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Digital Transformation and ESG Performance in Sustainable Food Production: The Mediating Role of Green Innovation and Organizational Agility

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Abstract

The purpose of the study is to examine the digital transformation on ESG performance in the food production sector, through green innovation, organizational agility, and sustainable food production. The study aims to explore the influence of digital transformation on environmental, Social, and Governance outcomes. The study assessed the influence of digital transformation on ESG performance through green innovation and organizational agility using primary data collected from the academician and industry practitioners within the food manufacturing sector. The study results indicate that digital transformation could enhance the ESG performance through green innovation, organizational agility, and sustainable food production. The study provided an empirical framework linking the constructs and provide a practical insight for food production firms and policymakers to utilize digital transformation for sustainable production and enhance ESG outcomes.

1. Introduction

The advancement of technology and digitalization has transformed (February et al., 2025) the way organizations operate, compete, and create sustainable value (Gan, 2025). The Digital technologies have revolutionized the way organization’s function, compete, and generate sustainable value. The AI technologies have helped organisations to optimize their operations, make better decisions and improve resource efficiency (Bharadwaj, 2000; Dubey et al., 2019). Digital transformation has therefore grown beyond being a mere technology adoption to a strategic capacity for innovation, operational excellence and sustainability (Bendig et al., 2018). Recent research indicates that digital transformation can improve organizations' capabilities, including real-time monitoring, process automation, stakeholder collaboration, and the data-driven decision-making aspects leads to better sustainability results and competitiveness (Brynjolfsson and McElheran, 2016). Despite the growth of investment in digital technologies, however, organizations still struggle to convert digitalization capacities into tangible sustainability performance, especially in emerging economies where institutions actively support sustainability and sustainability practices are less developed (Aschehoug, Boks and Støren, 2012).

Alongside this, ESG performance has evolved into a critical measure for assessing a company's sustainability performance and for a long-term success (Zhang et al., 2024). The CSR, environmental responsibility, and good governance are now a part of mainstream business practices in enterprises and part of the expectations of various stakeholders, including governments, investors, consumers, and regulatory bodies (Lo and Kwan, 2017; Miralles-Quirós, Miralles-Quirós and Gonçalves, 2018). The ESG performance is considered as a compliance metric, but rather a part of a company's strategy for resilience, trust, and sustainable competitive advantage (Lu et al., 2016). However, some new data shows that despite this, a lot of companies, especially in developing countries, are still not performing well on all three pillars – governance, environmental, and social – though they are doing well on governance (Baraibar-Diez, Odriozola and Fernández Sánchez, 2019). These differences have created anxiety over the efficacy of ESG efforts and how truly impactful they are when it comes to helping meet

sustainable development goals, as opposed to merely meeting reporting obligations (Aravind and Shashidhar, 2020).

This is in the context where food manufacturing industry as a key sectors for sustainable development (Heidari et al., 2026; Kanter et al., 2026). With the escalating food demand via Urbanization and Population growth, the food production are under increasing pressure to produce food efficiently and sustainably while minimizing the damage to the environment (Bulambo, de Clerck and Lassois, 2026). Food production is an energy, water and raw material intensive process that generates high levels of GHGs, food waste and packaging waste (Al-Nasrawi, Sadiq and Al-Khazraji, 2026; Yin et al., 2026). For this reason, sustainable food production is a government to meet the United Nations & SDGs (Vishnu et al., 2026; Ziegler-Rodriguez et al., 2026). The opportunities with digitalization are vast in the area of sustainable food production, including: precision manufacturing, intelligent use of resources, traceability of the food supply chain, predictive maintenance, minimization of waste, and efficient use of energy, water & technology (Aschehoug, Boks and Støren, 2012; Nandi et al., 2021; Heidari et al., 2026; Zhu et al., 2026). The use of technological capabilities in production in an environmentally responsible manner, and at the same time they can enhance the operational efficiency and competitiveness of organizations (Li et al., 2026; Nakamoto et al., 2026; Pimenta-Alonso et al., 2026).

Although digital transformation is known to have a significant impact, prior studies offer conflicting findings on its effects on sustainability performance (Dubey et al., 2019; Wei, Bakumenko and Zhang, 2026). Some, studies found that digital transformation is strongly correlated with the ESG performance. Meanwhile, other studies stated that the technology investment cannot produce sustainable results to support a proper organizational enhancement and innovation processes (Chen et al., 2021; Cho et al., 2021). The result was a lack of consistency, indicating that the digital transformation–ESG performance relationship is more complex than initially thought and can be explained by the mediation mechanism of organizational mechanisms (Zamani et al., 2026; Q. Zhao et al., 2026).

The development of green-innovation assumes special importance as one of these mechanisms in which the organizations are able to create environmentally friendly products, processes and technologies that will decrease resource consumption and environmental degradation. Digital technologies enable knowledge transfer, process optimisation and co-innovation, which boost green innovation processes. Likewise, in the context of organizational-agility, companies could quickly adjust to shifts in the market, environmental laws and regulations, and stakeholder demands, thereby fostering flexibility, responsiveness, and adaptability in decision-making (Brynjolfsson and McElheran, 2016). Dynamic capability scholars suggest that more agile organizations restructure resources and successfully incorporate digital technologies into sustainable business practices (Zhong, Tang and Albitar, 2026). Green innovation and organizational agility are crucial avenues for achieving sustainability impacts from digital transformation.

While prior research studies relationships at individual a little research that brings together these constructs in an empirical context. In addition, there has been little research on the mediation effect of

sustainable food production in relationship between the digital transformation and better ESG-performance (Capelle-Blancard and Petit, 2017; Lokuwaduge and Heenetigala, 2017). Scientific studies have mainly concentrated on the performance of the manufacturing sector as a whole or on financial and operational performance; few empirical studies have been conducted in the food sector (Chelawat and Trivedi, 2016; Broadstock et al., 2019). With sustainability issues gaining a lot of momentum in the food industry, it is imperative to explore how digital skills can contribute to sustainable production methods and, eventually, to environmentally, socially and governance (ESG) performance (Velte, 2016; Crespi and Migliavacca, 2020; Rajesh and Rajendran, 2020).

Based on the Resource Based View theory (Manani et al., 2013) and Dynamic Capability Theory, study proposes the conceptual framework of DCT and RBV integrated (Teece, Pisano and Shuen, 1997a; Nandi et al., 2021). The conceptual framework is based on the Resource Based View theory and Dynamic Capability Theory (DCT) and proposes an integrated conceptual framework in which digital-transformation influences ESG-performance through the mediating role of green innovation, organizational agility, and sustainable food production (Fernando, Shaharudin and Abideen, 2023). The study empirically explores these relationships in the food manufacturing industry, aiming to advance existing literature on the digital-transformation, the sustainability and offer practical insights for managers (Pebruary et al., 2025) and policy makers (Dasuki, 2021; Nandi et al., 2021; Chaudhuri, Subramanian and Dora, 2022). The results will enable food production companies to use digital technologies to improve their green innovation, organisational agility, sustainable food production and performance on ESG (environmental, social, and governance) measures to increase their competitiveness and support their sustainable development goals and objectives (Peteraf, 1993; Coppola, Vollero and Siano, 2023).

2. Literature Review

In the world of corporate strategy, digital transformation (DT) stands out as a key area defining the competitiveness, innovation, and sustainability of organizations in industries. While technology has been used in the past as a way to make things run more efficiently, digital transformation isn't just about putting technology in place. It is a holistic organizational change that encompasses the embedding of digital technologies in organizational processes, organizational structures, decision-making procedures and value creation processes. Digital transformation is not just about the technology but about a new business model, fostering digital skills and building an adaptive organizational culture that adapts to the changing nature of the market. Thus, digital transformation is becoming a key strategy for organizations to remain competitive in digital economy.

Digital transformation has undergone significant change in the past 10 years. Digital transformation has been looked at as a mere introduction of information systems and automation technologies to boost efficiency in operations in earlier studies. The term digital transformation has been redefined by recent research as an organizational capability that brings together a range of digital technologies as well as strategic, organizational and managerial processes to generate sustainable value. This is further

mentioned in contemporary literature in that digital-transformation as an organizational event that involves continuous learning, innovative ways of reconfiguring resources. The wider scope of the study connects the concept model on digital transformation to strategic management theories, which outline on how organizations can gain a competitive advantage in use of a technological and organizational resources.

The Resource Based View on digital transformation sees it as a strategic organizational resource which allows firms to increase their capacity for valuable, rare, difficult-to-imitate, and organizationally embedded capabilities (Wernerfelt, 1984; Mahoney and Pandian, 1992; Peteraf, 1993). However, RBV argues that technological resources are not enough to create competitive advantage (Peteraf, 1993; Barney, 2001). Rather, competitive advantage occurs when organizations integrate digital technologies with complementary organizational resources, managerial skills and knowledge-based skills (Wright, Dunford and Snell, 2001; Connor, 2002; Helfat and Peteraf, 2003). The Dynamic Capability Theory (DCT) is an extension, which suggests that businesses exist in a dynamic environment, where it need to be constantly monitored new opportunities, identify new technologies, and adjust their internal resources to stay competitive (Fernando, Shaharudin and Abideen, 2023). Digital-transformation is thus considered to empowers businesses to be agile and respond quickly to environmental uncertainty, while at the same time improving their innovation, agility and sustainability results (Fernando, Shaharudin and Abideen, 2023).

Empirical research in recent years is increasingly showing that digital transformation has a positive influence on organizational outcomes with operational efficiency (Al-Nasrawi, Sadiq and Al-Khazraji, 2026; Kanter et al., 2026), innovation capability, supply chain resilience, sustainability performance and environmental performance (Aamer et al., 2026; Abbasi, 2026; Abdel-Wareth et al., 2026). Digital technologies for companies to integrate data collection, predictive analytics, intelligent decision-making and communication between different organizational functions, allowing them to use their resources efficiently and be more responsive to market dynamics (Barney, Wright and Ketchen Jr, 2001). Moreover, DT improves the collaboration between various departments within the organization as well as with external parties, which means that it creates opportunities for organizational learning and speedy innovation cycles (Nickell, 1981; Freeman, 1984; Teece, Pisano and Shuen, 1997a). Despite this, researchers have repeatedly pointed out that the advantage of digital transformation goes beyond technology adoption—firms need to build the proper managerial and innovation capacities to achieve the value of digital investments (Chisholm, 1995; Pretty, 1999; Pujari, Wright and Peattie, 2003; Tumusiime and Matotay, 2014).

The food manufacturing sector has been gaining traction in the food industry's digital transformation, as it grapples with major challenges regarding sustainability and operations (Adams, 1990; Tharmabalan et al., 2025; Vittis et al., 2025). Food manufacturers have to deal with the issue of food safety and product traceability, the need to conserve resources, to conform to regulations, to reduce waste, and to cater to the rising demand for eco-friendly products (Stefanovic, 2022; Vasilescu et al., 2022; Wekeza, Sibanda and Nhundu, 2022; Winters, Crisman and Dumke, 2022). Leveraging digital technologies like IoT

connected sensors, AI for quality checks, blockchain track-and-trace systems, robotics, and predictive analytics helps companies gain real-time visibility of production processes, which decreases production waste, optimizes energy and water use, and increases supply chain transparency (Pellegrini et al., 2020; Pelletier et al., 2020; Perciun, Amarfii-Railean and Nataliia, 2020). Beyond increasing the efficiency of operations, these technologies help achieve sustainable food production by reducing environmental footprint and product quality. But these advantages are not always realized in food production due to cost, a lack of digital skills, production processes that are a legacy holdover, and the resistance of organizations to change (Donner and Radić, 2021; Drexler, 2021).

While the literature is aware of the strategic value of Digital Transformation, the study identified gaps in the academic literature. Firstly, most empirical research focuses on relationships with organizational performance, innovation or operational efficiency, and less research has examined its role in food manufacturing sustainability outcomes (Zhang et al., 2024; Gan, 2025; Pimenta-Alonso et al., 2026). The study tend to view its impact with respect to digital transformation as an independent variable of organizational performance rather than a variable that explains how digital capabilities have a sustainable impact on organizational performance (Perciun, Amarfii-Railean and Nataliia, 2020; F. Zhao et al., 2026; Yan, Chen and Lin, 2026; Zhou et al., 2026). Thirdly, there is limited research on DT integration with green innovation, organizational agility, sustainable food production, and ESG performance especially in emerging economies (Christensen, Serafeim and Sikochi, 2022; Liu, Wang and Fang, 2024; Xu, Wang and Chen, 2024). As such, a framework that captures the development of organizational capabilities through digital transformation, which then drive sustainability performance, is needed (George, Merrill and Schillebeeckx, 2021; Chen and Hao, 2022; Wang, Cao and Wang, 2022).

Based on these observations, the study builds a concept on digital transformation as the strategic capability which acts as a catalyst for generating organizational capability (Wamba et al., 2017). In particular, digital transformation is expected to support green innovation by providing environmentally friendly technological solutions, and to boost organizational agility by increasing the speed-of-firms reaction to the changes of environmental and market conditions (Adams et al., 2016; Herremans, Nazari and Mahmoudian, 2016). These capabilities are then envisioned to enhance sustainable food production and environmental performance. So, the mechanisms of value for sustainability as a result of digital transformation. Based on the following aspects the study proposed the following hypothesis.

H1: Digital Transformation has significant influence on green innovation.

H2: Digital Transformation has significant influence on Organizational Agility.

H3: Digital Transformation has significant influence on Sustainable Food Production.

H4: Digital Transformation has significant influence on ESG performance.

2.1 Green Innovation and Organizational Agility as Strategic Organizational Capabilities

In growing attention on environmental pressures, technological change and changing stakeholder expectations (Herremans, Nazari and Mahmoudian, 2016; Darsono et al., 2026), green innovation and organizational agility have become two complementary strategic capabilities that can help organizations to effectively respond (Bjerkan, Sund and Nordtømme, 2014). Organizations are expected to use the latest digital technologies and to build organizational competence that turns technology investment into long-term business results, in the age of digital-transformation (Zheng et al., 2026). Although both themes share an interest in green innovation that involves creating environmentally sustainable products (Qiu, Gao and Song, 2025), processes and managerial practices, organizational agility is about an organisation's capacity to respond and adapt to dynamic-market conditions quickly (Su and Hu, 2025). These capabilities improve the overall resilience of the organization, the efficiency of its operations and the sustainability performance (Yifan, 2023), which is critical for its long-term competitive-advantage in manufacturing sectors, especially the food manufacturing sector (Yin, Wen and Chang, 2023).

Green-innovation is an evolution and application to environmental friendly products, production-processes technologies and management practices (Usman et al., 2026), which reduce the environmental impacts on organization and increase in its performance (Kleimann et al., 2023). The Green-innovation is different from traditional one, in which the environment gets more considerations in the innovation process (Partzsch, 2023; Irfan et al., 2024), such as cleaner production, waste reduction, energy saving, sustainable product design and resource optimization (Chen, Liao and Tan, 2024; Yang, Zheng and Wu, 2024). Green innovation is more than just a compliance exercise; it's a strategic tool that enables companies to gain a competitive edge in a sustainable fashion as regulations tighten and the awareness of the value of sustainability grows (Lewis, 2017). The studies have highlighted the importance of green innovation for the benefit of firms to lower the operating costs, optimise the use of resources, improve their corporate image and boost environmental performance (Shin et al., 2018; Yang, Zheng and Wu, 2024; ‘The ecosystem: Financing, actors, and tools’, 2026). In addition, digital technologies like AI, IoT (Al-Nasrawi, Sadiq and Al-Khazraji, 2026), to facilitates the real-time monitoring these intelligence of environmental conditions, data-driven decision making, to acceleration green-innovation (Kleimann et al., 2023; Irfan et al., 2024; Yang, Zheng and Wu, 2024).

Green innovation is complemented by organizational agility and defined as “the ability to anticipate and adapt quickly to changes within and outside the organization” (Xiao, 2017; Galbreath, 2019; Veugelers, 2026). Organizational agility defined as an organizations ability to relocate resources, processes, and competencies results in shifting demands of customers, technological innovations, market volatility, and uncertainty in the environment, based on the DCTs (Teece, Pisano and Shuen, 1997b). The Organizational agility involves not just operational flexibility but also agility, decision-making, cross-functional agility, and organizational learning (Ismail and Aldous, 2024; Liu, Wang and Fang, 2024). The changes brought by digital transformation have been emphasized in recent literature as a way to enhance organizational agility through better information processing, communication, process integration and decision support systems (Pretty, 1999; Gandhi, Aggarwal and Sasindaran, 2016; Zhang and Kanagaretnam, 2026). In turn, an agile organization can take the most advantage of new

opportunities, control risks and execute sustainability efforts more efficiently than less agile ones (Chen, 2008; Chang, 2011; Dzingirai and Dzapasi, 2025; Walz and Eichhammer, 2026).

From a business perspective, the concepts such as green-innovation and organizational agility were studied separately, but recent research indicates that these two are two very complementary organizational capabilities (O'Brien et al., 2014; Midttun and Witoszek, 2015). Meanwhile, green innovation can help companies develop environmentally friendly products and processes. The organizational agility allows companies to adapt and continuously improve their innovations in response to shifting market conditions. Commercializing green innovations and adapting to environmental regulations could be a challenge for companies with high green innovation capability but low organizational agility (Brand and Wissen, 2020; Fu and Wang, 2020). On the other hand, highly agile firms with inadequate innovation capabilities can react promptly to market variations but cannot achieve the long-term goals for sustainability. Thus, the combination of innovation capability and organizational agility has a synergy effect, improving the organizational resilience and sustainable operational performance. It aligned with RBV and the Dynamic Capability Theory that suggest that SCA is result of integration with valuable resources and the adaptability of the organization, not simply the ability to do one independently (Vargas-Hernandez et al., 2025; Tchórzewska, 2026).

In the food sector, the adoption of green-innovation and the organization's agility has gained greater significance as the sector faces challenges such as strict food safety standards, limited resources, evolving consumer preferences, and environmental risks arising from climate change, among others, all of which are driving a growing demand in sustainable products (Abubakar *et al.*, 2022; Rahmawati and Rosadi, 2026). Digital technologies can be used to support food manufacturers to adopt green production methods like energy efficiency in food processing, sustainable packaging, vaporization of food waste, precision manufacturing and traceability in the supply chain. But these achievements also rely on things like organisational agility, which allows companies to fine-tune their production processes quickly, adjust to new regulations and integrate new technology into the daily workflow (Maharramli, 2016; Mukhtarova, Trifilova and Zhidebekkyzy, 2016; Bendell, 2017; Erdmenger, 2017; Zhang and Hu, 2026). As a result, the organizations that have both green innovation and organizational agility have a higher chance in achieving sustainable food production and in terms of environmental and organizational performance (Brears, 2017, 2023; Stefanovic, 2022; Chen et al., 2026).

Though, the increasing number of publications, there are still some gaps in the research. It's been largely dedicated to study green innovation and organizational agility as separate issues, and mostly to the respective impact of these on the organization's performance or competitiveness (Garbade, Fortuin and (Onno)Omta, 2012; Vasilescu et al., 2022). Much less has been done to understand how these two capabilities can work together to enable sustainable food production in digitally transforming organizations. Moreover, empirical evidence on the food manufacturing sector is still scarce, especially in emerging economies like India. The present study proposes to view green innovation and organizational agility as complementary organizational capabilities that can support sustainable food production by digital transformation, and consequently, in improving the environmental performance.

This holistic view complements current sustainability literature by providing an understanding of the mechanisms for building capabilities that enable digital transformation to deliver environmental results. Based on the existing literature the study proposed Fig. 1: Conceptual Model.

H5: Green Innovation has significant influence on Sustainable Food Production.

H6: Organizational Agility has significant influence on Sustainable Food Production.

H7: Green Innovation has significant influence on Organizational Agility.

Insert here Fig. 1: **Conceptual Model.**

2.2 Sustainable Food Production

As the global food demand grows, the population keeps increasing, the climate changes, and natural resources are dwindling, sustainable food production has been a main concern of governments, industries and researchers (Wang and Xie, 2026; Wang et al., 2026). The FAO known as (Food and Agriculture Organization) defines sustainable food production (SFP) as a food production system with food security and nutrition for people and ecosystems while preserving natural resources for future generations and ensuring economic viability (Fu and Wang, 2020). In contrast to traditional agriculture, which focuses mainly on productivity and profitability, sustainable food production is more comprehensive, incorporating social, environmental and economic sustainability into the entire food value chain (Chaudhuri, Subramanian and Dora, 2022; Roukos et al., 2026). It has thus become a key element of sustainable development and of achieving the UN & SDGs, in particular SDG 2, SDG 12 and SDG 13 (Vishnu et al., 2026).

The food manufacturing sector is one of the largest economic activity sectors and also demanding energy, water and raw material users in the world (Nocoń, 2026). Food production can be seen to be a significant emitter of greenhouse gases, a significant consumer of water resources, a significant contributor to food waste, a significant contributor to packaging waste and a significant contributor to environmental damage (Roy, 2019; Pavlova et al., 2026). The food production sector is facing increasing pressure to adopt sustainable food production methods that reduce impact on environment, maintain product quality and standards, boost operational-efficiency, and ensure long-term profitability, as environmental regulations become stricter and consumers are aware of importance of sustainability (Kanter et al., 2026). Sustainable food production thus involves different practices such as resource-efficient production, waste minimization, use of renewable energy, sustainable raw material sourcing, sustainable packaging, circular production systems, responsible water and energy management, etc (Pellegrini et al., 2020; Hammed and Sridhar, 2021; Yin et al., 2026).

Digital transformation has driven the shift towards sustainable food production by helping organisations implement high-tech solutions to improve the efficiency of food production processes (Fernando and Wah, 2019; Islam and Hossain, 2020; Hammed and Sridhar, 2021). These technologies enable on-the-fly monitoring of production processes, predictive maintenance, smart quality control and traceability for

the supply chain, as well as data-based resource management. As a result, organisations can minimize production waste, optimize their use of resources, improve food safety, and boost operational efficiency. The adoption of technologies is not alone sufficient, however, to achieve sustainable food production, as the development of organizational capabilities, including green innovation and organizational agility, are essential to effectively embed digital technologies into sustainable food production systems (Bulambo, de Clerck and Lassois, 2026).

Theoretically, the RBV theory implies that sustainable food production is a strategic organizational competence that is created through the ability to integrate technical resources (technology), managerial resources (management), and environmental resources (environmental) together in a good way (Barney, 2001; Münch, Benz and Hartmann, 2022; Coppola, Vollero and Siano, 2023). To be sure, Dynamic Capability Theory (DCT) holds that organizations in fast-changing markets have to continually modify their production routines and restructure their organizational assets to meet changing regulatory demands, environmental challenges, and consumer tastes (Kunc, Barnabè and Giorgino, 2020; Münch, Benz and Hartmann, 2022; Coppola, Vollero and Siano, 2023). Companies with high innovation potential and agility can thus be able to adopt sustainable production methods and gain competitiveness in the long term.

Several studies have studied sustainable manufacturing and sustainable supply chain management, but there are few empirical studies that specifically investigate sustainable food production (Roukos et al., 2026). Previous studies have focused on environmental management practices, food safety and operational efficiency, whereas few have studied how organizational mechanisms support sustainable food production in the digital transformation field (Chen, Lai and Wen, 2006; Pujari, 2006; Hoffmann, 2007; Jackson, 2008; Harrison, Bosse and Phillips, 2010). Specifically, there has not been enough focus on the understanding of how green innovation and organizational agility work together to enable the production of sustainable food and then how they can contribute to improved environmental performance. Additionally, there are limited data sources for food manufacturers in emerging markets. The present study addresses these gaps and places sustainable food production as one of the most important operational capabilities that will be possible thanks to digital transformation and the use of green-innovation & organizational-agility to improve environmental performance (Chen, Lai and Wen, 2006; Pujari, 2006; Shin et al., 2018; Abubakar *et al.*, 2022; Darsono et al., 2026). This integrated view adds to literature on digital-sustainability by helping to understand the translation of organizational capabilities to technological investments and sustainable production results (Jackson, 2008; Aschehoug, Boks and Støren, 2012; Abbasi, 2026).

H7: Sustainable Food Production has a significant influence on ESG performance.

2.3 ESG Performance

ESG performance is now a cornerstone of measuring the efforts of an organisation towards sustainable development and responsible business practices (Chelawat and Trivedi, 2016; Esser, 2025). Meanwhile, the ESG transformed from a voluntary project to a strategic-performance tool that could help companies

to ensure economic growth while also taking into account environmental stewardship and effective governance (Xiao, 2017; Usman et al., 2026). The growing emphasis on ESG principles by investors, regulators, consumers, and stakeholders has forced firms to incorporate ESG. The ESG factors to their corporate strategies, enhancing transparency, accountability, and long-term value creation (Maubane, Prinsloo and Van Rooyen, 2014; Aboud and Diab, 2018). This examines how the companies to managing risks, social-impact, and the governance practices (Aravind and Shashidhar, 2020; Quatrini, 2021).

The environmental aspect of ESG is concerned with how an organization can reduce its environmental impact through its efficient use of resources, lowering greenhouse gas emissions, waste management, pollution prevention, use of renewable energy and the conservation of biodiversity (Yin et al., 2026). The social aspect focuses on employee welfare, OH&S, community, customer satisfaction, human rights, and diversity and inclusion (Drexler, 2021). Governance performance is a measure of organizational leadership, ethical conduct of business, adherence to regulation, board effectiveness, transparency, risk management and stakeholder accountability (De Lucia, Pazienza and Bartlett, 2020). As a whole, these three dimensions offer an integrated approach to measure the sustainability performance and its impact on long-term societal & environmental (Roy, 2019; Benz-Saliasi, 2020; Bui, Houqe and Zaman, 2021).

ESG performance has become a major consideration in the food manufacturing sector in recent years because of growing environmental concerns, shifting consumer tastes, and enforcing rules and regulations (Himick, 2011; Beckmann, Hielscher and Pies, 2014; Ilgaz and Zademach, 2015). The food manufacturing sector uses significant amounts of energy, water and raw material and produces GHGs, food waste, wastewater and packaging waste (Caldeira dos Santos and Pereira, 2022). The companies are expected to adopt SPF methods that will minimize environmental impacts, maintain food safety, improve product quality and ethics in the business (Stubbs and Rogers, 2013; Semenova and Hassel, 2015). Firms with a good rating on the ESG score have been the focus of the study, and these have been shown to promote a positive corporate image, increased stakeholder trust, improved operational efficiency, increased investor confidence and sustainable competitive advantages (Freeman, 1984; Darsono et al., 2026). Consequently, food companies are now increasingly prioritizing ESG performance as a key strategic goal to meet growing consumer demands for sustainability (Aschehoug, Boks and Støren, 2012; Maubane, Prinsloo and Van Rooyen, 2014).

A major asset in the journey to ESG performance has been digital transformation and its ability to give organisations access to cutting-edge technologies which enable predictive analytics, intelligent decision making and transparent reporting (Ramirez et al., 2022; Al-Nasrawi, Sadiq and Al-Khazraji, 2026). The AI, IoT, blockchain & big data technologies support companies to better manage resources, enhance supply chain traceability, track environmental indicators and analyze data for decision making and governance (Słoński and Ligus, 2019; Alsayegh, Rahman and Homayoun, 2020). However, recent research indicates digital-transformation on ESG performance is often indirect (Cupertino, Consolandi and Vercelli, 2019). Rather, digital technologies add value by enhancing the organizational capabilities, such as green innovation, organizational agility, sustainable operational practices, and others, which in turn support the achievement of better ESG results (Rajesh and Rajendran, 2020). This view is in line with the RBV and

DCT that suggests organisations could achieve sustainable competitive advantage by leveraging technological resources into valuable organizational capabilities that boost their long-term performance (Nandi et al., 2021; Chaudhuri, Subramanian and Dora, 2022).

Sustainable food production is of special importance for improving the ESG performance as it directly meets several environmental and social goals (Luque-Vílchez et al., 2023). The sustainable sourcing, waste minimization, & resource efficient manufacturing, companies can lessen their environmental impact, enhance their operational efficiency, and boost stakeholder satisfaction (Su and Chen, 2020; Lee, Kim and Cho, 2024). Moreover, green innovation and organizational agility of organizations with successful implementation in sustainable production practices, which improves overall ESG performance (Naqvi and Nair, 2026; Siddiqui and Sareen, 2026).

The field of ESG is growing increasingly vast, yet there are a number of research gaps. The existing literature has mostly addressed the cost and benefits of ESG reporting, corporate governance, or sustainability disclosure and, in comparison, fewer studies have examined the ways in which organizations can implement superior ESG performance (Galbreath, 2013; Aboud and Diab, 2018; Bose, Dong and Simpson, 2019). To date, empirical studies that combine digital transformation, green innovation, organizational agility, sustainable food production and ESG performance into one framework are still limited, particularly in the food manufacturing industry in emerging economies (Girerd-Potin, Jimenez-Garcès and Louvet, 2014; Jyoti and Khanna, 2021). Furthermore, the role of sustainable food production in the transformation of organizations into a measurable ESG outcome through digitalization has hardly been explored. The present study fills these gaps and proposes that green innovation, organizational agility, and sustainable food production are complementary mediators between DT and ESG-performance, with the former being the ultimate organizational outcome (Katsamakas, Miliaresis and Pavlov, 2022; Barykin et al., 2023). Thus study, builds on existing literature in digital sustainability & offers a comprehensive view of how food manufacturing companies can use digital tools to attain long-term ESG excellence.

3. Research Methodology

The study relied upon the quantitative, cross-sectional research methodology to access how digital-transformation affects ESG performance while using green-innovation, organizational agility, and sustainable food production as mediating variables in the food manufacturing industry. The study designed conceptual model based on the RBV and DCT, which suggest that digital transformation boosts the capabilities of organizations to operate more sustainably and improve ESG performance. A survey-based approach is deemed suitable, as it allows for the gathering of uniform data on digital initiatives and sustainability practices from managerial personnel in charge of these.

The target population includes food manufacturing companies such as the dairy industry, beverage manufacturing companies, processed food manufacturing companies, bakery manufacturing companies, edible oil manufacturing companies and the packaged food manufacturing companies. The

study collected its response from production managers, operations managers, supply chain managers, sustainability managers, ESG managers, plant managers, quality assurance managers and digital transformation managers with sufficient understanding of their organisation's digital transformation and with its' sustainability initiatives. The study utilized purposive sampling technique will be used to be sure to approach respondents with relevant expertise. The questionnaire will contain constructs that capture various aspects of digital transformation, green innovation, organizational agility, sustainable food production, and ESG performance, all on a five-point Likert scale. The study collected a total of 324 responses from the managers across various food production industries.

3.1 Construct Model Reliability and Validity Assessment

To measurement the construct model was tested using SmartPLS 4.0 PLS algorithm using indicator reliability (Khan et al., 2019), internal consistency reliability, and convergent validity (Shiau, Sarstedt and Hair, 2019). The results showed that all indicators had outer loadings that were higher than the recommended value of 0.70, ranging from 0.715 to 0.907, which indicated good indicator validity (Hair et al., 2012, 2019). The AVE ranged between 0.595 to 0.747 showing that all the constructs have more than 50% of variance explained by its indicators, confirming convergent validity (Shmueli et al., 2019). Moreover, the Composite Reliability values were between 0.854 and 0.898, and the Cronbach's alpha values were from 0.772 to 0.835 (Hair et al., 2013), which were all greater than the 0.70 cutoff for good internal consistency reliability (Hoc, Fong and Law, 2014) shown in the below Table no: 1; Reliability Assessment.

Insert here Table no: 1; Reliability Assessment

Likewise, the rho A values were between 0.776–0.840, which further indicate the construct reliability. The constructs had high convergent validity, with Sustainable Food Production being the highest (AVE = 0.747) and Green Innovation the lowest (AVE = 0.595), but still above the desired level (Sarstedt, Ringle and Hair, 2017). In general, the findings indicated that the measurement model has an acceptable reliability and also has a good convergent validity, meaning that the measurement scales are suitable to be used for further testing of the structural model and hypothesis (Zhao, Lynch and Chen, 2010).

The Heterotrait–Monotrait known as HTMT ratios to assess the discriminant validity of the measurement model. All the HTMT values are below the 0.90 recommended threshold and showed satisfactory discriminant validity among the constructs as shown in Table no: 2; Validity Assessment (Fornell and Larcker, 1981).

Insert here Table no: 2; Validity Assessment

The HTMT value of Sustainable Food Production and Organizational Agility has a relatively high value of 0.898, yet it is not beyond the acceptable level shown in the above Table no: 2; Validity Assessment. Overall, the findings indicate that the constructs are empirically separate and that each measure them

sufficiently, thus justifying the usage of the measurement model for further analysis of the structural model.

The R^2, adjusted R^2, Q^2predict, RMSE and MAE values are ustilized to evaluate the prediction accuracy of the structural model (Geisser, 1973). The findings show that Digitalization Factor (DF) has a very good level of explanatory power, with an R^2 of 55.6%, whereas Environmental Performance (E) has a moderate level with an R^2 of 0.337, and Innovation (I) and Management Innovation (MI) have a moderate level with R^2 values of 0.351 and 0.321 respectively (Geisser, 1975) in the below Table no: 3; Predictive Relevance.

Insert here Table no: 3; Predictive Relevance

All endogenous constructs show positive Q^2predict values ranging from 0.126 to 0.344, indicates that the constructs have a satisfactory predictive relevance (Brown and Hayes, 2008). Moreover, the low RMSE (0.815–0.942) and MAE (0.629–0.712) values point to minimum prediction errors (Arumugam, Antony and Linderman, 2016), which means the model proposed possesses a predictive capacity & is suitable for the explanation of endogenous constructs.

4. Analysis

4.1 Direct Assessment

The results of the construct model assessed using SmartPLS bootstrap with 5000 sub-samples, the Hypothesis H1, Digital-Transformation (DT) have a significant positive effect on Green Innovation (GI) ($\beta = 0.594$, $t = 16.770$, $p < 0.001$). This discovery validates the hypothesis that utilizing digital technologies improves the organizations' ability to create environmental sustainability for their products, processes and operational practices. Digital transformation has a relatively high path coefficient, indicating that it plays an important role in food manufacturing firms in terms of green innovation.

The direct relationship is found between Hypothesis H2, Digital Transformation and Sustainable Food Production (SFP, $\beta = -0.022$, $t = 0.546$, $p = 0.585$), which is statistically insignificant and negative. The p-value is greater than the accepted value of 0.05, so the hypothesis that there is a direct effect is rejected. This is a sign that digital transformation is not directly impacting sustainable food production. Its influence may rather be manifested in organizational skills and competencies, like 'green innovation' and 'organizational agility'.

Similarly Hypothesis H3, Digital Transformation also has a positive and statistically significant impact on the Organizational Agility (OA) ($\beta = 0.146$, $t = 2.190$, $p = 0.029$). The findings suggest that digital technologies investments improve the capacity of firms to rapidly adapt to market changes, operational disruptions, and sustainability issues, although the magnitude of the correlation is rather small.

The findings also show that Hypothesis H4, Sustainable Food Production is positively affected by Green Innovation ($\beta = 0.214$, $t = 4.585$, $p < 0.001$), meaning that the adoption of green innovations in

organizations is likely to improve sustainable production practices. Similarly, Hypothesis H5, Organizational Agility has a significant positive association with Sustainable Food Production (β = 0.613, t = 13.133, p < 0.001). This is the highest level of relationship in the model, indicating that the flexibility and responsiveness of organizations will be of key importance when it comes to sustainable food production shown in the below Table no: 4; Direct Assessment.

Insert here Table no: 4; Direct Assessment

Moreover, Hypothesis H6, Green Innovation has a significant positive effect on Organizational Agility (β = 0.487, t = 7.601, p < 0.001). The discovery indicates that companies that are adopting green innovation also gain in adaption capability, which allows them to better meet changing sustainability demands and a changing business landscape.

The Hypothesis H7, Sustainable Food Production and ESG Performance (EP) is also positively and significantly correlated (β = 0.451, t = 6.331, p < 0.001). The result confirms that companies that implement sustainable food production systems have better ESG Performance when they are more efficient in their use of resources, reduce waste, and produce food sustainably.

Finally, Hypothesis H8, Digital Transformation has a positive impact on ESG Performance (β = 0.218, t = 3.297, p = 0.001). This means that digital technologies have a direct and indirect impact on environmental improvement, via green innovation, organizational agility, and sustainable food production.

The results show that the relationship between DT and SFP is not significant, which implies that DT alone is not directly related to Sustainable Food Production. Rather, its effects are mainly mediated by Green Innovation and Organizational Agility, as the organizational capabilities that allow companies to achieve sustainable production results from digital investments. Organizational Agility has the highest coefficient of coefficient β = 0.613 among all relationships, indicating that the reaction speed to the changes in technology and environment is more significant than technology adoption per se in Sustainable Food Production. Secondly, the direct effect on ESG Performance of Digital Transformation is significant, implying that digital technologies have a direct impact on sustainability, as well as indirect through capability-building mechanisms. The results align with the theoretical arguments of the Resource-Based View (RBV) and Dynamic Capability Theory (DCT) in that digital resources add value as they become part of the capabilities of the organization, which in turn improve sustainable operational performance.

4.2 Indirect assessment

To test the indirect effects of digital transformation on sustainable food production and ESG Performance via the proposed mediating variables, a mediation analysis was performed using the SmartPLS 4.0 software with 5,000 bootstrap resample runs.

The findings revealed that Hypothesis H9, Green Innovation (GI) was found to be a significant mediator variable between Digital Transformation (DT) and Sustainable Food Production (SFP) (for β = 0.127, SE =

0.029, t = 4.399, p < 0.001). The indirect effect is positive and significant, indicating that digital transformation positively affects sustainable food production through the positive influence of green innovation. That is, firms using digital technologies are more likely to adopt environmentally-friendly products, processes and operations which, in turn, help to enhance sustainable food production. Thus, the mediation effect of green innovation is reinforced, suggesting that green innovation is a key channel by which digital transformation can help achieve sustainable production.

Similarly, Hypothesis H10, Organizational Agility (OA) a positive mediation in between Digital Transformation and Sustainable Food Production (β = 0.089, SE = 0.041, t = 2.204, p = 0.028). The indirect effect is less powerful than the green innovation effect, but still significant at a level of 1%. This discovery implies that digital transformation enhances an organization's to adapt swiftly to current trends, technological innovations, and sustainability issues, playing a significant role in sustainable food production. Thus, the organizational agility also plays a role in mediation shown in the below Table no: 5; Indirect Assessment.

Insert here Table no: 5; Indirect Assessment

On the other hand, the indirect effect of Hypothesis H11, Digital Transformation on ESG Performance (EP) via Sustainable Food Production (SFP) is negative and statistically insignificant (β = − 0.010, SE = 0.022, t = 0.537, p = 0.591). The proposed mediation effect is not supported since the bootstrap 95% confidence interval contains zero and the p-value is larger than 0.05. So, it appears that sustainable food production is not the key driver of the impact of digital transformation on ESG Performance. Rather, the digital transformation has a direct effect, or through other organizational capabilities, such as the green innovation and organizational agility, on ESG Performance.

The results of this mediation analysis indicate that overall, green innovation is the most contributing factor between digital transformation and sustainable food production, then organizational agility. The findings support the propositions of the RBV and DCT in that digital transformation does not only generate value by adopting the new technology but also by fostering organizational capabilities that help firms to sustain production practices. The lack of a significant indirect effect due to the sustainable production of food suggests, however, that efforts aimed at improving the sustainability of food production alone are unlikely to yield noticeable benefits for ESG Performance unless they are paralleled by other environmental management efforts and organizational innovations.

The findings indicate that, in your sample, the most important pathways that lead to better Sustainable Food Production via Digital Transformation are organizational capabilities (green innovation and organizational agility), with Sustainable Food Production itself not being a significant pathway (Appel and Richter, 2010).

5. Discussion

This study's results offer empirical evidence indicate that digital transformation (DT) on the capabilities of the organization as well as its sustainability outcomes in the food manufacturing sector. The findings confirm that digital transformation helps companies build strategic capabilities that lead to green innovation (GI) and organizational agility (OA) and eventually to sustainable food production and ESG performance, as per the RBV and DCT.

The results show that digital transformation has a positive effect on green-innovation ($\beta = 0.594$; $p < 0.001$). The discovery underscores the role played by digital technologies, such as artificial intelligence, cloud computing and the Internet of Things (IoT) in the creation of sustainable products, greener processes and in the efficient use of resources. This is consistent with recent research by Table no: 5; Indirect Assessment. which found that firms' innovation potential is improved and their technological integration fosters environmental sustainability when they embrace digital transformation. For RBV, digital technologies are valuable organizational tools that enhance the innovation capacity of the organization and give them a sustainable competitive advantage.

Digital transformation-organizational agility correlation is also positive ($\beta = 0.146$, $p = 0.029$), meaning that digital technologies increase the possibility of an organization reacting quickly to the evolving market and sustainability needs. This discovery is consistent with Dynamic Capability Theory that highlights the importance of organizations with a superior adaptive capacity to reconfigure their resources in presence of uncertainty. The same has been observed, stating that digital transformation increases the agility and flexibility of organizations.

But the direct association between Digital Transformation and food production sustainability was determined to be not-significant ($\beta = -0.022$, $p = 0.585$). The discovery indicates that using digital technologies is not enough to guarantee sustainable food production. However, it is crucial that complementary organizational abilities are created first, which allow them to leverage the digital technologies effectively. This is an observation that is in line with RBV and DCT which suggest that technological resources will only produce value if they are tied to organizational competencies. The lack of significance of the relationship also confirms recent sustainability studies, which have suggested that the adoption of technology is not enough for the achievement of sustainable production without supporting innovation and organizational capabilities.

The results indicate that green innovation has a significant effect on sustainable food production ($\beta = 0.214$, $p < 0.001$), which implies that green innovation in product and process innovation can lead to resource-efficient production, reduce waste, and deliver sustainable production. Similarly, the agility of the organization has been identified as having the greatest impact on sustainable food production ($\beta = 0.613$, $p < 0.001$), emphasizing the need for agility of decision making, flexibility in operation, and speed of response to implement sustainable food production systems. Further, the high significance of the green innovation-organizational agility relationship ($\beta = 0.487$, $p < 0.001$) justify organizations that are actively working on green innovation are also gaining agility, which helps them react to technological and environmental changes.

Additionally, the findings show that sustainable food production is definitely associated with a higher level of ESG performance ($\beta = 0.451$, $p < 0.001$), meaning that sustainable food production methods lead to better ESG results. Moreover, digital transformation directly positively influences ESG performance ($\beta = 0.218$, $p = 0.001$), which suggests that digital technology is effective in supporting sustainability efforts through increased transparency, efficiency in resources and governance.

The findings of mediation results indicate digital transformation and sustainable food production by green innovation is also significant ($\beta = 0.127$, $p < 0.001$), as is the mediation effect of organizational agility ($\beta = 0.089$, $p = 0.028$). These findings show that capability development is the main pathway to the benefits of digital transformation, rather than simple technology adoption. In contrast, the indirect effect of the digital transformation on ESG performance through sustainable food production was not significant ($\beta = -0.010$, $p = 0.591$), indicating that sustainable food production is not entirely accounted for the digital transformation on ESG performance. Other organisational mechanisms like governance practices, environmental management systems, stakeholder engagement and other sustainability strategies can also be important elements in bridging the gap between digital-transformation and better ESG performance.

Overall, the results built on the existing literature by identifying the issues of digital transformation, green innovation, organizational agility, sustainable food production, and ESG performance, under one empirical framework. The study adds value to RBV and Dynamic Capability Theory indicates digital transformation is created by complementing organizational capabilities, not just by introducing technology. The findings highlight that, for food manufacturers, any investments in digital technologies need to be complemented by a strategy that helps build innovation ecosystems and agility in the organization, to ensure sustainable production and long-term ESG performance.

6. Managerial & Practical Implications

6.1 Managerial Implications

The results have indicated several managerial implications for food manufacturing companies that want to make their business more sustainable and improve their ESG performance to become a digital company (Sun, Li and Xia, 2025; Wu et al., 2026). First, it identifies a negligible direct linkage between digital transformation and sustainable food production, indicating that such transformation is not enough for the sustainable production of food (Caveen et al., 2025; Chen et al., 2025). Instead, when (in addition to digital technologies) value is added by organizational skills, the capacities of green innovation and organizational agility. Managers might be willing to think of digital transformation as a strategic organizational investment instead of technology investment (Cupertino, Consolandi and Vercelli, 2019; Caldeira dos Santos and Pereira, 2022).

Second, organizations should focus on building green innovation capacity by promoting investments in green technologies, cleaner production processes, sustainable product development and resource-

saving production processes (Lee, Kim and Cho, 2024; Sun, Li and Xia, 2025). At the same time, companies need to develop organizational agility through flexible decision-making processes, cross-functional integration, learning and quick adjustment to market and regulation changes (Pujari, 2006). With these capabilities, organisations can successfully turn their investments in digital into lasting operational results.

Third, organizational agility has the most significant impact on sustainable food production, so organizational processes should be reconfigured to improve agility and operational resiliency (Naqvi and Nair, 2026; Wu et al., 2026). The use of real-time analytics, digital supply chain systems, and intelligent manufacturing technologies can boost production efficiency and lower waste and resource usage. Lastly, managers need to integrate ESG targets into their business strategies, set up measurable sustainability goals, use digital technologies to track environmental performance, and include ESG indicators in the framework of organisational performance assessment (Yap and Al-Mutairi, 2024; Chen, Hsu and Lin, 2025; Nasiyev et al., 2025). This will not only help boost stakeholder confidence, but will also enhance company reputation and create a sustainable competitive edge.

6.2 Practical Implications

The study suggest these implications for food manufacturing stakeholders including policy makers, industry practitioners, food technology providers and other food manufacturing actors. First, supportive policies that promote digital transformation and sustainable manufacturing need to be developed, and they could be based on financial incentives, tax relief, research grants, and investing in digital infrastructure (Katsamakas, Miliaresis and Pavlov, 2022; Ismail and Aldous, 2024). These can help to drive the uptake of cutting-edge digital technologies by food businesses, especially SMEs, that may lack financial and technological resources.

Second, industry associations and sustainability agencies can frame capacity building programmes, technical workshops and professional training programmes to build industry competencies in green innovation, digital technologies and agile management practices. Better skills and managerial capability of employees will support to the sustainable food production systems (Cho et al., 2021; Yin et al., 2023; Nijhawan et al., 2025).

Third, vendors and digital solution and service developers should develop a more comprehensive and integrated ecosystem that integrates AI, IoT, blockchain, and data analytics to help companies produce in a more environmentally friendly manner, trace products, optimize resources, and monitor ESG. Accessible and user-friendly digital solutions specific to the needs of food manufacturers can speed up technology uptake and enhance sustainability performance (Luque-Vílchez et al., 2023; Caveen et al., 2025).

Lastly, investors and regulators can leverage the results to incentivize organizations to improve their ESG practices by supporting a uniform sustainability reporting standards, open tools for measuring ESG performance. Comprehensive monitoring systems that incorporate ESG indicators into the regular

decision-making process of companies are essential to enhance sustainable food production, which is a key element of their ESG performance. These government-industry-technology-business partnerships to building as resilient, digital and sustainable food manufacturing industry shown below Table no: 6; Practical vs Managerial Implications.

Insert here Table no: 6; Practical vs Managerial Implications

6.3 Limitations and Future Suggestions

This following study has few limitations and this limit its contributions both theoretically and practically. The study used a cross-sectional-design that measures the perceptions of organizations. Furthermore, the result of this measure of construct, limits how people interpret the causal relationships within these constructs and therefore should be interpreted cautiously. Future researchers could take a longitudinal approach to investigating the evolution of digital-transformation capabilities and its impact on ESG performance over time. Second, the sample for this research includes only food manufacturers and therefore the results may not be generalizable to other types of manufacturers or service providers. Future researchers could conduct similar research using different samples from agriculture, pharmaceuticals, consumer goods, and logistics industries, and use the results to validate the model against different industry types and improve the external validity of the model. Third, this study was conducted in context of India and due to varying institutional settings, digital maturity, and regulations for sustainability, the results may not be comparable to other countries. Fourth, reliance on self-reported surveys from the managerial population may lead to respondent bias, despite reliability, validity, and common method bias assessments, when completing the survey. Future researchers could use objective measures to assess similarities and differences between surveys used in their research and obtain a greater degree of accuracy when validating their models.

Although this study focuses on green innovation, organizational agility, and sustainable food production as mediating factors for digital transformation, digital transformation may also benefit from other organizational factors. Additional variables further be explored in future research include: (i) digital capability; (ii) environmental orientation; (iii) circular economy practices; (iv) green supply chain management; (v) organizational learning; (vi) institutional pressure; (vii) leadership; or (viii) artificial intelligence capability. A more complete analysis of these additional variables would add to the field's body of knowledge and improve understanding of digital sustainability. Finally, future research could use multi-group analysis or longitudinal PLS-SEM to explore differences among firms with different sizes, ownership structures, or levels of digital maturity. Overall, these limitations do not lessen the significance of the present study; they are an initial springboard for future studies to expand our current knowledge regarding both digital transformation and ESG performance in such a multifaceted and sustainability-driven business environment.

7. Conclusion

This study explored that mediating effects of green innovation, organizational agility, and sustainable food production in the food manufacturing sector on the relationship between digital transformation and ESG performance (Cupertino, Consolandi and Vercelli, 2019). Using the concepts of the RBV and DCT, the study provided an integrated model to explain how digital transformation can enhance sustainable business performance by building complementary organizational capabilities and empirically tested it (Chen, Hsu and Lin, 2025; Nasiyev et al., 2025).

The empirical results indicate that digital transformation on green innovation and organizational agility had shown a positive relationship, thus supporting the idea that digital technologies are becoming strategic resources that can boost firms' innovation potential and adaptability (Drexler, 2021; Abdillah et al., 2025). In addition, the positive influence of green innovation on the organizational agility and sustainable food production are observed, and organizational agility has the highest impact on sustainable food production (Chen, Hsu and Lin, 2025). The results show that the organization that can integrate environmental innovation and operation flexibility has a better ability to undertake the sustainable manufacturing (Wang, Cao and Wang, 2022). The study also shows that sustainable food production has a significant impact on the ESG performance and underscores the need for environmentally responsible food production chains to achieve sustainability goals overall (Alsayegh, Rahman and Homayoun, 2020). In addition, digital transformation has a direct positive influence on ESG performance, highlighting the strategic value of digital technologies in supporting organizations in sustainability (Nijhawan et al., 2025).

The mediation analysis indicate that green innovation and organizational agility has a significant mediating role between digital transformation and sustainable food production, which suggests that digital investments do not have a direct effect on sustainable food production, but also more indirectly (Stefanovic, 2022). The indirect impact of digital transformation on ESG performance via sustainable food production was not statistically significant, however, suggesting that sustainable food production is not enough to fully account for the impact of digital transformation on ESG performance (Cupertino, Consolandi and Vercelli, 2019; Alsayegh, Rahman and Homayoun, 2020). The results show that there is potential for further organizational and governance related mechanisms to drive the achievement of more complete ESG results from digital capabilities (Stubbs and Rogers, 2013; Luque-Vílchez et al., 2023).

It is theoretically a compounding of the RBV and Dynamic Capability Theory that brings together digital transformation, green innovation, organizational agility, sustainable food production and ESG performance in a single empirical framework (Teece, Pisano and Shuen, 1997b; Yifan, 2023). This study differs from past work, which mostly investigated these constructs separately, by showing how they can complement each other to achieve sustainability-oriented performance.

In general, this research helps to advance the digital sustainability by offering empirical evidence that organizational capabilities are the key mechanisms that enable digital transformation to deliver sustainable value. The food manufacturing sector will continue to be under immense pressure from

environmental, regulatory and stakeholder challenges as well as digital technologies together with innovation and agile management will be vital to delivering long-term sustainability and improved ESG outcomes.

Declarations

Author Contribution

All the authors have contributed equally to the study through the division of work. Pinnika Syam Yadav has worked on data analysis and presenting results in tables. The remaining authors, P B Yadav and Preeti Kumari, have worked on the literature review and conceptual model.

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All authors who contributed to this article are equally represented in the study.

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Tables

Tables are available in the Supplementary Files section.

Figures

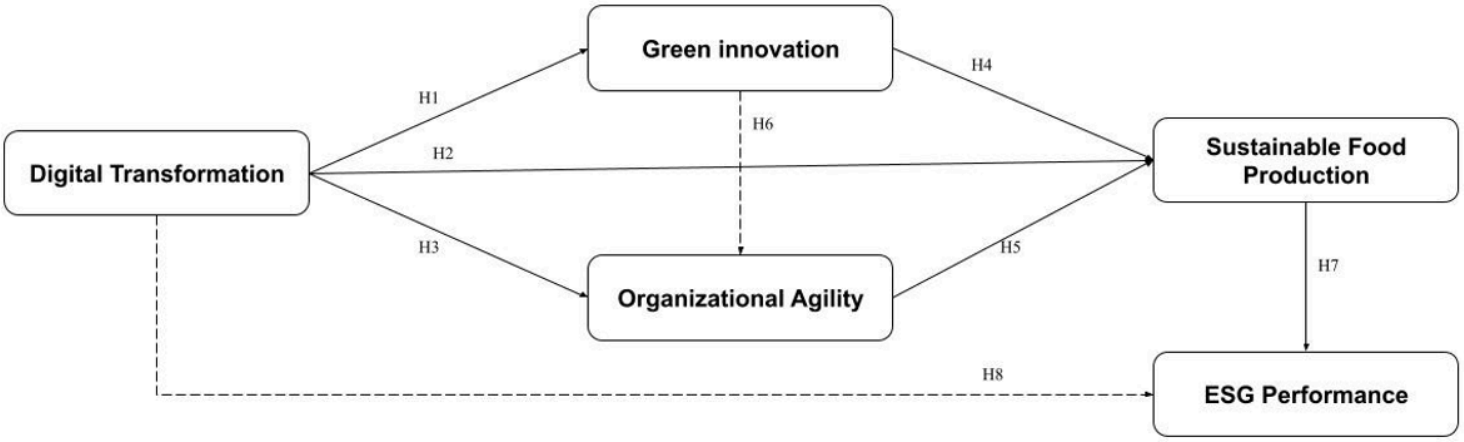


Figure 1

Conceptual Model

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