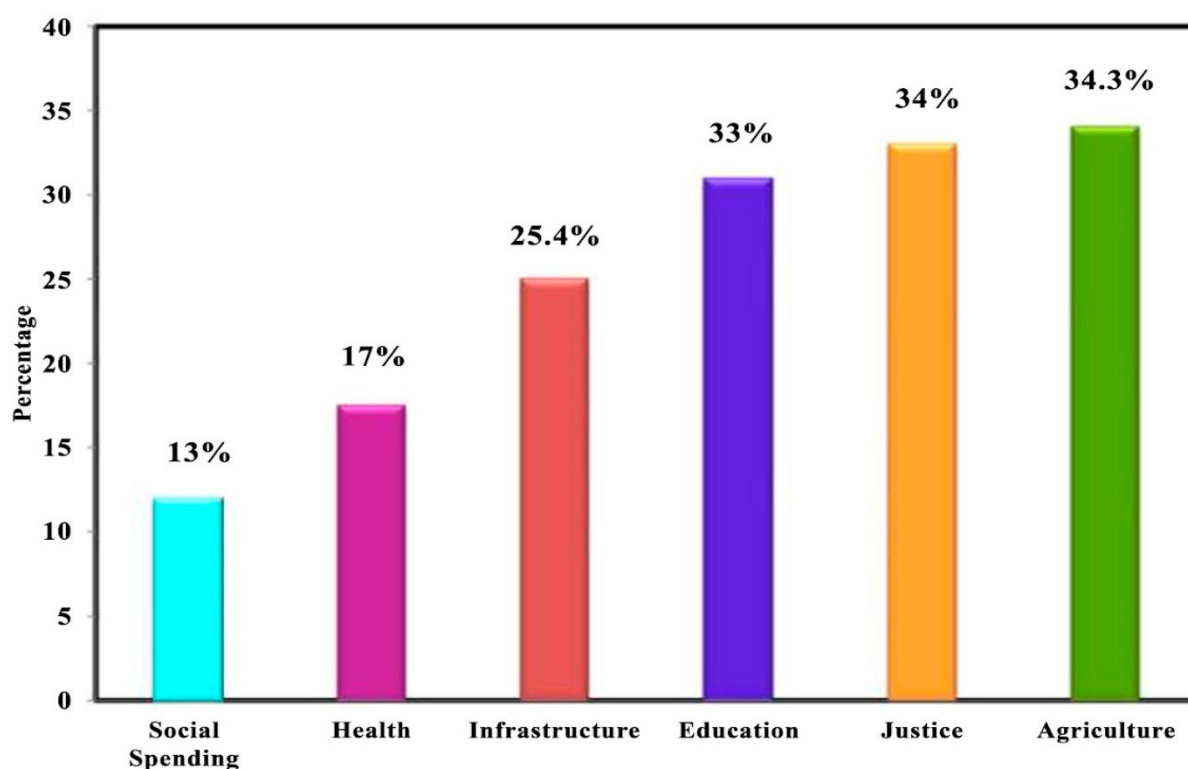


Figure 1. Sustainable development sectors (Source: <https://doi.org/10.3390/su152014697>).

Research goals and questions:

RQ1: What role may digital changes play in promoting social sustainability?

RQ2: How can digital transformation contribute to an organization's long-term viability?

RQ3: What aspects of sustainable digital transitions affect resource allocation and risk mitigation?

II. Literature Review

This section summarises the findings of previous research studies that are relevant to the current study. It covers sustainability and digital transformation, with a constant focus on its adoption in DT, and the use of innovative technologies in digital transformation. The review also identifies the research gaps that the current study needs to fill.

1. Digital Transformation and Sustainability

Over the years, industrial progress and technical breakthroughs have caused many changes in the world. The main factors driving the phenomena known as digital transformation are the volatility, unpredictability, complexity, and ambiguity that currently define markets. A thorough analysis of 89 published papers was used in the study. Filters for thorough content analysis were used. According to the study, it is possible to develop a paradigm for research that views DT as both a forerunner and a driver of sustainability. The research recommended that in order for enterprises to survive the digital revolution, they should: (i) develop their digital capabilities; and (ii) balance their economic, environmental, and social ramifications. As information and communication technologies are used more often in industrial production, the dangers and possibilities they bring for environmental sustainability, as well as political awareness of these risks and potential, become increasingly significant. Kunkel and Matthes (2020) assessed the anticipation-concerning impacts of ICTs on professions for environmental constants in the industrial and digital sectors of four Sub-Saharan African nations and three East Asian and Pacific Island countries. The study revealed that policies emphasise a wide range of ambiguous expectations and give more weight to the advantages of using information and communication technologies.

2. Importance of Sustainable Adoption in Digital Transformation

Due to DT, which changes sectors and calls for the creation of new change-adoption methods, businesses confront tremendous hurdles. Businesses and sectors are undergoing a major transition that will lead to digital business operations. Digitisation is driving all business operations and forcing companies to create entirely new strategies. The relationships between financial performance, a sustainability plan, and a digital business strategy were examined by Ukko et al. (2019). According to the research, implementing a digital company plan requires two operational and managerial competencies. The findings showed that the relationship between a digital corporate strategy and financial performance is facilitated by a sustainability plan. The study found that the sustainability approach reinforced the relationship between financial performance and management skill. However, when employing the sustainability plan, operational capabilities and financial performance showed a negative association. Due to societal and technical tendencies toward digitalisation, universities have seen a number of notable developments in recent decades. The use of technology by universities is currently associated with a paradigm shift in which technology is viewed as a complex and linked environment that facilitates digital learning. Abad et al. (2020) examined global research patterns on the impacts of sustainable DT management in higher education. The adoption of new technology in higher education is significantly impacted, according to the report.

3. Implementing Innovative Digital Technologies for Digital Transformation

New information and communication technologies (ICTs), also referred to as new technologies, help digitally enabled businesses and increasingly provide substantial development opportunities. The methods required to apply DT inside traditional enterprises were examined in the study by Loonam et al., 2018. According to Loonam et al. (2018), it found four main themes that businesses should follow when making realistic adjustments to their digital business models. Digitalisation greatly advances the UN Sustainable Development Goals, claim Bican and Brem (2020). Without the change of current firms, future economic and environmental concerns cannot be successfully addressed. The study looked at earlier research to provide a broad definition and knowledge that would form the basis for the relationships inside a conceptual framework. The study found seven key terms associated with digitalization—digital, digital business model, business model, digital technology, digital transformation, digital innovation and digital entrepreneurship—based on a thorough review of the literature in the domains of management and economics.

4. Decrees are used to integrate spatial data infrastructures (SDIs) into the information infrastructure of EU member states

The collection of inventions and technologies, organisational structure, and tactics that provide a basis for geographic data discovery are all part of the spatial data infrastructure (SDI). GPS, remote sensing, geographic information systems (GIS), and other related technologies are the key components of SDI. For instance, SDI facilitates information exchange and emergency mapping operations (EMOs) support decision-making in the Dominican Republic, a tiny island developing state that is susceptible to natural catastrophes like hurricanes and earthquakes. A wide range of stakeholders with divergent goals must be taken into account when evaluating future plans for SDI implementation in order to meet emergency mapping goals. Multi-actor multi-criteria analysis (MAMCA) provided a road map for cooperation amongst various stakeholders committed to putting into practice an SDI that provides a framework for EMOs in emergency situations in the reference study (Rosario Michel and Gonzalez-Campos, 2023).

5. Comparative Methods of Geoportal Functionality Are Used for Research

In their study, Soldatke et al. (2023) used the Polish towns of Puck and Wladyslawowo as an example to illustrate the variations in the geographical evolution of beach towns during and outside of the summer. Additionally, they looked at and evaluated the tourism services that have been provided in those towns, as well as the development of long-term solutions, the provision of tourism seasonality, the application of spatial tools, the opinions of locals regarding tourist traffic, the creation of resorts for tourists, and the numerous developments pertaining to the spatial development projects in those specific towns.

6. Protective rights of land, infrastructure above, in, and below the ground, and special markings on maps and ISO standards are all crucial components of sustainable development

In order to collaborate and exchange information at the national level and concurrently develop the INSPIRE geoportal of the European Commission's Community Research Center, the development of a geospatial data infrastructure has been introduced. They have discovered both new obstacles and chances to address the issues by employing them. According to a research by Ogryzek et al. (2019), maps showing utility networks and the property rights acquired by utility firms may evolve. Since there are now no details accessible in the systems, the information about remote sensing techniques is useful for the disclosure of rights on maps of a technological framework. Both national and local geoportals can leverage the improved outcome.

III. Theoretical Framework

Stakeholder engagement, resource allocation, risk mitigation, resources and support for successful implementation, and sustainability goals in digital transformation initiatives are all covered in the theoretical framework, along with long-term sustainability outcomes for organisations, competitive advantage, governance, and management.

1. The Efficiency of the Transformation

The process of incorporating digital technology into a company's operations, strategy, and overall value offering is known as digital transformation (DT). By automating manual procedures and optimising operations, DT increases operational efficiency. Organisations may boost productivity, decrease human error, and get rid of time-consuming and repetitive jobs by using digital tools and technology. Employees are able to concentrate on more strategic and valuable tasks as a result, which eventually boosts team performance. DT enhances cooperation and communication both inside and outside the company (Albukhitan, 2020). Teams may work together in real time from any place by utilising digital platforms like video conferencing, instant messaging, and project management software. Through the use of data analytics and business intelligence tools made possible by DT, businesses may obtain important insights into market trends, consumer behaviour, and operational performance (Carroll et al., 2021). Businesses may increase performance and maintain their competitiveness in the digital era by using these insights to make data-driven choices, enhance their strategy, and pinpoint areas for development (Sivarajah et al., 2019).

2. Long-Term Sustainability Outcomes for Organizations

In addition to having major long-term sustainability implications for businesses, DT may boost operational effectiveness, enhance consumer experiences, and spur innovation. DT assists businesses in lessening their environmental impact. Organisations may decrease the demand for physical resources, automate operations, and simplify procedures by utilising digital technology. This results in lower energy use, lower carbon emissions, and lower waste production (Moghrabi et al., 2023). DT fosters an innovative and flexible culture in businesses. DT encourages cooperation and information exchange both inside and between supply chains. Businesses may lessen the need for in-person travel by putting in place cooperative digital platforms and communication tools, which will lower transportation-related emissions. Organisations may interact with consumers and stakeholders in more sustainable ways because to DT. Businesses may use digital platforms to share their sustainability initiatives, advertise eco-friendly goods and services, and inform customers about responsible consumption (Guinan et al., 2019). Increased consumer loyalty, improved brand recognition, and eventually a more sustainable company climate will result from this.

3. Competitive Advantage

In order to spur innovation, improve customer value, and streamline operations, DT makes use of cutting-edge technologies including artificial intelligence, machine learning, cloud computing, big data analytics, and the Internet of Things (IoT). The advantage of DT is its capacity to gather, examine, and use enormous volumes of data to provide insights that can be put to use. Organisations may enhance their operations, customise consumer experiences, and find new growth prospects with the use of advanced analytics and data-driven decision-making. Additionally, DT helps businesses become more adaptable and sensitive to

shifting market conditions. Businesses may increase productivity, save expenses, accelerate time to market, and swiftly respond to client demands by implementing digital platforms and automation (Dutta et al., 2022). Businesses may interact with consumers at many touchpoints, meet their demands, and provide customised solutions by utilising digital channels, personalised marketing tactics, and omnichannel capabilities. This fosters customer loyalty and sets them apart in the competition. Aligning technology investments with business goals, consistently innovating and adjusting to digital trends, and fostering a culture of digital agility and customer centricity are all ways to get a competitive edge in DT (Khanom, 2023).

4. Governance and Management: Stakeholder Engagement, Resource Allocation, and Risk Mitigation

The success of DT is largely dependent on governance and administration (ElMassah, S.; Mohieldin, 2020). Stakeholder engagement is the process by which stakeholders actively participate in the change process. This covers workers, clients, vendors, and other associated parties. By involving stakeholders, organisations may solve issues, obtain insightful information, and develop a common transformation vision. Allocating resources is yet another crucial aspect of management and administration. DT frequently necessitates large expenditures for process change, people acquisition, training, and technological infrastructure. Identifying and ranking the resources required for successful transformation, as well as making sure they are available and used appropriately, are all part of effective resource allocation. In DT, risk mitigation is an essential component of governance. This procedure entails finding possible hazards and creating plans to lessen their effects. Technical difficulties, security risks, opposition to change, and problems with regulatory compliance are examples of risks. Organisations may ensure a seamless transition process by anticipating and addressing any impediments via proactive risk assessment and mitigation planning. Strong risk mitigation techniques, effective resource allocation, and active stakeholder involvement are all necessary for DT governance and management (George et al., 2022). Organisations can improve their chances of attaining excellent DT results by taking a thorough approach to these areas.

5. Resources and Support for Successful Implementation

Careful preparation, implementation, and continuous support are necessary for a DT to be effective. Driving DT will need assembling a team of people with a variety of abilities and knowledge in fields including technology, project management, change management, and data analytics. Assessing the present situation, defining a change roadmap, and offering assistance during the implementation process may all be accomplished by hiring seasoned consultants with expertise in DT to offer advice, best practices, and strategic insights (Zaoui and Souissi, 2020). Employee communication and information exchange are made easier by the use of collaboration tools and platforms. Access to the most recent technological advancements may also be ensured by working with technology suppliers and partners that can offer technical know-how, assistance, and creative solutions. Organisations may enhance customer experiences, company development, efficiency, and the probability of successful DT by implementing resources and support systems (Camarinha-Matos et al., 2019).

6. Sustainability Goals in Digital Transformation Initiatives

Organisations may accomplish a number of goals by including sustainability into their digital strategy. Resource optimisation and energy efficiency can be made possible via DT activities. Businesses may lower energy consumption, decrease waste, use less paper, and speed operations by using digital tools and technology. This reduces the impact on the environment and saves money. Utilising renewable energy sources is a top priority for sustainable DT initiatives. Greenhouse gas emissions can also be decreased by using virtualisation, cloud computing, and data centers that run on renewable energy (Hoosain et al., 2023). By promoting remote work and virtual collaboration, DT will lower carbon emissions associated with travel and promote a more environmentally friendly workplace. Organisations may implement eco-friendly practices, maximise resource utilisation, lessen their influence on the environment, and contribute to a more sustainable future by including sustainability goals into DT initiatives.

IV. Conclusions

The sustainable adoption of cutting-edge digital technology in digital transformations and its effects on organisations are examined in this study. The analysis's findings showed that the integration of DT and sustainability principles has a beneficial impact on the transformation's efficiency, which can be assessed using economic, social, and environmental performance metrics. The results of the study showed that organisations' long-term sustainability outcomes are improved when DT objectives are in line with SDGs. According to the study, digital solutions that prioritise sustainability provide businesses a competitive edge. Effective governance improves stakeholder involvement, resource allocation, and risk mitigation for successful implementation and results, according to the analysis of sustainable adoption in DT projects. Prioritising a thorough digital transformation business case with sustainability advantages and multidimensional returns enhances resources

and support for effective implementation, according to the study's findings. According to the study's findings, adopting cutting-edge digital technology with strong integration, change management techniques, and stakeholder participation greatly helps DT efforts achieve their sustainability objectives. The study highlights the importance of strategic resource allocation and risk mitigation techniques, as well as the role that stakeholder participation plays in fostering successful DT.

Limitations and Future Directions

Future research can enhance results by addressing certain constraints in addition to the contribution of this work. Future research might integrate quantitative and qualitative research methodologies for better research outcomes because this study's predominantly quantitative approach is insufficient to empirically substantiate its conclusions. The importance of a company's DT was discussed in detail in this research, but it did not address the challenges that come up during this process, such as internal resistance to change, a lack of organisational change management plan, and a lack of expertise. Thus, these problems might be the focus of future research.

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