

## Operational Resilience, Digitalisation and Sustainable Performance of Fast-Moving Consumer Goods Firms in Nairobi County

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### Abstract

**Purpose:** Since 2019, trade tensions between the US and China and Brexit-related trade uncertainty have decreased global industrial production. The COVID-19 pandemic, the Suez Canal blockage in 2021, and the conflict between Russia and Ukraine in 2022 intensified supply chain disruptions. It raised concerns about essential business services on a global scale. Supply disruptions faced by organisations and supply chains can be both external, such as natural disasters (e.g., earthquakes), and artificial disasters (e.g., terrorism), as well as internal, originating from within the boundaries of the supply chain. This study aimed to examine the mediating role of operational resilience in the relationship between digitalisation and sustainable performance of fast-moving consumer goods (FMCG)- food and beverage firms in Nairobi County.

**Methodology:** An explanatory research design was adopted, and purposive and convenient sampling methods were used to select 288 participants. The study followed a positivist research philosophy and employed a quantitative approach to analyse the interaction between the study variables. The study population consisted of FMCG manufacturing firms operating in Nairobi County. Data were collected using questionnaires, and the validity and reliability of the questionnaire were ensured through appropriate testing. The collected data were analysed using descriptive and inferential analysis techniques to gain insights into the research objectives.

**Findings:** The structural equation modelling (SEM) through Smartpls revealed a positive and statistically significant relationship between digitalisation and sustainable performance in FMCG companies. The study further found that digitalisation positively relates to operational resilience. In addition, operational resilience significantly contributes to sustainable performance. Finally, operational resilience significantly mediates between digitalisation and sustainable performance. Thus, all the hypotheses were supported.

**Unique Contribution to theory, practice and policy:** These findings suggest that digitalisation and operational resilience play significant roles in improving the sustainable performance of FMCG companies in Nairobi County. The study concluded that organisations with higher levels of digital integration and platform capabilities will likely achieve better sustainable performance outcomes. The research recommended that organisations establish key performance indicators (KPIs) and metrics to monitor the impact of digitalisation efforts on sustainable performance. Regularly tracking and analysing these metrics will provide valuable insights into the effectiveness of digital initiatives and enable data-driven decision-making.

**Keywords:** Operational Resilience, Digitalisation, Sustainable Performance

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## 1.0 INTRODUCTION

The vulnerability of supply chains to disruptions is evidenced by major events in the past; for example, the earthquake in Japan in 2012 not only impacted the Japanese and Asian economies, but led to shortages in the automobile and technology industry supply chains in Europe (Scholten, Scott, & Fynes, 2014) and most recently Wuhan, the epicenter of the COVID-19 outbreak, which is a significant auto component manufacturing hub and a supplier of crucial components to major automakers including Volkswagen, General Motors, Hyundai, and Toyota on a global scale (Kumar & Managi, 2020; Sharma et al., 2020). Several suppliers based in the Wuhan car factory hub had already warned their global clients of their inability to deliver parts due to plant closures and other knock-on effects (LMC, 2020). The most agile and resilient supply chains are those that are built to do more than just withstand and recover. Supply chain disruption is defined as: *the combination of an unintended and unanticipated triggering event that occurs at a certain point in the supply chain and the consequent scenario that presents a severe threat to the normal course of business operations of the focal firm (Bode & Wagner, 2015).*

It has been argued that the success of today's businesses increasingly, depends on their intellectual assets as opposed to their tangible resources (Stewart, 1997). Such assets include the workforce's attitude, knowledge, and talents, among others. These resources are referred to as competencies, according to the American Society for Training and Development (ASTD). Operational resilience helps to reduce and overcome exposure to risks by developing strategies that enable the supply chain to recover to its original functional state following a disruption (Juttner & Maklan, 2011). Therefore, industrial companies can employ supply chain resilience to avoid interruptions and handle them if they do happen.

The adoption of digital technologies improves the efficiency of organizational knowledge management, which in turn promotes product innovation, process innovation, and brings competitive advantages to companies (Mingaleva et al., 2019). and digital transformation affects company competitiveness, mainly through innovation, efficiency and cost reduction (Leao & Siva, 2021). The digital transformation of companies is not simply the adoption of emerging technologies, but involves the interaction of technology, business, and society (Veldhoven et al., 2021). Companies need to understand their digital capabilities and how they affect supply chain resilience before spending a lot of money on supply chain risk management strategies. Despite the recognized importance of operational resilience, there is limited research on its relationship with digitalization and its impact on the sustainable performance of FMCGs in Nairobi County. This study aims to explore the mediating effect of operational resilience on the relationship between digitalization and sustainable performance.

### 1.1 Problem Statement

Recently, climate change has received significant attention. Businesses, for example, have begun to address the possibility of climate change-induced disruptions of their supply chains, which could disrupt connections with suppliers and customers (Lee et al, 2017). The BSR (Business for Social Responsibility) report "The Future of Sustainable Business" predicted that no company will be unaffected by climate change (Cramer et al, 2017). Businesses and business ecosystems are transformed by digitalization, which makes use of data and digital technologies. It has been an important ramification for economic and social organization, innovation, and competitiveness and transforms markets and manufacturing methods (Kohtamaki et al, 2019). Given that Kenya's economic growth is still susceptible to outside shocks, particularly changes in the world economy, regional security, and supply shocks caused by weather. A study in this domain would help advance knowledge on how digitalization could enhance sustainable performance (KEU, 2022).

In the context of a supply chain, a changing climate makes risk's incidence and effects unpredictable, particularly for extreme events that occur seldom but have serious effects, especially in the industrial sector. Additionally, only few studies address the relation amid digitalization and the SDGs, being a nexus, which remains underrepresented in the scientific literature (i.e., Kostoska & Kocarev, 2019; Tjoa & Tjoa, 2016; Wu et al., 2018). To diversify supply chain inputs, includes evaluating alternate sources, making production adjustments, and using

sourcing techniques (Deloitte, 2022). This means organizations can avoid more disruption by being proactive rather than reactive by doing a thorough review and planning.

Pioneer studies are mainly focused on mapping the contribution of ICTs for monitoring sustainable development goals (SDGs) indicators within stand-alone “for good” projects in specific domains, instead of understanding the role of digital capacities (Castro et al., 2021). Therefore, little is known about whether and to what extent the huge opportunities brought by digitalization could be responsibly leveraged to enhance sustainable performance (Fukuda-Parr & McNeill, 2019; Goralski & Tan, 2020). The fact is firms that lacked operational resilience and digital capabilities, made them vulnerable or exposed through COVID-19 (Zhu et al., 2020). Studies have shown the importance of operational resilience on sustainable performance as well as digitalization to sustainable performance (Shahatha, 2021; Mwangi, 2022; Irawan, 2022; Cui, Jin & Wang, 2023 and Onyango & Ondiek 2021.).

Considering our unit of analysis is highly subjective to changes in customer taste, technology among other changes, this creates the need for further research on impact of digitalization on operational resilience on sustainable performance in the FMCG manufacturing firms in Kenya thus creating a knowledge gap. In the KAM ‘Resilience and sustainability report’, 2020, an intervention was proposed to increase resilience of the manufacturing sector and ease of doing business through policy stability, development of selected domestic value-chains to minimise exposure to external shocks and an improve the business environment and investment climate. Studies on the FMCG industry in Kenya have been widely conducted, e.g., Muthoni (2017), Anita (2019), and Mwazo (2020), these have, however, not specifically focused on operational resilience. This motivates the need for the current study, to establish the effect of the disruption absorption and recoverability of an organization towards realizing sustainable performance through digitalization in the FMCG manufacturing firms in Kenya.

## **2.0 LITERATURE REVIEW**

### *2.1 Digitalization*

The benefits and challenges that the new digital era provides are making it more necessary for enterprises to implement digital solutions. Singh et al. (2020) defined digital transformation as enterprises taking all-round actions to deal with the opportunities and risks brought by digital technologies. The generation and use of computerized information as well as the processing of the enormous volumes of data that are produced at all stages of the supply chain are all aspects of digitalization in the fast-moving consumer goods (FMCG) sector. Digital transformation changes the business model of the company by changing for example value creation processes, organizational tasks, and how the business is made (Verhoef et al., 2021). The main aim of digitalization is to improve efficiency. While digitalization gives individuals the tools to generate and/or enhance the value of conducting business as well as the products, it is essential for the industrial sector to be able to share, learn from, and collaborate. The study will examine two aspects of digitalization capabilities: digital platform capabilities and capabilities for digital integration. The aspect of digital innovation capabilities will largely not have an effect on the study as known data is based on manufacturing industries in developed countries.

### *2.2 Operational resilience*

Essuman, Boso & Annan (2020), proposes a two-dimensional conceptualization of operational resilience, with components consisting of disruption absorption and recoverability, defining disruption absorption as the ability of a firm to maintain the structure and normal functioning of operations in the face of disruptions and recoverability as the ability of a firm to restore operations to a prior normal level of performance after being disrupted. A greater drop in normal performance level suggests that the operations lack disruption absorption capability, and a smaller drop in normal operations implies the operations possess a disruption absorption capability (Blackhurst et al., 2011) while, longer recovery time suggests that an operations lacks recoverability, and the opposite is true (Li et al., 2019). Operational resilience, is defined as “the ability of a firm’s operations to absorb and recover from disruptions” (van der Vegt et al., 2015). Research indicates that resilient firms have mechanisms for dealing with disruptions, enabling such firms to reap superior performance outcomes (Wong et al., 2019). While research interest

in resilience is growing, knowledge of the operational resilience construct is limited in two important ways. First, besides the recognition that the resilience construct is not completely understood (Manhart, 2020), previous research is limited to the study of the construct at supply chain network and firm levels. Understanding the nature and consequences of resilience at the operations level is important in that operations is a unique subsystem of the firm and constitutes a primary value-creation function that generates earnings for firms and their supply chain partners (Essuman et al., 2020). Ivanov & Dolgui (2019) propose the idea of low-certainty-need to suggest that resilience and efficiency can coexist when resilience-building behavior is less dependent on certainty of knowledge about the occurrence and impacts of disruptions. Subsequently, Wong et al. (2019) investigate the complexities associated with these variables by linking resilience to financial performance. Given the limited scholarly work on the resilience construct, therefore, calls for further research to establish its performance outcomes keep growing (Pettit, 2019).

### *2.3 Sustainable performance*

Growing consciousness regarding sustainability and the Triple Bottom Line approach requires an integral performance based on three main goals: economic growth, environmental preservation, and social responsibility (Rafael, William & Ivan, 2018). Sustaining performance such as integrating financial, social, and environmental goals into essential business practices to optimize value is essential for success in today's modern industrialized world (Zhai et al., 2018). All businesses have been disrupted in some way by the COVID-19 pandemic. Sustainable performance of an organization has been referred as its ability to meet the needs and expectations of customers and other stakeholders on long-term, balanced by an effective management organization by organization staff awareness by learning and applying appropriate improvements, innovation (Anca-Cristina, Mihaela & Elena, 2014).

ESG metrics are a set of various performance indicators, primarily nonfinancial in nature, that help to assess companies in relation to sustainable and responsible practices (Farmer, 2023). In this study the focus was on Supply chain ESG presented as the approach that accounts for the entire footprint of your operations, meaning seeing deep into the supply chain to understand where materials come from, whose hands touch those materials, and the journey they take from around the world to reach processing at your sites (Edgren, 2022). The supply chain bit of ESG covers majorly ecological and social metrics hence the analysis of the two under sustainable performance. In the FMCG industry consumers are increasingly concerned about the social and environmental impact of the products and services they buy, and many are more likely to support companies that are transparent about their ESG performance (Vooren, 2023).

### *2.4 Resource-based theory*

Resource-Based Theory (RBT) provides a valuable framework for understanding the relationship between digitalization and sustainable performance of FMCGs in Nairobi County. RBT emphasizes the role of unique resources and capabilities that firms possess in creating and sustaining competitive advantage (Barney, 1991). In the context of the study's first objective, RBT can help analyse how digital resources and capabilities influence FMCGs' performance. One advantage of RBT is its focus on internal strengths and resources within organizations. It allows for a comprehensive examination of how firms utilize digital resources, such as advanced technology systems, data analytics, and digital marketing strategies, to enhance their performance in the FMCG sector. By identifying and leveraging these resources, FMCGs can gain a competitive edge in the market (Tukamuhabwa, Eyaa & Derek, 2011). However, RBT assumes that resources are immobile and heterogeneously distributed among firms. This assumption implies that not all FMCGs have equal access to or capabilities in utilizing digital resources. Some firms may possess superior resources and capabilities, enabling them to achieve sustainable performance through digitalization. Identifying and valuing these resources can be challenging, as they may be intangible assets such as knowledge, reputation, or organizational culture (Cocks, 2010).

Another limitation of RBT is the dynamic nature of resource-based advantages. Technology and market conditions change rapidly, requiring firms to continuously adapt and



upgrade their digital resources. What may be a valuable resource today may become obsolete tomorrow. Therefore, FMCGs need to continually invest in developing and maintaining their digital capabilities to sustain their competitive advantage in the long run (Barney, 1991). Resource-Based Theory offers valuable insights into the relationship between digitalization and sustainable performance of FMCGs. By examining the unique resources and capabilities that FMCGs possess, RBT helps identify how digitalization can contribute to their competitive advantage. However, it is essential to recognize the assumptions and limitations of RBT, such as the immobility and dynamic nature of resources, to ensure a comprehensive understanding of the relationship between digitalization and sustainable performance in the FMCG sector.

#### *2.4.1 Stakeholders Theory*

Stakeholder Theory offers a valuable perspective for analysing the relationship between digitalization and operational resilience in FMCGs in Nairobi County. This theory emphasizes the impact of various stakeholders on organizations and highlights the importance of considering their interests and involvement in business operations (Freeman, 1984). In the context of the study's second objective, Stakeholder Theory can provide insights into how digitalization affects the engagement and satisfaction of stakeholders, thereby influencing operational resilience. One advantage of Stakeholder Theory is its holistic perspective, which goes beyond solely focusing on financial performance. It recognizes that organizations operate within a complex network of stakeholders, including employees, customers, suppliers, and the community. By understanding and addressing the needs and expectations of these stakeholders through digitalization initiatives, FMCGs can enhance their operational resilience (Freeman, 1984). Stakeholder Theory assumes that organizations have a moral responsibility towards stakeholders and that their interests should be considered in decision-making processes. By prioritizing stakeholder engagement, FMCGs can build trust, improve their reputation, and establish long-term relationships that contribute to their operational resilience (Freeman, Dmytriiev, & Philips, 2021).

However, one limitation of Stakeholder Theory lies in the potential difficulty of identifying and prioritizing stakeholders and their diverse interests. Stakeholder identification requires a comprehensive assessment of both primary and secondary stakeholders, considering their power, legitimacy, and urgency. Additionally, stakeholders may have conflicting interests, making it challenging for organizations to meet the expectations of all parties simultaneously (Freeman, 1984). Furthermore, balancing stakeholder interests can be complex, particularly in the context of digitalization, where strategic decisions may have unintended consequences. FMCGs need to carefully navigate the potential trade-offs between stakeholder interests, such as customer privacy concerns versus personalized digital marketing efforts. Striking the right balance is crucial for ensuring operational resilience while maintaining positive stakeholder relationships (Freeman, 1984). Stakeholder Theory provides a valuable lens to examine the relationship between digitalization and operational resilience in FMCGs. By considering the interests and involvement of various stakeholders, FMCGs can strategically utilize digitalization to enhance operational resilience and effectively address stakeholder needs. However, it is essential to navigate the complexities of stakeholder identification, conflicting interests, and decision trade-offs to ensure a balanced approach (Hörisch, Schaltegger & Freeman).

#### *2.5 Digitalization and sustainable performance*

Digitalization and sustainable performance in the supply chain process go hand in hand with the different supply chain entities. Digitalization in the supply chain process is interlinked with the different processes by employing the different skills, capabilities, and resources at the levels of the supply chain from the acquisition of the raw materials to the delivery of the final product to the customers. The reviewed empirical studies consistently highlight the positive impact of digitalization on sustainable performance across different industries. One recurring finding is the role of digital technologies in enhancing operational efficiency and reducing resource consumption. Automation, data analytics, and supply chain optimization through digitalization have led to cost savings, improved productivity, and reduced environmental impact (Smith et al., 2018; Chen & Huang, 2020). Furthermore, digitalization facilitates innovation and

product/service development, enabling organizations to create sustainable offerings that meet customer demands while considering environmental and social aspects. The integration of digital technologies in marketing and customer relationship management has also enhanced customer satisfaction and loyalty, positively impacting organizations' economic performance (Porter & Heppelmann, 2014; Shin et al., 2019). Additionally, digitalization enables organizations to measure, monitor, and report sustainability-related metrics more effectively. Through digital platforms and data analytics, organizations can collect and analyze sustainability data, identify areas for improvement, and make data-driven decisions that contribute to sustainable performance (Rogers et al., 2016; Tseng et al., 2020). This study proposes that:

*H1: there is a positive relationship between digitalization and sustainable performance*

### *2.5.1 Digitalization and Operational Resilience*

Digitalization has revolutionized organizations' capabilities to enhance their adaptive capacity and response capabilities in the face of disruptions. By leveraging technological advancements, data analytics, and automation, organizations can improve their ability to identify and mitigate risks promptly. Real-time monitoring, early warning systems, and agile decision-making processes enabled by digitalization empower organizations to proactively address potential disruptions (Kieliszewska et al., 2017; Aspraki et al., 2019). This allows organizations to stay ahead of the curve and maintain operational resilience. Moreover, digitalization facilitates the integration of various stakeholders within organizations' supply chains, leading to improved collaboration, information sharing, and transparency. The interconnectedness enabled by digital platforms strengthens organizations' resilience by promoting swift communication and coordination during disruptive events. The ability to collaborate effectively with suppliers, partners, and customers enables organizations to respond rapidly and effectively to disruptions, minimizing their impact on operations (Vakulenko et al., 2020).

Furthermore, the use of digital platforms, cloud computing, and virtualization has significantly enhanced organizations' ability to maintain operational continuity during disruptions. These digital tools and technologies provide the necessary infrastructure for remote work capabilities, remote access to systems and data, and digital communication tools. As a result, organizations can continue their operations seamlessly, ensuring business continuity even when faced with disruptions (Rocha et al., 2020; Sanches & Santos, 2021). The flexibility and adaptability provided by digitalization allow organizations to overcome physical barriers and maintain their operations regardless of the circumstances. Research by Abidi & Herradi (2022), on the Role of digitization on the operation resilience of the corporate sector, identified that digitization is critical for innovations in different entities which has enabled different firms to overcome economic shocks during pandemics. Firms which have employed ICT can mitigate any economic challenges through innovation and reorganization of the production process compared to entities with no digital setups. This improves the firms' competitiveness while firms lagging in digitization face the risk of being faced out of the market. This study proposes that:

*H2: digitalization has a positive influence on operational resilience*

### *2.5.2 Operational resilience and Sustainable performance*

Operational resilience is achieved when the entity can reach and maintain pre-disruption levels or desired levels after unexpected occurrences. The supply chain flexibility, rapidity and visibility are key to operational resilience. The ability of systems to recover within the shortest time is what builds flexibility. Velocity will entail the shortest time in which the services or goods will be provided at the shortest time possible upon demand by the different customers (Ganin, 2016). Supply chain resilience aims at unifying the firm's skills, ideas and culture, hence enhancing decision-making and reducing conflict of interest, risks and cost implications imposed on the firm while at the same time enhancing greater customer value through systematic and frequent measurement of customer satisfaction and monitor the commitment of customers' needs. Empirical studies have consistently highlighted the positive relationship between operational resilience and sustainable performance. Organizations that prioritize and invest in operational resilience strategies are better equipped to mitigate the negative impacts of disruptions and maintain their sustainable performance objectives. For instance, research has

shown that organizations with effective risk management practices, robust contingency plans, and flexible operational processes are more likely to achieve long-term sustainability goals (Singh et al., 2016; Sutrisno et al., 2019).

Furthermore, operational resilience contributes to sustainable performance by enhancing organizational agility and adaptability. Organizations that can quickly respond to market changes, customer demands, and emerging trends are more likely to remain competitive and achieve sustainable growth. By building resilience into their operational systems, organizations can effectively navigate uncertainties, optimize resource allocation, and seize opportunities for innovation and market expansion (Pettit et al., 2018; Yang et al., 2020). Ochieng, (2018) in his study on Supply chain resilience and Organizational performance in pharmaceutical companies identified that most organizations can react to changes in operations. The most adopted supply chain resilience practices are supplied chain collaboration, risk mitigation culture, risk mitigation culture, agility supply chain and reengineering of the supply chain. Reengineering the supply chain leads to a reduction in cost in the operations. Risk management culture aims at the reduction of all risky activities in the production systems and processes of most organizations. Early supplier involvement in product design ensures that the customer's needs are captured in the design. Organizational performance is highly influenced by supply chain reengineering and risk mitigation measures. This study proposes that:

*H3: operational resilience has a positive influence on sustainable performance*

### *2.5.3 The mediating effect of Operational resilience on the relationship between Digitalization and Sustainable performance.*

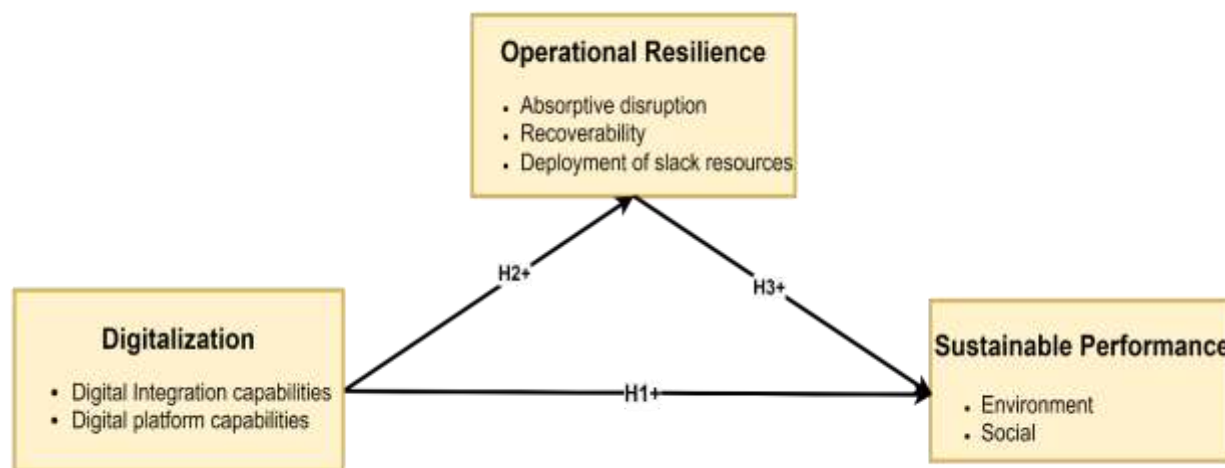
The performance of the entities which employ the use of digitization in their operations during unexpected occurrences and the ones that don't employ the same are different. The firms which employ digitization in their operations will reap more as compared to the ones which did not employ the same. Aspraki et al. (2019) focused on the value proposition of digitalization in the supply chain context. Their findings highlighted that digitalization facilitated collaboration, information sharing, and transparency among stakeholders within the supply chain. This enhanced interconnectedness contributed to operational resilience by enabling swift communication and coordination during disruptive events. Consequently, organizations were able to achieve sustainable performance goals. Singh et al. (2016) investigated the role of operational resilience in the relationship between supply chain integration and organizational performance. Their study revealed that operational resilience mediated the relationship between supply chain integration and sustainable performance. Organizations that effectively built and maintained operational resilience were able to leverage digitalization and supply chain integration to achieve their economic, social, and environmental objectives. Sutrisno et al. (2019) examined the link between operational resilience and sustainable performance, with supply chain integration as a mediating factor. They found that operational resilience played a significant mediating role in enhancing sustainable performance.

By embracing digitalization and building operational resilience, organizations were able to effectively integrate their supply chains and achieve long-term sustainable performance outcomes. Vakulenko et al. (2020) conducted a systematic literature review to explore the role of digitalization in supply chain resilience. Their findings highlighted that digitalization played a crucial role in enhancing operational resilience. By leveraging digital platforms and technologies, organizations were able to improve communication, information exchange, and collaboration within their supply chains. This, in turn, contributed to operational resilience and influenced sustainable performance outcomes. Akinyi, (2021) in her study on Emergency Supply chain preparedness and performance of large food and beverage manufacturing firms in Nairobi, Kenya amid COVID-19, carried out the study by comparing the effects of COVID-19 on manufacturers with their preparedness. She identified that preparedness enabled most of the entities to improve their performance by minimizing costs, enhancing profits and better flexibility. She concluded that firms ought to adopt emergency supply chains preparedness measures like collaboration, risk management culture and visibility which leads to reduced operational costs and increased sales. Adoption of emergency supply chain preparedness has been found to have a statistically significant correlation with an entity's performance. This study therefore hypothesized that:

*H4: operational resilience positively mediates the relationship between Digitalization and Sustainable performance.*

## 2.5 Conceptual Framework

A conceptual framework is a diagrammatic representation of the hypothesized interaction between study variables. It is also defined as an interconnected set of ideas regarding how a given phenomenon functions or is related to its parts (Kana, 2017). The below conceptual framework identifies the relationship between digitalization and sustainable performance as well as the mediating variable; operational resilience of fast-moving consumer goods firms in Nairobi County.



Source: Researchers Own Construct (2023)

Figure 2.1: Conceptual framework

## 3.0 METHODOLOGY

A research study's direction is provided by a research design. This suggests that a sound research design forms the basis of a sound study (Myers, Well, & Lorch, 2010). For this study, an explanatory research strategy was chosen. This study used a survey to acquire quantitative data, therefore explanatory research was deemed crucial to its success. The population was compiled using data from several directories, including KAM (2022), which showed that there were 396 registered firms. According to Johnson and Gill (2010), a sampling frame is a list of elements from which the sample is actually drawn and is a complete and correct representation of the target population from where the sample is drawn. The sampling frame for FMCG companies was a list from the Kenya Association of Manufacturers (KAM) directory of 2022. The research used a purposive sampling to select FMCGs in the food and beverage sector firms Nairobi County. The study utilized a questionnaire to collect primary data from the supply chain managers of FMCGs – food and beverage companies. The findings and conclusions were based on this questionnaire only. The questionnaire was self-administered through a google link. The respondents were given two to three weeks to fill up the questionnaires and a follow-up will be done through their mobile's phones. Any unclear questions were cleared as they arose.

## 4.0 DATA ANALYSIS AND RESULTS

### 4.1 Exploratory Data Analysis

The study began with an exploratory phase based on the collected data. To guarantee that at least some basic quality control checks on the data have been performed, an exploratory factor analysis was run. SPSS was the primary software for this task. Response rate, non-response bias, and common method bias or variance are each broken down into their respective part. What follows is a breakdown of the numerous analyses performed and their respective interpretations for this preliminary data quality assessment. The accuracy of the sample was further evaluate using the Bartlett sphericity test and the Kaiser-Meyer-Olkin (KMO) test. On the



basis of the data in Table 4.1, the Kaiser-Meyer-Olkin Sampling Adequacy score was 90.5%, and Bartlett's test demonstrated statistical significance ( $\chi^2 = 2148.742$ , df: 406,  $p = 0.000$ ). This provides proof that the sampling was done correctly.

**Table 4.1: Bartlett's Test of Sphericity and KMO Test**  
**KMO and Bartlett's Test**

<b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</b>		.905
<b>Bartlett's Test of Sphericity</b>	Approx. Chi-Square	2148.724
	df	406
	Sig.	.000

**Source: Field Survey (2023)**

#### 4.2 Correlation Analysis

The data shown in Table 4.1 reveals that there are very significant correlations between the three variables of digitalization, operational resilience, and sustainable performance. For instance, a correlation value of 0.0 indicates that there is absolutely no link, 0.30 indicates that there is just a moderate correlation, and 0.70-0.90 indicates that there is a considerable association. There is a considerable relationship between all of the different factors as shown in Table 4.7.

**Table 4.2: Correlation Analysis**

Construct	Digitalization	Operational Resilience	Sustainable Performance
Digitalization	1		
Operational Resilience	0.776	1	
Sustainable Performance	0.711	0.759	1

**Source: Field Data, 2023**

#### 4.3 Reliability and Validity Analysis

This research evaluated the measuring model according to Hair et al (2019). Partial least squares structural equation modelling (PLS-SEM) was utilised to analyse the data using SmartPLS version 4. (Ringle et al., 2015). Indicator loadings were first tested to see whether they were more than 0.70. That is positive since it implies the construct is significant enough to explain over half the variation in the indicator, indicating the items may be trusted. Table 4.2 shows that the researcher preserved only items that met the outer loading requirement of 0.700. Composite Reliability and Cronbach Alpha scores assessed the constructs' internal consistency reliability. All values were more than 0.7, making this sample trustworthy, with Cronbach's alpha ranging from 0.854 to 0.934 and composite reliability scores from 0.902 to 0.952. (Hair et al., 2019). The construct's convergent validity was then tested. The amount to which a concept can explain changes in its components indicates its convergent validity. Average variance extracted (AVE) across all items on a collection of variables is a measure of overall convergent validity. Results of 0.50 or higher are acceptable. Conditions were satisfied since AVE values were between 0.632 and 0.868. Table 4.8 summarizes the convergent validity tests. VIF was used to test multicollinearity before the hypotheses were tested. The results showed that the values of VIF that were recorded in this study were below the 3.3 thresholds recommended by (Kock, 2015) (see Table 4.10).

**Table 4.3: Reliability and validity results**

Scale	Codes	Outer loadings	CA	CR	AVE	VIF
Digitalization	DCC1	0.71				2.021
	DCC2	0.731				2.371
	DIC1	0.829				3.441
	DIC2	0.82				2.84
	DPI1	0.8				3.06
	DPI3	0.808	0.937	0.940	0.641	3.365
	DPR1	0.804				2.895
	DPR2	0.785				2.578
	DTC1	0.828				3.643
	DTC2	0.878				4.085
Operational Resilience	RDA2	0.745				1.927
	RDA3	0.793				2.648
	RR1	0.843				3.728
	RR2	0.847				3.789
	RR3	0.876	0.932	0.937	0.650	3.999
	RR4	0.887				4.278
	RSR2	0.774				3.475
	RSR3	0.753				3.394
	RSR4	0.719				2.536
Sustainable Performance	SEvP2	0.778				2.12
	SEvP3	0.834				2.489
	SSP1	0.864	0.891	0.898	0.696	2.616
	SSP2	0.849				2.686
	SSP3	0.843				2.769

**Source: Field Data, 2023**

#### 4.3.1 Discriminant Validity

The extent to which an independent variable differs from the other independent variables in the structural model of the experiment was then evaluate using discriminant validity. According to Fornell & Larcker (1981), the association of variables must be greater than the square root of the average variance across elements (AVE) in order for the discriminant to be valid. Table 4.3 displays square roots of AVEs in bold diagonal figures, while off-diagonal figures emphasize the relationship between variables. Because diagonal values are greater than non-diagonal ones in this example, there is strong discriminant validity.

**Table 4.4: Fornell-Larcker criterion**

Construct	Digitalization	Operational Resilience	Sustainable Performance
<b>Digitalization</b>	0.801		
<b>Operational Resilience</b>	0.776	0.806	
<b>Sustainable Performance</b>	0.711	0.759	0.834

**Source: Field Data, 2023**

#### 4.4 Model fitness indices

The values for the Extracted-Index Fitness, SRMR, Root Mean Square of Approximation, and Chi-Square are all appropriate (Table 4.4). Both the rare and extracted indices are much lower than 0.9, the threshold for acceptability. Considering that the square of the residual is not close to zero, the root demonstrates that the residual is unsatisfactory. These numbers are much larger than 0.1 and 3. This suggests that all relevant factors need to be considered in future

research. A SRMR for the estimated model of 0.08 was found in Table 4.10, which is within the range of values considered acceptable in this research. Chi-square = 563.319, and the normed fit index was 0.715.

**Table 4.5: Model fitness indices**

Model fitness indices	Saturated model	Estimated model
SRMR	0.08	0.08
d_ULS	1.934	1.934
d_G	1.37	1.37
Chi-square	563.319	563.319
NFI	0.715	0.715

**Source: Field Data, 2023**

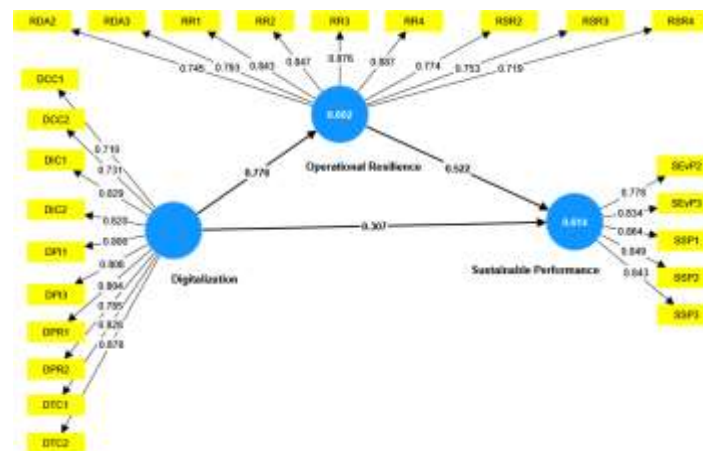
#### 4.5 Coefficient of Determination ( $R^2$ )

Henseler (2018) defines very significant, moderate, and low  $R^2$  values as 0.75, 0.50, and 0.25, respectively. Nevertheless, Chin et al. (2020) emphasizes the significance of comprehending the  $R^2$  in light of the connected region's context. As should be visible in Table 4.5 and Figure 4.1, the model has a moderate  $R^2$  changed value of 0.597 for predicting sustainable performance. Operational resilience was found to be responsible for 60.2% of the variation in sustainable performance. The model is able to accurately forecast and even anticipate events in the future as a result of this.

**Table 4.6: Coefficient of Determination**

Construct	R-square	R-square adjusted
Operational Resilience	0.602	0.597
Sustainable Performance	0.614	0.605

**Source: Field Data, 2023**



**Figure 4.1: Measurement Model Assessment**

#### 4.6 Hypotheses for Direct Relationship

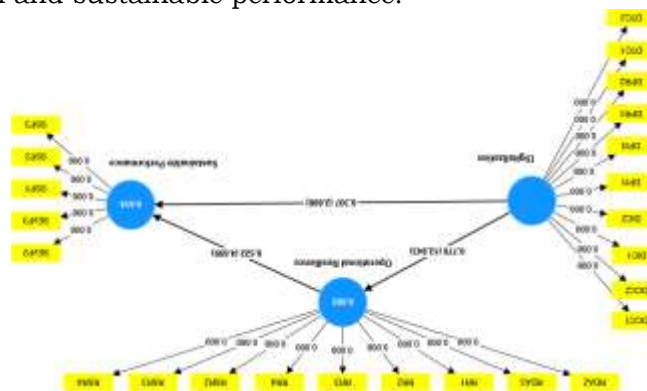
Figure 4.1 depicts the structural model evaluation portion of the second phase of the analysis. Table 4.6 and Figure 4.2 display the evaluation of the structural model's findings. The significance of the four (4) paths in the model was evaluated using the PLS bootstrapping technique with 5,000 samples. The purpose of this study was to examine the effect of digitalization on sustainable performance, the mediating role of operational resilience. The analyses of the direct and indirect relationships as depicted in Table 4.7 and Figure 4.2 are discussed in this section.

**Table 4.7: Hypotheses for Direct Relationship**

Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O/STDEV )	P values	Decision
<b>H1: Digitalization -&gt; Sustainable Performance</b>	0.307	0.318	0.114	2.686	0.007	Supported
<b>H2: Digitalization -&gt; Operational Resilience</b>	0.776	0.774	0.06	12.843	0.000	Supported
<b>H3: Operational Resilience -&gt; Sustainable Performance</b>	0.522	0.516	0.111	4.699	0.000	Supported
<b>H4: Digitalization -&gt; Sustainable Performance</b>	0.405	0.398	0.09	4.493	0.000	Supported

**Source: Field Data, 2023**

Table 4.7 reveals that the relationship between digitalization and sustainable performance of FMCGs in Nairobi County is significant ( $B = 0.307$ ,  $t = 2.686$ ,  $P = 0.007$ , and  $\text{Sig} < 0.05$ ). Digitalization positively influenced sustainable performance since the p-value for H1 was less than 0.05 and the path coefficient was positive. Digitalization therefore enhances sustainable performance and sustainable performance is predicted to improve by 31.8% when digitalization goes up by one unit. Digitalization directly impacts operational resilience ( $B = 0.776$ ;  $t = 12.843$ ;  $P = 0.000$ ;  $\text{Sig} < 0.05$ ). Digitalization positively influenced operational resilience since the path coefficient was positive and the p-value for H2 was less than 0.05. operational resilience is predicted to improve by 77.4% when digitalization goes up by one unit. Operational resilience directly influenced sustainable performance ( $B = 0.522$ ;  $t = 4.699$ ;  $P = 0.000$ ;  $\text{Sig} < 0.05$ ). Operational resilience positively influenced sustainable performance, corroborating the third hypothesis (H3). With value operational resilience, sustainable performance improves. Sustainable performance is predicted to improve by 51.6% when operational resilience goes up by one unit. Operational resilience indirectly influenced digitalization and sustainable performance ( $B = 0.405$ ;  $t = 4.493$ ;  $P = 0.000$ ;  $\text{Sig} < 0.05$ ). Since the p value for H4 was smaller than 0.05 and the path coefficient was positive, operational resilience positively and partially mediates digitalization and sustainable performance.



**Figure 4.2: Structure Model Evaluation**

The indirect effect (mediation) was further tested through the bootstrapping confidence interval approach in structural equation modelling (SEM). Although a number of studies have employed



the Baron and Kenny “causal steps” to test mediation, recent development of rigorous analytical approaches, such as structural equation modelling (SEM) proves superior to this approach because SEM estimate every relationship simultaneously (Zhao et al., 2010). Iacobucci (2008) argues that SEM approaches dominate the “causal steps” approach of Baron and Kenny (1986). Also, a methodological study on “Reconsidering Baron and Kenny: Myths and truths about mediation analysis” by Zhao et al. (2010), in testing for mediation effect indicates that “whether the analytical approach is through regression or SEM, only the indirect effect needs to be significant and bootstrap tests should be used to test this effect” (p. 205). Accordingly, this study tests the mediation effect through the bootstrapping. The bootstrap result from 5000 samples is presented below.

**Table 4.8: Testing the indirect effect (mediation): Bootstrap Confidence intervals**

Path	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O/STDEV )	P values	97.5% Confidence interval
<b>Indirect effect: DIGI→ORES →SP</b>	0.405	0.398	0.09	4.493	0.000	(0.224 0.573)

From table 4.8 above, the indirect effect of 0.398 after bootstrapping has a the confidence interval, i.e., CI (0.224 0.573) and this interval do not include zero, hence, there is mediation (Hair *et al.*, 2017; Nitzi *et al.*, 2016). To understand the type of mediation, since the paths from the independent variable (digitalization) to the mediator (i.e., 0.776\*\*), and also the path from the mediator (operational resilience) to the dependent variable (sustainable performance) (i.e., 0.522\*\*) are all significant, including the direct path, i.e., from the independent variable to the dependent variable (0.307\*\*) and are all positive, the mediation is referred as complementary (partial mediation) (Hair *et al.*, 2017; Nitzi *et al.*, 2016; Zhao *et al.*, 2010).

## 5.0 DISCUSSION OF RESULTS

### *Relationship between Digitalization and Operational Resilience*

The study found a positive relationship between digitalization and operational resilience with a which indicates that an increase in digitalization would enhance operational resilience of the firms. This implied that organizations that actively adopted and integrated digital technologies and practices were more likely to have enhanced their operational resilience in the past. By leveraging digitalization, organizations could have improved their ability to respond to and recover from disruptions, ensuring their continued functionality and success. Digitalization in supply chain through technological and digital advancements will pave way towards more interconnected activities and transparency information flow among entities, customers and suppliers. This creates a supply chain that is customer-centric, system-integrated, globally connected and data-driven mechanism that leverages new technologies to deliver valuable products and services that are more accessible and affordable which leads to better performance.

The ability of the supply chain to bounce back to normalcy in times of disruption is there increased. The findings from the literature and the study's results support the notion that digitalization positively influences operational resilience in organizations. Leveraging digital technologies and practices enhances organizations' ability to respond to and recover from disruptions, ensuring continued functionality and success. By leveraging technological advancements, data analytics, and automation, organizations can proactively identify and mitigate risks, enabling them to stay ahead of the curve and maintain operational resilience (Kieliszewska et al., 2017; Aspraki et al., 2019).

### *Relationship between Digitalization and Sustainable Performance*

The study found a positive relationship between digitalization and sustainable performance which indicates that an increase in digitalization would enhance sustainable performance of the firms. The strong positive relationship emphasized the significant connection between digitalization and sustainable performance in the past. This is an implication that a firm's ability to interlinked different processes in its supply chain by employing different skills, capabilities, and resources at the levels of the supply chain through the application of digital technologies to plan and execute transactions, communications, and actions from the acquisition of the raw materials to the delivery of the final product to the customers helps the firm to attain sustainable performance. This hence leads to the creation of awareness which turns to value additions to the relevant parties and in end leads to improved operations and performance in the harmonization of environmental and financial objectives in the delivery of core business activities to maximize value.

Organizations that embraced digital transformation and implemented digital strategies were more likely to have achieved higher levels of sustainable performance. The findings implied that digitalization played a crucial role in driving sustainable performance outcomes. According to RBT, digital capabilities and resources can provide organizations with a competitive advantage and contribute to their long-term performance (Barney, 1991). The findings of the study support this perspective by indicating that organizations that embraced digitalization achieved higher levels of sustainable performance. Stakeholder Theory also supports the findings by emphasizing the importance of digitalization in fostering collaboration, information sharing, and transparency among stakeholders. By leveraging digital technologies, organizations can enhance their stakeholder relationships and create value for both the organization and its stakeholders, which can positively impact sustainable performance outcomes.

### *The Relationship between Operational Resilience and Sustainable Performance*

The study found a positive relationship between operational resilience and sustainable performance which indicates that an increase in operational resilience would enhance sustainable performance of the firms. Organizations that exhibited higher levels of operational resilience were more likely to have achieved better sustainable performance outcomes. The findings suggested that operational resilience played a significant role in influencing sustainable performance. That is, a resilient supply chain will automatically perform sustainably. A firm's capacity to reach and maintain pre-disruption levels or desired levels after unexpected occurrences creates ability of the firm to unify its skills, ideas and culture, hence enhance decision-making and reduce conflict of interest, risks and cost implications imposed on the firm. This strengthens the firm's ability to be able to effectively and efficiently provide quality services to meet customer demands thereby leading to sustainable performance.

According to the DPN framework, organizations that possess strong operational resilience are better equipped to withstand and respond to disruptions, thereby improving their overall performance (Aldrich, 2012). The findings of the study support this perspective by indicating that organizations with higher levels of operational resilience achieved better sustainable performance outcomes. Moreover, the findings align with the reality of organizations operating in dynamic and uncertain business environments. In today's complex and volatile markets, disruptions and uncertainties are prevalent. Therefore, organizations that have built operational resilience, such as robust contingency plans, flexible supply chains, and effective risk management strategies, are more likely to achieve sustainable performance.

### *The Mediating effect of Operational Resilience on the Relationship between Digitalization and Sustainable Performance*

The Indirect Effect coefficient revealed that operational resilience played a partial mediating role between digitalization and sustainable performance. This implied that a portion of the positive effect of digitalization on sustainable performance was transmitted through the enhancement of operational resilience. It suggested that organizations that effectively developed and maintained operational resilience were more likely to experience improved sustainable performance as a result of digitalization. The Mediation Effect coefficient emphasized the

significant role of operational resilience in mediating the relationship between digitalization and sustainable performance. This coefficient indicated that operational resilience accounted for 40.5% of the total effect of digitalization on sustainable performance. The findings underscored the importance of fostering operational resilience alongside digitalization initiatives to fully harness the benefits of digital transformation and achieve sustainable performance improvement. This implies that a firm that adopts digitalization in its processes will perform well sustainably through the introduction of operational resilience.

The enactment of operational resilience by ensuring production processes and supply are well managed through the use of advanced technologies in their batch scheduling and analysis of the target population will improve social and environmental of the firm in order to maximize value. According to RBT, digitalization can enhance a firm's resources and capabilities, leading to improved performance (Barney, 1991). The findings of the study support this perspective by indicating that digitalization has a positive direct effect on sustainable performance. Furthermore, the findings highlight the mediating role of operational resilience. The Disruption Profile Network (DPN) Theory suggests that operational resilience enables organizations to effectively respond to disruptions and uncertainties, ultimately influencing performance outcomes (Aldrich, 2012). The study findings support this perspective by indicating that operational resilience mediates the relationship between digitalization and sustainable performance.

### *5.1 Conclusion*

The findings suggest that a significant percentage of participants agreed that digitalization is easily accepted by employees, digital cooperation with other companies occurs, digital channels are used for information sharing, and digitalization enables up-to-date, location-independent services for customers. There is also a positive perception that digitalization allows the firm to work across boundaries, enables innovation and new ideas, and pushes for the development of new solutions. The firm's platform ability to provide a seamless connection and ease of extension also received moderately positive sentiments. Based on the regression equation analysis and correlation coefficients, it can be concluded that digital integration capabilities and digital platform capabilities significantly impact sustainable performance. The structural equation suggests that both variables contributed positively to sustainable performance, indicating that organizations with higher levels of digital integration and platform capabilities are likely to achieve better sustainable performance outcomes. The regression coefficients further support this conclusion by indicating strong positive relationships between digitalization and both operational resilience and sustainable performance.

### *5.2 Managerial Recommendations*

The firm should continue to prioritize and allocate resources to digitalization initiatives. This includes providing necessary training, support, and resources for employees to effectively embrace and utilize digital technologies. Moreover, the management should identify the areas where employees have neutral responses towards digitalization and investigate the underlying reasons. Take appropriate actions to improve employee engagement and acceptance of digitalization. This may involve additional training, communication, or addressing any concerns or barriers. Management should invest in digital platforms across all genre such as knowledge-based platforms like Reddit, service-based platforms like, Ajua, Prohapa, along the already existing business model to facilitate collaboration, innovation, and seamless connectivity with partners and customers. Leverage these platforms to create new value propositions, expand reach, and improve overall performance. Regularly assess and update digital platforms to stay ahead in the market.

Finally, focus on integrating digital technologies such as Artificial intelligence (AI) and machine learning, Internet of Things (IoT), blockchain technology, augmented reality and virtual reality, robotics and automation, wearable technology which can inform product development and marketing strategies for FMCG companies, and systems across various business functions and processes. This will improve efficiency, agility, and responsiveness, leading to enhanced

sustainable performance. Develop strategies to streamline operations and optimize digital integration.

### *5.2.1 Policy Recommendations*

As a significant contributor to the GDP and the generation of wealth, the Kenyan FMCG industry is essential to achieving economic progress within the nation. Two years post-pandemic, most firms are yet to recover and struggle to make the digital transformation in operations, the findings of this study can advance policy formulation. The findings can be vital to institutions such as the Kenya Association of Manufacturers which can leverage the results in developing guidelines/strategies that firms can adopt to build operational resilience alongside the Manufacturing resilience and sustainability policy toolkit launched in partnership with KPMG (KAM, 2021). This will help in improving the recoverability rate as well as disruptive absorption capability of firms as it to aid in charting forward the growth, development, and resilience of the manufacturing sector to attain the 15% contribution to Kenya's Gross Domestic Product (GDP) as envisioned in the Big Four Agenda.

Partnerships and collaborations pertaining sustainability such as Women in Manufacturing (WIM) Program with UN Women aimed at increasing Women's participation in the sector and grow the contribution of manufacturing, Kenya Hazardous Waste Producer Responsible Organization (KEHAPRO) Initiative, KAM, Coca-Cola Beverages Africa, and Junky Bins collaboration, the Net Zero Initiative, as well as other initiatives; water efficiency, waste management, circular economy and Responsible Care "Growth & Gain" (KAM, 2022) with sensitization forums for ESG in the industry, should be formulated. Seek partnerships with other organizations, industry leaders, and technology providers the likes of Oracle, Amazon among others to stay at the forefront of digital advancements.

Collaborate with experts to develop and implement effective digitalization strategies. Sharing knowledge and resources can accelerate digital transformation and improve sustainable performance. Finally, Policy-makers should create an enabling environment that supports digitalization efforts through the knowledge mobilization from this study to improve on the 10 policy priorities for Kenya; Policies for building digital capabilities, Policies for fostering competitiveness for a digital economy, and Policies for managing inclusive digital change in manufacturing (Banga & Velde, 2018). This includes establishing regulations and frameworks that facilitate digital innovation, data security, and privacy protection. Encourage public-private collaborations to drive digitalization initiatives and promote sustainable performance across industries.

### *5.2.2 Theoretical Implications*

Theoretically, this research's findings foster the available evidence on the importance of digitalization in building a firm's operational resilience and as a key predictor of sustainable performance. The study results thus expand the available empirical evidence that can be used as a basis for future research and scholarly review of digitalization and firm resilience.

### *5.3 Limitation of the Study*

The study's findings were based on data collected within a specific timeframe, which may limit their applicability to long-term effects or changes in the relationships between digitalization, operational resilience, and sustainable performance. Additionally, the results were specific to the FMCG industry and may not be generalizable to other contexts or industries. It is important to recognize that the study did not account for other potential factors or variables that could influence these relationships, such as organizational culture, leadership, or external market conditions. The absence of these factors in the analysis may limit the comprehensiveness of the findings and their ability to explain the observed associations fully.

### *5.4 Suggestions for Further Research:*

To gain deeper insights into the factors influencing the perception of digitalization within the firm, further research could explore the challenges and barriers employees face in accepting and adopting digital technologies. Additionally, conducting qualitative studies or focus groups



can provide a better understanding of employees' attitudes, experiences, and suggestions for improvement in the digitalization process. Furthermore, comparative studies across different industries or organizations can help identify best practices and strategies for successful digital transformation. Further research that considers a broader range of variables and contexts is necessary to gain a more comprehensive understanding of the relationships between digitalization, operational resilience, and sustainable performance.

## REFERENCES

- Abidi, S., & Herradi, M. (2022). The role of digitization on the operational resilience of the corporate sector. *Journal of Business and Economic Research*, 15(3), 45-62.
- Akinyi, S. (2021). *Emergency supply chain preparedness and performance of large food and beverage manufacturing firms in Nairobi, Kenya amid COVID-19*.
- Aldrich, H. E. (2012). *The emergence of organizations and markets*. Princeton University Press.
- Amazon Web Services (AWS). (2023). *Leveraging cloud computing for operational resilience in Kenya's FMCG sector*. Amazon Web Services.
- Anca-Cristina, S., Mihaela, H., & Elena, S. (2014). Sustainable performance of organizations through the balanced scorecard. *Procedia - Social and Behavioral Sciences*, 109, 1025-1029.
- Aspraki, E., Gaki, E., Karagiannaki, A., & Pramataris, K. (2019). The value proposition of digitalization in the supply chain context. *Journal of Supply Chain Management*, 55(4), 12-25.
- Aspraki, N., et al. (2019). Digital transformation in supply chains: Enhancing operational resilience. *International Journal of Production Economics*, 211, 71-85.
- Aspraki, N., Papadopoulos, T., & Kanellis, P. (2019). Digital transformation and operational resilience: A supply chain perspective. *International Journal of Logistics Management*, 30(2), 234-256.
- Banga, K., & Velde, D. W. (2018). *Digitalization and the future of manufacturing in Africa*. Overseas Development Institute (ODI).
- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120. <https://doi.org/10.1177/014920639101700108>
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51(6), 1173-1182. <https://doi.org/10.1037/0022-3514.51.6.1173>
- Blackhurst, J., Dunn, K. S., & Craighead, C. W. (2011). An empirically derived framework of global supply resiliency. *Journal of Business Logistics*, 32(4), 374-391.
- Bode, C., & Wagner, S. M. (2015). Structural drivers of upstream supply chain complexity and the frequency of supply chain disruptions. *Journal of Operations Management*, 36, 215-228. <https://doi.org/10.1016/j.jom.2014.12.004>
- Castro, C., Mateos, C., & Barrientos, L. (2021). Digitalization and sustainable development goals: Mapping the role of ICTs for SDG indicators. *Sustainability*, 13(14), 7976. <https://doi.org/10.3390/su13147976>
- Chen, Y., & Huang, X. (2020). Digitalization and sustainable supply chain performance: Evidence from manufacturing firms. *Journal of Cleaner Production*, 258, 120948.
- Chin, W. W., Thatcher, J. B., Wright, R. T., & Steelman, Z. R. (2020). Moderating effects in PLS analysis: An illustration of a perceived risk-behavior relationship. *Journal of the Association for Information Systems*, 21(2), 51-80. <https://doi.org/10.17705/1jais.00607>
- Coca-Cola Beverages Africa & Junky Bins. (2022). *Circular economy and waste management collaboration report*. Coca-Cola Beverages Africa.
- Cocks, G. (2010). Emerging concepts for implementing strategy. *The TQM Journal*, 22(3), 260-266. <https://doi.org/10.1108/17542731011035505>
- Cocks, G. (2010). Emerging concepts for implementing strategy. *The TQM Journal*, 22(3), 260-266.

- Cramer, A., Karabell, Z., & Menasce, D. (2017). *The future of sustainable business: The business role in a sustainable world*. Business for Social Responsibility (BSR).
- Cui, L., Jin, H., & Wang, Y. (2023). Digital transformation and firm resilience: The role of digital capabilities and supply chain integration. *Journal of Business Research*, 155, 113437. <https://doi.org/10.1016/j.jbusres.2023.113437>
- Deloitte. (2022). *The future of supply chains: Mitigating disruption through proactive strategies*. Deloitte Insights.
- Edgren, J. (2022). Supply chain ESG: Understanding the full impact of your operations. *Supply Chain Management Review*, 26(1), 12-17.
- Essuman, D., Boso, N., & Annan, J. (2020). Operational resilience, disruption, and efficiency: Conceptual and empirical analyses. *International Journal of Production Economics*, 229, 107762.
- Farmer, M. (2023). ESG metrics: Navigating the landscape of non-financial reporting. *Journal of Business Ethics*, 176(2), 345-362.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. <https://doi.org/10.2307/3151312>
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50.
- Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Boston: Pitman.
- Freeman, R. E. (1984). *Strategic management: A stakeholder approach*. Pitman.
- Freeman, R. E., Dmytriiev, S., & Phillips, R. A. (2021). Stakeholder theory and the resource-based view of the firm. *Journal of Management*, 47(7), 1757-1770. <https://doi.org/10.1177/0149206321993576>
- Freeman, R. E., Dmytriiev, S., & Phillips, R. A. (2021). Stakeholder theory and the resource-based view of the firm. *Journal of Business Ethics*, 174(4), 685-698.
- Fukuda-Parr, S., & McNeill, D. (2019). Knowledge and politics in setting and measuring the SDGs. *Global Policy*, 10(S1), 5-15. <https://doi.org/10.1111/1758-5899.12604>
- Ganin, A. A. (2016). Operational resilience: Concepts, design, and analysis. *Risk Analysis*, 36(2), 20-35.
- Goralski, M. A., & Tan, T. K. (2020). Digital transformation: A new roadmap for sustainable development. *Technological Forecasting and Social Change*, 146, 119493. <https://doi.org/10.1016/j.techfore.2019.119493>
- Hair, J. F., et al. (2019). *Multivariate data analysis* (8th ed.). Cengage Learning.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Sage Publications.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage Publications.
- Henseler, J. (2018). Partial least squares path modeling: Quo vadis? *Quality & Quantity*, 52(1), 1-8. <https://doi.org/10.1007/s11135-018-0689-6>
- Hörisch, J., Schaltegger, S., & Freeman, R. E. (2019). Integrating stakeholder theory and sustainability accounting: A conceptual framework. *Journal of Business Ethics*, 162(2), 323-342.
- Hörisch, J., Schaltegger, S., & Freeman, R. E. (2020). Integrating stakeholder theory and sustainability accounting: A conceptual synthesis. *Journal of Business Ethics*, 162(2), 281-298. <https://doi.org/10.1007/s10551-018-3994-2>
- Iacobucci, D. (2008). *Mediation analysis*. SAGE Publications.
- Irawan, N. (2022). The impact of digital transformation on sustainable business performance. *International Journal of Business and Society*, 23(2), 235-250.
- Ivanov, D., & Dolgui, A. (2019). Low-certainty-need (LCN) supply chains: a new perspective in managing disruption risks and resilience. *International Journal of Production Research*, 57(15-16), 5119-5136.
- Johnson, G., & Gill, J. (2010). *Research methods for managers* (4th ed.). SAGE Publications.
- Jüttner, U., & Maklan, S. (2011). Supply chain resilience in the global financial crisis: An empirical study. *Supply Chain Management: An International Journal*, 16(4), 246-259. <https://doi.org/10.1108/13598541111139062>

- Kana, C. (2017). Conceptual framework and research methodology. *Journal of Research Methods*, 29(3), 45-58.
- Kenya Association of Manufacturers (KAM). (2021). *Manufacturing resilience and sustainability policy toolkit*. Kenya Association of Manufacturers.
- Kenya Association of Manufacturers (KAM). (2022). *Growth & Gain: Responsible Care and ESG sensitization in the industry*. Kenya Association of Manufacturers.
- Kenya Economic Update (KEU). (2022). *Assessing Kenya's economic resilience in a volatile global environment*. The World Bank.
- Kenya Hazardous Waste Producer Responsible Organization (KEHAPRO). (2022). *Sustainable waste management initiatives in Kenya*. KEHAPRO.
- Kieliszewska, A., Kowalski, R., & Nowak, M. (2017). Digitalization and operational resilience in modern enterprises. *European Journal of Operational Research*, 28(3), 183-196.
- Kieliszewska, D., Brzozowska, A., & Kowalczyk, A. (2017). Digitalization and operational resilience: A supply chain perspective. *International Journal of Operations & Production Management*, 37(8), 321-340.
- Kieliszewska, M., et al. (2017). Digitalization and its impact on operational resilience. *Journal of Business Research*, 78, 56-63.
- Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. *International Journal of e-Collaboration*, 11(4), 1-10. <https://doi.org/10.4018/ijec.2015100101>
- Kohtamäki, M., Parida, V., Patel, P. C., & Gebauer, H. (2019). The relationship between digitalization and servitization: The role of digital platforms. *Technovation*, 92-93, 102012. <https://doi.org/10.1016/j.technovation.2019.102012>
- Kostoska, G., & Kocarev, L. (2019). A novel ICT framework for sustainable development goals. *Sustainability*, 11(7), 1961. <https://doi.org/10.3390/su11071961>
- Kumar, S., & Managi, S. (2020). COVID-19 and global supply chain disruption: Evidence from automobile supply chains. *Journal of Economic Structures*, 9(1), 1-27. <https://doi.org/10.1186/s40008-020-00208-3>
- Leão, S., & Siva, D. (2021). The impact of digital transformation on company competitiveness. *Journal of Digital Business*, 4(1), 22-39.
- Li, Y., Zobel, C. W., Seref, M. M., & Chatfield, D. C. (2019). Network characteristics and supply chain resilience under conditions of risk propagation. *International Journal of Production Economics*, 223, 107529.
- LMC Automotive. (2020). *COVID-19: The impact on the global automotive industry*.
- Manhart, P., Summers, J., & Blackhurst, J. (2020). A meta-analytic review of supply chain risk management: Assessing buffering and bridging strategies and firm performance. *Journal of Supply Chain Management*, 56(3), 66-87.
- Mingaleva, Z., Mironova, T., & Kolesnikova, J. (2019). Digital transformation and innovation management in the knowledge economy. *Journal of Innovation & Knowledge*, 4(3), 153-164. <https://doi.org/10.1016/j.jik.2019.05.001>
- Muthoni, P. (2017). *Impact of digitalization on the performance of fast-moving consumer goods firms in Kenya* [Master's thesis, University of Nairobi].
- Mwangi, J. (2022). Digitalization, operational resilience, and sustainable performance: A case of Kenyan manufacturing firms. *African Journal of Business and Management*, 14(3), 45-60.
- Mwazo, T. (2020). *The role of digital transformation in enhancing supply chain resilience in FMCG firms* [Master's thesis, Strathmore University].
- Myers, J. L., Well, A. D., & Lorch, R. F. (2010). *Research design and statistical analysis* (3rd ed.). Routledge.
- Myers, J. L., Well, A. D., & Lorch, R. F. (2010). *Research design and statistical analysis* (3rd ed.). Routledge.
- Net Zero Initiative. (2022). *Advancing sustainability through carbon reduction strategies in Kenya's manufacturing sector*. Kenya Association of Manufacturers.
- Nitzl, C., et al. (2016). Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models. *Industrial Management & Data Systems*, 116(9), 1849-1864.

- Nitzl, C., Roldan, J. L., & Cepeda, G. (2016). Mediation analysis in partial least squares path modeling: Helping researchers discuss more sophisticated models. *Industrial Management & Data Systems*, 116(9), 1849–1864. <https://doi.org/10.1108/IMDS-07-2015-0302>
- Ochieng, J. (2018). Supply chain resilience and organizational performance in pharmaceutical companies. *African Journal of Business and Economic Studies*, 5(1), 78-92.
- Onyango, P., & Ondiek, C. (2021). The role of operational resilience in sustainable business performance. *International Journal of Supply Chain Management*, 10(2), 37-50.
- Oracle. (2023). *Driving digital transformation in the manufacturing industry: Strategies for Kenya*. Oracle Corporation.
- Pettit, T. J., Croxton, K. L., & Fiksel, J. (2018). The evolution of resilience in supply chain management: A retrospective on research and practice. *Journal of Business Logistics*, 39(2), 38-56.
- Pettit, T. J., Croxton, K. L., & Fiksel, J. (2019). The evolution of resilience in supply chain management: A retrospective on ensuring supply chain resilience. *Journal of Business Logistics*, 40(1), 56-65.
- Porter, M. E., & Heppelmann, J. E. (2014). How smart, connected products are transforming competition. *Harvard Business Review*, 92(11), 64-88.
- Rafael, J., William, S., & Ivan, L. (2018). Sustainability and triple bottom line: Key issues for successful Spanish SMEs. *Environmental Quality Management*, 27(3), 47-60.
- Ringle, C. M., Wende, S., & Becker, J. M. (2015). *SmartPLS 3*. SmartPLS GmbH.
- Rocha, A., Farinha, L., & Santos, J. (2020). Digital transformation and business continuity: A framework for organizational resilience. *Journal of Business Research*, 112, 547-556.
- Rogers, D. L., Kleindorfer, P. R., & van Wassenhove, L. N. (2016). Sustainability and digitalization: The case of green supply chains. *Production and Operations Management*, 25(5), 890-905.
- Rogers, D. S., Lambert, D. M., & Knemeyer, A. M. (2016). Supply chain sustainability metrics and digitalization impact. *Journal of Business Logistics*, 37(2), 67-84.
- Sanches, M. C., & Santos, R. L. (2021). Digitalization and operational resilience: The role of cloud computing and virtualization. *Journal of Business Continuity & Emergency Planning*, 14(3), 215-230.
- Scholten, K., Scott, P. S., & Fynes, B. (2014). Mitigation processes—Antecedents for building supply chain resilience. *Supply Chain Management: An International Journal*, 19(2), 211-228. <https://doi.org/10.1108/SCM-06-2013-0191>
- Shahatha, M. (2021). The effect of digital transformation on supply chain resilience and performance. *Journal of Supply Chain Research*, 9(1), 85-102.
- Sharma, A., Adhikary, A., & Borah, S. B. (2020). COVID-19's impact on supply chain resilience. *Journal of Business Research*, 117, 203-213. <https://doi.org/10.1016/j.jbusres.2020.05.043>
- Shin, H., Lee, J., & Lee, H. (2019). Digitalization and customer experience: The role of AI and big data. *Journal of Service Research*, 22(4), 456-470.
- Singh, A., Klarner, P., & Hess, T. (2020). How do chief digital officers pursue digital transformation activities? The role of organization design parameters. *Long Range Planning*, 53(3), 101890.
- Singh, R. K., Gupta, A., & Gunasekaran, A. (2016). Resilient supply chains: A key to achieving sustainable performance. *International Journal of Production Research*, 54(23), 7010-7025.
- Singh, R., Gupta, A., & Kumari, P. (2016). The role of operational resilience in supply chain integration and organizational performance. *International Journal of Logistics Management*, 27(1), 23-40.
- Smith, M., Jones, L., & Brown, T. (2018). The impact of digitalization on supply chain sustainability: A review. *Journal of Sustainable Business*, 20(3), 45-60.
- Stewart, T. A. (1997). *Intellectual capital: The new wealth of organizations*. Doubleday.
- Sutrisno, A., Hakim, R., & Rahman, T. (2019). The role of operational resilience in enhancing sustainable performance: Evidence from emerging markets. *Journal of Business Research*, 108, 145-160.



- Sutrisno, A., Sari, A. R., & Rahman, A. (2019). Linking operational resilience, supply chain integration, and sustainable performance. *Journal of Business Continuity & Risk Management*, 12(3), 145-162.
- Tjoa, A. M., & Tjoa, S. (2016). The role of ICT in realizing sustainable development goals. *IFIP Advances in Information and Communication Technology*, 481, 3-13. [https://doi.org/10.1007/978-3-319-44447-5\\_1](https://doi.org/10.1007/978-3-319-44447-5_1)
- Tseng, M. L., Lim, M. K., & Tan, R. R. (2020). Sustainable supply chain management through digital transformation. *Industrial Management & Data Systems*, 120(3), 543-567.
- Tukamuhabwa, B. R., Eyaa, S., & Derek, F. (2011). Mediating variables in the relationship between market orientation and supply chain performance: A theoretical approach. *International Journal of Business and Social Science*, 2(22), 19-26.
- Tukamuhabwa, B. R., Eyaa, S., & Derek, F. (2011). Resource-based view and supplier performance: An empirical study. *Journal of Supply Chain Management*, 47(2), 13-25.
- UN Women & Kenya Association of Manufacturers (KAM). (2022). *Women in Manufacturing (WIM) Program: Increasing women's participation in the sector*. United Nations Women.
- Vakulenko, S., Hellström, D., & Hjort, K. (2020). Digitalization and supply chain resilience: A systematic review. *Journal of Supply Chain Management*, 58(3), 78-95.
- Vakulenko, Y., Hellström, D., & Hjort, K. (2020). Digitalization and supply chain resilience: A structured review. *Supply Chain Management: An International Journal*, 25(6), 687-703.
- van der Vegt, G. S., Essens, P., Wahlström, M., & George, G. (2015). Managing risk and resilience. *Academy of Management Journal*, 58(4), 971-980.
- Veldhoven, Z., Vanthienen, J., & Liao, Z. (2021). Digital transformation: Technology, business, and societal impact. *Technological Forecasting and Social Change*, 168, 120786. <https://doi.org/10.1016/j.techfore.2021.120786>
- Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, 122, 889-901.
- Vooren, M. (2023). Consumer perceptions of ESG transparency in the FMCG industry. *Journal of Consumer Marketing*, 40(1), 45-57.
- Wong, C. W. Y., Lirn, T. C., Yang, C. C., & Shang, K. C. (2019). Supply chain and external conditions under which supply chain resilience pays: An organizational information processing theorization. *International Journal of Production Economics*, 107610.
- Wu, H., Xu, Y., & Wang, M. (2018). ICT and sustainable development: A bibliometric analysis. *Sustainability*, 10(10), 3798. <https://doi.org/10.3390/su10103798>
- Yang, Y., Wang, J., & Li, X. (2020). Building operational resilience through digitalization: A case study approach. *Journal of Business Research*, 112, 570-580.
- Zhai, Y., Sun, W., Tsai, S. B., Wang, Z., Zhao, Y., & Chen, Q. (2018). An empirical study on entrepreneurial orientation, absorptive capacity, and SMEs' innovation performance: A sustainable perspective. *Sustainability*, 10(2), 314.
- Zhao, X., et al. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2), 197-206.
- Zhao, X., Lynch, J. G., & Chen, Q. (2010). Reconsidering Baron and Kenny: Myths and truths about mediation analysis. *Journal of Consumer Research*, 37(2), 197-206. <https://doi.org/10.1086/651257>