Drivers of Enhanced Supply Chain Circularity Performance with Green Supply Chain Resilience as Intervening Through Resource-Based View (RBV) & Dynamic Capabilities Theory (DCT)

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ABSTRACT

Introduction/Main Objectives: The transition toward a circular economy requires supply chains to achieve higher levels of resilience, adaptability, and sustainability. This study investigates the determinants of enhanced supply chain circularity performance by integrating perspectives of digital technology adoption advantages, networking advantages, and green infrastructure resources. Building on the resource-based view and dynamic capabilities theory, the research emphasizes the mediating role of organizational agility and green supply chain resilience in driving circular outcomes. A quantitative research design was deployed using survey data collected from supply chain and sustainability managers across manufacturing and logistics industries.
Background Problems: Modern supply chains continue to suffer from limited visibility across tiers, high barriers to adopting sustainable and digital practices, organizational inertia, fragmented resilience–sustainability strategies, and data and collaboration gaps—collectively undermining their adaptability and circular performance.
Novelty: Current research novelty is the Integration of Triple Bottom-Line Outcomes (Enhanced Supply Chain Circularity Performance, spans environmental, operational, and economic dimensions) such as reverse logistics, resource efficiency, partnerships, performance. This holistic framing is distinct which fills a specific gap between DCT and RBV.
Research Methods: Multi-stage Cluster with Stratified Random Sampling used and SEM-AMOS) was applied to test the hypothesized relationships among constructs.

Findings/Results: The findings demonstrate that digital technology adoption, networking, and green infrastructures significantly contribute to building green supply chain resilience, which in turn positively influences circularity performance. Furthermore, organizational agility is identified as a critical mediating capability that enables firms to rapidly reallocate resources, foster innovation, and respond effectively to sustainability challenges.
Conclusion: The study concludes that digitalization, networking, and green infrastructure enhance circular supply chain performance through agility and resilience, offering both theoretical contribution to RBV–DCT integration and practical guidance for sustainable logistics management.
Implementation Potential: This study provides both theoretical and managerial contributions. Theoretically, it enriches circular economy and supply chain management literature by linking agility and resilience with circular performance outcomes. Practically, the findings offer actionable insights for managers to prioritize digitalization, cross-network collaboration, and green infrastructure investments as enablers of circularity. By highlighting the interconnectedness of agility, resilience, and sustainability practices, this research offers a comprehensive model for achieving enhanced supply chain circularity in the era of environmental and market uncertainty.

Keywords: Supply Chain Circularity; Organizational Agility; Resilience; Digital Technology; Sustainability.
JEL Classification: L23, M11, O32, Q01, Q56

1. INTRODUCTION

Climate change, limited natural resources, and increasing stakeholder pressure require companies to adopt sustainable supply chain practices. One increasingly important approach is Supply Chain Circularity, which aims to minimize waste and maximize resource value through reduce, reuse, recycle, and remanufacture (Geissdoerfer et al., 2017). However, to achieve optimal circular performance, companies require not only internal resources but also adaptive capabilities to address external uncertainties. Therefore, Green Supply Chain Resilience (GSCR) is a key factor in bridging the influence of resources and capabilities on improving supply chain circularity performance, especially for Large-Scale Enterprises (LSEs) in Indonesia, which face the complexities of the global market.

Despite the widespread adoption of green and circular supply chains, many companies still face obstacles in integrating sustainability strategies with supply chain resilience. The Resource-Based View (RBV) theory explains how valuable, rare, inimitable, and non-substitutable (VRIN) resources can be a source of competitive advantage (Barney, 1991). Meanwhile, Dynamic Capabilities Theory (DCT) emphasizes an organization's ability to integrate, build, and reconfigure

internal competencies to respond to environmental changes (Teece et al., 1997). However, there is limited research examining how the interaction between the RBV and DCT, with GSCR as an intervening variable, can drive improved supply chain circularity performance in the Indonesian context.

Based on the background and problem formulation above, the research questions proposed are: What are the main driving factors that improve supply chain circularity performance in large companies in Indonesia? What is the role of green supply chain resilience as an intervening variable in the relationship between company resources and capabilities and circular supply chain performance? And How can the integration of the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) explain the mechanisms for improving supply chain circularity performance in the context of Indonesian LSEs?

This research aims to: (1) identify the main factors influencing improved supply chain circularity performance in large companies in Indonesia, (2) analyze the role of green supply chain resilience as an intervening variable in strengthening the relationship between RBV and DCT and circular performance, and (3) develop a theoretical framework that integrates RBV and DCT to provide a more comprehensive understanding of green and circular supply chain strategies in an era of business uncertainty. Theoretically, this research is expected to enrich the literature on green supply chain management by integrating the RBV and DCT perspectives, as well as increasing understanding of the role of GSCR as a mediating variable. Practically, the research findings can serve as a guide for managers of large companies in Indonesia in designing more resilient, green, and sustainable supply chain strategies. Furthermore, this research will benefit policymakers by providing empirical evidence on the importance of resilience in supporting the transition to a circular economy in Indonesia.

Although the adoption of digital technology has been proven to improve supply chain efficiency and resilience, previous research tends to emphasize general aspects of supply chain resilience without considering the sustainability dimension integrated into green supply chain resilience (GSCR). However, in the context of global pressures on sustainable business practices, companies are not only required to be resilient to disruptions but also to ensure environmentally friendly practices that support a circular economy. Furthermore, most studies linking digital

technology adoption to supply chain resilience are still dominated by developed country contexts, while empirical evidence in developing countries like Indonesia remains very limited. This situation creates a research gap regarding how digital technology adoption can act as a dynamic resource and capability (RBV & DCT) that drives the strengthening of GSCR, ultimately improving the circularity performance of supply chains in large-scale companies in Indonesia. Therefore, further research is needed to comprehensively examine this relationship, thereby providing theoretical and practical contributions to the development of green and sustainable supply chain strategies.

2. LITERATURE REVIEW

2.1 The Relationship between Digital Technology Adoption advantages on Green Supply Chain Resilience

The adoption of digital technologies is increasingly recognized as a critical driver of green supply chain resilience (GSCRes) amidst contemporary disruptions, such as the COVID-19 pandemic and other unforeseen events. Exploring the relationship between digital technology adoption and its benefits for green supply chain resilience reveals multifaceted insights into improving operational efficiency while promoting environmental sustainability. Numerous studies confirm that digital technologies, including Industry 4.0, the Internet of Things (IoT), artificial intelligence (AI), and blockchain, act as facilitators that strengthen supply chain resilience, enabling organizations to effectively navigate risks while adhering to environmentally friendly practices.

Technology integration improves visibility and collaboration across the supply chain, facilitating real-time decision-making and more agile responses to disruptions. For example, research shows that the implementation of IoT and blockchain not only enhances transparency and traceability in the supply chain but also contributes to environmental performance by optimizing resource utilization and reducing waste in operations (Yin, 2022; Cui et al., 2022; Piprani et al., 2024). The implementation of these advanced technologies provides a dual benefit to organizations: enhancing operational resilience while supporting sustainable practices, which are

critical to achieving long-term goals in volatile market conditions (Kang et al., 2024; Akbari & Hopkins, 2022).

Furthermore, the concept of green supply chain management (GSCM) is closely linked to the adoption of digital technologies. Recent findings indicate that GSCM not only benefits from digital transformation but also actively influences organizational resilience to supply chain shocks. As noted in the literature, the integration of digital tools facilitates better knowledge sharing among stakeholders, ultimately driving innovation in green practices and improving operational performance (Yuan et al., 2023; Irfan et al., 2022). The collective adoption of digital technologies among supply chain partners fosters a culture of collaboration necessary for achieving sustainability amidst a volatile environment (Pan et al., 2023; Lerman et al., 2022).

Furthermore, frameworks developed to understand the link between digitalization and green practices emphasize the need for a strategic approach to technology implementation. One study suggests that successful GSCM requires coordinated efforts to align digital transformation initiatives with environmental goals, thereby improving performance (Trivellas et al., 2020). Recognizing this synergy is crucial as organizations strive to meet environmental, social, and governance (ESG) criteria while enhancing risk resilience (Wang et al., 2023; Nisar et al., 2022). The impact of digital technology on GSCRes can also be contextualized within a broader discussion of supply chain dynamics. Digital integration, particularly when aligned with sustainability practices, has been shown to significantly mediate the effect of environmental uncertainty on organizational resilience (Ali et al., 2024; Liu et al., 2023). For example, organizations that implement advanced analytics and big data applications are better equipped to anticipate disruptions and respond proactively, thus strengthening their resilience to unexpected challenges (Metwally et al., 2024; Akbari & Hopkins, 2022). These findings broaden the understanding of GSCRes beyond technology implementation to encompass strategic decision-making processes informed by data-driven insights.

The exploration of digital technologies in building resilience also encompasses the broader implications of technology adoption across various industries and geographic contexts. Research in developing countries, for example, shows that digital technologies play a crucial role in improving sustainability and operational efficiency in supply chains (Fatih & Junejo, 2024).

Specific strategies implemented across various contexts highlight the flexibility and adaptability of digital solutions in addressing unique local challenges while maintaining a commitment to environmental stewardship.

Furthermore, leadership and organizational culture are crucial for the successful adoption of digital technologies and green practices in the supply chain. Leadership that prioritizes innovation and sustainability creates a conducive environment for technology adoption, thereby enhancing resilience (Chowdhury et al., 2022; Chelh & Ababou, 2023). This leadership-centric perspective emphasizes the importance of building an organizational culture that encourages experimentation with digital tools and sustainable practices, ensuring supply chains remain resilient while aligning with the organization's overall sustainability goals.

In conclusion, the synergy between digital technology adoption and green supply chain resilience underscores the importance for contemporary organizations of integrating digital innovation with the sustainability paradigm. The roadmap outlined by recent studies demonstrates that successful integration not only enhances operational capabilities but also ensures long-term sustainability. Therefore, organizations need to consider a comprehensive strategy encompassing digital transformation, collaborative practices, and environmental awareness to effectively navigate the complexities of today's rapidly evolving supply chain landscape.

H1: The Digital Technology Adoption Advantages is designed to Increase Green Supply Chain Resilience

2.2 The Relationship Between Digital Technology Adoption and Organizational

The relationship between digital technology adoption and organizational agility is an increasingly relevant area of study as companies strive to adapt to rapidly changing environments driven by technological advancements. Digital technology adoption refers to the integration of digital tools and practices that improve business processes, while organizational agility is an organization's ability to quickly adapt to market changes and uncertainty. Numerous scientific papers demonstrate that digital technology adoption not only streamlines operations but also acts as a catalyst for organizational agility, providing companies with a competitive advantage in dynamic markets.

Digital technology adoption is fundamental to enhancing organizational agility, as demonstrated by numerous studies. For example, research highlights that a proactive approach to technology helps organizations particularly in the aviation industry predict external changes and rapidly improve services to meet evolving customer needs. This demonstrates a direct correlation between the use of digital tools and the development of agile capabilities in a highly competitive environment (Paethrangsi et al., 2023). Furthermore, Yamin and Murwaningsari emphasized that digital technology significantly impacts organizational agility, making it a crucial factor bridging leadership with business performance outcomes (Yamin & Murwaningsari, 2023). This relationship is further reinforced by other research identifying digital technology as a facilitator of risk mitigation and increased responsiveness, supporting both operational and organizational agility (Rubino et al., 2023).

The dynamic nature of contemporary business ecosystems demands a broader understanding of how digital technology shapes organizational structures and processes. Effective employee management and feedback mechanisms are crucial for building an agile work culture during times of organizational transformation. This agile performance management framework represents a paradigm shift that emphasizes adaptability and resilience as key organizational pillars (Widjaja, 2023). The implications of this are profound; when companies adopt agile management practices enhanced by digital technology, their ability to respond to market fluctuations and operational challenges becomes increasingly evident.

Significantly, research on transformational leadership demonstrates that its interaction with digital technology adoption is crucial in fostering organizational agility. Probojakti et al. state that transformational leadership combined with digital innovation plays a crucial role in building organizational agility and resilience, particularly in the banking sector, which demands rapid adaptation to survive in a hypercompetitive landscape (Probojakti et al., 2024). This evidence suggests that organizations investing in digital transformation not only strengthen their agility but also align strategic objectives with new leadership paradigms that drive performance.

Technological innovation, as outlined by several academics, forms a crucial link in achieving organizational agility. Satar et al. highlight the substantial correlation between technological innovation and agility, arguing that organizations with advanced digital

infrastructure can respond to change more effectively, thereby gaining a competitive advantage in their respective industries (Satar et al., 2024). Thus, the discourse on technological capabilities emphasizes the need for organizations to utilize digital tools not only for operational efficiency but also to foster agility as a strategic asset.

Experience in the banking sector demonstrates how digital adoption correlates with increased organizational resilience and agility. Recent research indicates that deeper integration of digital technology enables organizations to maintain a competitive advantage amidst complex market environments. Achieving efficiency and adaptability through digitalization enables companies to survive even in disruptive conditions ("Building Organizational Resilience by Developing Customer Orientation, Digital Adoption, and Organizational Agility: An Empirical Study in the Indonesian Banking Industry," 2023). This phenomenon highlights the multiplicative effect of digital technologies on organizational agility, where strong digital capabilities correlate with higher responsiveness and flexibility.

However, this relationship is not always linear. It is important to note that not all studies explicitly state that the adoption of digital technology automatically increases an organization's internal agility. Kim and Choi, for example, show that while digital tools are crucial, they do not necessarily increase internal agility, particularly in the context of generative AI applications (Kim & Choi, 2024). This highlights a gap in understanding the mechanisms by which digital adoption translates into greater organizational agility and suggests that other factors, such as organizational culture and employee engagement, play a crucial role. The role of information and communication technology (ICT) in supporting organizational agility is also widely discussed. In educational organizations, increased use of ICT has increased employee knowledge and awareness, fostering an agile work environment (Bakhshalipour et al., 2024). A culture that supports the use of these technologies increases employee efficiency, which directly impacts organizational performance and agility.

Furthermore, various studies confirm that organizational agility can act as a mediating variable in the relationship between digitalization and organizational performance. Research by Yosufzai and Siddiqui shows that an agile organizational framework is a prerequisite for achieving total quality management performance, as it integrates technology management practices with

agility principles (Yosufzai & Siddiqui, 2023). This demonstrates that for companies to maximize their digital investments, they must build an agile infrastructure capable of adapting to and effectively utilizing these technologies.

Investments in digital capabilities must also be aligned with corporate culture, which significantly shapes how technology is integrated and utilized. Findings indicate that a strong emphasis on culture, along with digital tools, positively contributes to the success of digital transformation initiatives and, in turn, to organizational agility (Fangqi et al., 2023). Organizations that emphasize cultural readiness for digital change often report higher levels of agility, with employee behaviors aligned with strategic digital goals.

In reviewing the existing literature, several scholars argue for a deeper understanding of how digital transformation interacts with other organizational factors such as leadership, talent management, and knowledge transfer mechanisms. For example, Ramadan et al. concluded that adopting digital leadership enhances organizational agility and facilitates effective digital transformation, which is crucial for business model innovation amidst uncertain market conditions (Ramadan et al., 2023). This reinforces the view that organizational agility is not simply a byproduct of digitalization but a key driver in navigating and achieving success in the complex modern business landscape.

Furthermore, the application of dynamic capabilities, a framework that underpins digital technology, provides a comprehensive perspective on organizational agility. Dong emphasizes the application of dynamic capabilities as a pathway for organizations to adapt rapidly through strategic innovation and digital agility, particularly in the manufacturing context (Dong, 2024). This concept is increasingly relevant as organizations leverage technology to enhance adaptive capacity and ultimately achieve strategic objectives in rapidly changing environments.

In conclusion, the relationship between digital technology adoption and organizational agility is a multifaceted construct influenced by various factors, including leadership, culture, employee engagement, and strategic alignment. Numerous studies support the premise that organizations that adopt digital technologies are better able to achieve agility. However, realizing these benefits depends heavily on a deeper understanding of the contextual elements that facilitate their integration and implementation. As organizations move toward digital transformation, they

must cultivate an agile culture that utilizes technology as a catalyst for improved performance and adaptability.

H2: Digital Technology Adoption is Designed to Increase Organizational Agility

2.3 The Relationship Between Networking Advantages and Organizational Agility

The relationship between networking advantages and organizational agility is a crucial aspect of contemporary management theory and practice. Organizations increasingly recognize that the ability to quickly adapt to environmental changes is crucial for maintaining competitive advantage, particularly amidst technological disruption and market fluctuations. Agility, defined as an organization's capacity to respond quickly to market demands while seizing competitive opportunities, is closely related to a firm's network resources. This paper synthesizes recent literature to provide a comprehensive overview of how networking advantages can enhance organizational agility.

One fundamental premise is that network advantages facilitate access to resources and information essential for rapid adaptation. Liu & Yang (2020) argue that networks provide crucial resources that can mitigate constraints, thereby helping firms achieve their goals more effectively. Specifically, collaboration within networks can improve resource allocation and utilization, which in turn strengthens organizational agility. In this context, firms can engage in more effective information exchange and collaborative learning, thereby fostering dynamic capabilities aligned with changing business needs. The ability to leverage external expertise and knowledge through networks strengthens a firm's ability to innovate and adapt quickly, confirming that strong networks are integral to achieving agility.

Furthermore, organizational flexibility—a key component of agility—often depends on the resources a firm can mobilize from its network. The moderating role of organizational flexibility in enhancing supply chain agility underscores this interconnectedness. Yamin et al. (2024) demonstrated the significant influence of organizational flexibility on the relationship between supply chain agility and resilience, suggesting that firms can enhance both agility and resilience through operational flexibility. When firms build strategic partnerships and alliances, they gain relational capital that enhances operational flexibility and supports agile responses to demand

fluctuations and technological changes. This is particularly relevant for small and medium-sized enterprises (SMEs), which may be limited in internal resources but can compensate through strategic alliances (Arsawan et al., 2022).

Furthermore, the notion of competitiveness through social networks is demonstrated in the findings of Khan et al. (2020), who highlight that social capital including trust and information sharing—increases a firm's agility in strategic engagement. The interaction between a firm's internal competencies and external relationships underscores the importance of a network-based approach to fostering agility. Networks not only build trust and collaboration but also facilitate innovation and the ability to respond to competitive threats, thus strengthening their role as a foundation for organizational agility.

It's also important to note that knowledge management is an integral factor when discussing the benefits of networks. Lemańska-Majdzik and Okręglicka (2024) assert that competent knowledge management within an organizational framework enhances flexibility and agility. Knowledge-based resources enable companies to improve processes, innovate in offerings, and strengthen their competitive position. This demonstrates the dual benefits of networks: they not only provide tangible resources but also facilitate the flow of information necessary for agile decision-making and action.

The impact of flexible work arrangements, as explored by Marumpe et al. (2023), also provides additional insights into the interaction between networking advantages and organizational agility. Flexible work policies create an environment that fosters employee engagement and satisfaction—critical elements for organizational performance. The relationship between flexibility and job performance, as highlighted by numerous studies, supports the argument that well-structured internal and external networks significantly enhance a company's adaptive capacity. This is consistent with the modern organizational paradigm that places employee well-being as an integral part of agility and resilience.

Furthermore, the link between organizational health and strategic flexibility further demonstrates how networks influence agility. Alfy et al. (2023) demonstrated that a healthy organizational environment, supported by strong interorganizational relationships, fosters adaptability because firms can leverage shared values and collaborative practices to address

challenges. The cyclical relationship between organizational well-being, network engagement, and agility demonstrates a holistic perspective on how firms can thrive in dynamic environments by maintaining robust relational networks.

Emerging themes in the literature also indicate that digital transformation and technology adoption are increasingly playing a crucial role in enhancing organizational agility through networking advantages. In the context of Industry 4.0, companies that leverage technological capabilities in conjunction with their network resources can better position themselves to respond to changing market conditions (Aka, 2023). Thus, a company's technological capabilities—strengthened through networking—become a core part of the agility equation.

A focus on innovation is a key aspect of this discussion. Awais et al. (2023) explain that strategic flexibility mediates the relationship between network engagement and performance, demonstrating that companies that effectively manage their network relationships tend to foster an innovative organizational culture, which in turn supports agility. When companies facilitate an environment where knowledge flows smoothly across networks, the potential for innovation increases, essentially laying the foundation for agility. By synthesizing these dimensions, it becomes clear that organizational agility is not solely a function of internal capabilities but is also strongly influenced by external networking advantages. Companies that strategically engage with networking ecosystems better position themselves to leverage resources, share knowledge, and innovate. This insight underscores the importance of ongoing investigation and emphasis on building and maintaining interorganizational relationships embedded in an agility strategy.

Thus, as organizations navigate the evolving business landscape, recognizing and maximizing the interplay between networking advantages and organizational agility will enhance their competitive position and ensure long-term sustainability. At the heart of this relationship lies the leveraging of existing networks and the creation of new collaborations, ensuring that agility becomes a fundamental characteristic, not simply a reactive response to uncertainty.

In conclusion, the relationship between networking advantages and organizational agility is underpinned by mutual benefits in the form of resource access, flexibility, and innovation. Networks serve as a crucial facilitator that strengthens organizational agility, especially when combined with effective knowledge management and an organizational culture that supports

collaboration. Therefore, companies must prioritize building strong networks to effectively navigate the complexities of the contemporary market landscape.

H3: Networking Advantages is Design to Increase Organizational Agility

2.4 The Relationship Between Green Infrastructure Resources with Organizational Agility

Exploring the relationship between green infrastructure resources and organizational agility provides valuable insights into how sustainable practices and innovative management approaches can enhance an organization's ability to adapt and thrive in a rapidly changing environment. Organizational agility, defined as an organization's ability to respond quickly and effectively to market changes and internal dynamics, intersects with components of green infrastructure both through physical assets and organizational capabilities that support agility.

Green infrastructure, which includes sustainable land management, urban greening, and water management systems, can strengthen organizational agility. These practices foster resilience within organizational structures, enabling companies to respond to external pressures, regulatory changes, and increasingly sustainability-oriented consumer preferences. Research demonstrates a positive relationship between effective resource management including green infrastructure and organizational performance. This highlights the role of organizational agility in adapting to change and its positive outcomes in sectors such as healthcare and hospitality (Devie et al., 2023; Akkaya & Mert, 2022).

Furthermore, organizational agility is significantly influenced by the use of information technology (IT) and innovative practices. Studies show that organizations that optimize IT capabilities can increase their agility, accelerate internal processes, and respond more quickly to market needs (Gao et al., 2020; Tomomitsu & Moraes, 2021). IT provides the necessary infrastructure for efficiently implementing green practices. This relationship illustrates that adopting IT solutions not only supports agile responses but also increases the effectiveness of green initiatives, resulting in better sustainability outcomes within an organization's operational framework (Tomomitsu & Moraes, 2021; Ismail et al., 2024).

Integrating employee perceptions and engagement is also crucial in building an agile organization. Research shows that perceptions of organizational agility increase workforce

engagement; employees who perceive their organization as agile tend to be more motivated and committed (Ludviga & Kalviņa, 2023). This correlation indicates that establishing a culture of agility can accelerate the achievement of environmental goals through green infrastructure, while simultaneously improving overall performance by strengthening employee engagement and morale (Ludviga & Kalviņa, 2023; Khairy et al., 2023). The relationship between employee empowerment and organizational agility emphasizes the importance of internal cultural factors in the effective implementation of agility and sustainability strategies (Shuhaime & Isa, 2023; Stei et al., 2024).

Leadership style also significantly influences organizational agility. Transformational leadership, which emphasizes inspiration and change-oriented practices, has been shown to be positively correlated with increased organizational agility (Fachridian et al., 2024). This type of leadership can foster initiatives that integrate green infrastructure practices, as leaders are able to motivate teams to innovate and embrace agility in addressing environmental challenges. Aligning a supportive organizational culture with strong leadership not only builds an agile workforce but also fosters a commitment to sustainability, enabling the simultaneous achievement of organizational and environmental goals (Arifin & Purwanti, 2023; Khalid et al., 2020).

Organizations must also recognize the importance of dynamic capabilities extended to sustainability initiatives. Agility enables organizations to identify and seize new opportunities in sustainable practices, while adapting quickly when necessary. This complex environment demands the continuous development of dynamic capabilities that integrate organizational learning and knowledge management to maintain a balance between flexibility and strategic focus (Li, 2022; Namjoo & Jafari, 2021). As green infrastructure adapts and reallocates resources to maintain competitive advantage, it can serve as both a strategic asset and a mechanism for achieving agility (Akkaya & Mert, 2022; Munteanu et al., 2020).

Furthermore, the link between organizational agility and green infrastructure is reflected in the literature on digital transformation and environmental management. Organizational agility has been identified as a critical enabler for successful digital transformation, which often aligns with sustainable practices (Gong & Ribière, 2023; Zhang et al., 2023). As organizations integrate digital capabilities into their operations, they gain new opportunities to implement green initiatives

that not only reduce costs but also enhance agility. This underscores the potential of agile organizations to become leaders in environmental management, creating value through sustainability efforts in response to stakeholder and regulatory demands (Zhang et al., 2023; Alshamsi et al., 2024).

In sectors characterized by high volatility and the need for rapid innovation, such as healthcare and technology, integrating responsive infrastructure with agile methodologies is crucial for success. Building robust systems based on sustainable practices contributes to organizational resilience, which is particularly evident in the post-COVID-19 recovery phase, where agility must be combined with sustainability to meet new operational realities and consumer expectations (Devie et al., 2023; Akkaya & Mert, 2022). Therefore, implementing green infrastructure is not simply an add-on to operational protocols, but rather a critical component that underpins organizational agility.

In conclusion, the integration of green infrastructure resources and organizational agility presents a comprehensive approach to modern organizational management. As external pressures for sustainability increase, the combination of agile methodologies with green practices will become imperative. Adapting to these practices requires a combination of dynamic capabilities, a shift in organizational culture, effective leadership, and a deep understanding of how technology can facilitate rapid response. Thus, the interconnectedness between green infrastructure and organizational agility is significant and essential for strengthening resilience and long-term performance in a competitive market landscape.

H4: Green Infrastructure Resources is Designed to Increase Organizational Agility

2.5 The Relationship between Green Infrastructure Resources with Green Supply Chain Resilience

The relationship between green infrastructure resources and green supply chain resilience (GSCR) is a rapidly growing area of research that emphasizes the crucial link between environmental sustainability initiatives and supply chain resilience. Green supply chain management (GSCM) is gaining increasing attention as consumers, businesses, and governments demand more environmentally friendly practices. Increasing compliance with sustainability

mandates reflects a shift toward integrating green principles into supply chain management and demonstrates the close relationship between environmental management and supply chain resilience (Jing et al., 2023; Chen & Xiang, 2023).

Examining supply chain resilience, particularly in the agricultural sector, it is clear that the implementation of green practices serves as a buffer against disruption. GSCR encompasses the supply chain's ability to recover and adapt quickly to disruptions while maintaining sustainable operations (Hsieh et al., 2023). This relationship is based on improving operational practices that support sustainability, such as the implementation of green logistics, which contributes significantly to resilience through increased resource efficiency (Issa et al., 2024).

Furthermore, the adoption of green innovations has been identified as a key factor driving supply chain resilience. Research shows that integrating green innovations into supply chain practices can help mitigate risks associated with environmental disruptions and improve overall performance (Issa et al., 2024). This is particularly relevant in the context of disruptions caused by events such as the COVID-19 pandemic, where networks that adopt green practices have shown a lower negative impact on performance (Fasan et al., 2021). Integrating environmental considerations into supplier selection and procurement processes also strengthens resilience by ensuring that organizations can respond quickly to unforeseen circumstances (Ji et al., 2020).

A comprehensive analysis of the implications of green supply chain practices reveals significant insights into how these initiatives strengthen resilience. For example, effective green supplier integration through collaboration focused on environmental outcomes—has been shown to positively impact both the proactive and reactive dimensions of supply chain resilience (Ji et al., 2020). Such integration strengthens the operational sustainability of supply chains, thereby reducing vulnerability to external shocks while enhancing long-term viability (Ya et al., 2023).

The role of technology cannot be overlooked. Advances in digitalization, particularly through advanced technologies such as blockchain and artificial intelligence, have transformative potential for green supply chains by enabling real-time data sharing and increasing transparency (Piprani et al., 2024). This technology helps simplify operations, reduce waste, and strengthen supply chain resilience by creating more adaptive and flexible organizational structures (Zainurrafiqi & Gazali, 2024). Furthermore, research on the relationship between digital platforms,

sustainability, and supply chain performance shows that companies that utilize advanced technology solutions are better prepared to adapt to new challenges in a rapidly changing market landscape (Zaman et al., 2022).

The human element is also a crucial factor in adopting green practices in the supply chain, including investments in green human capital and innovation capabilities (Ya et al., 2023). A workforce skilled in sustainability and green logistics practices can create a culture that prioritizes resilience. Employee engagement in sustainability initiatives through training and awareness-raising programs—not only improves organizational performance but also fosters a resilient mindset in the face of operational challenges (Yamin, 2021). Collaborative efforts throughout the supply chain, underpinned by trust and knowledge sharing, lead to a more integrated approach to sustainability and strengthen an organization's ability to withstand and recover from ecological and economic disruptions (Chen & Ye, 2023).

Strategically, the correlation between green infrastructure resources and GSCR also relates to the need for policies that support sustainable practices (Wang et al., 2022). Policymakers play a crucial role in establishing a framework that encourages companies to adopt green measures, thus positioning them for a more competitive position while supporting environmental stewardship. A robust policy environment encourages companies to integrate resilience into their operational ethos, preparing them for unexpected challenges, and ensuring supply chains remain responsive and adaptive (Eryarsoy et al., 2022).

Furthermore, empirical studies show that managing supply chain resilience is increasingly considered crucial for achieving competitive advantage. Organizations that build resilience through green practices not only conserve resources but also develop systems that can adapt to new market conditions, thereby maintaining profitability (Zhang et al., 2023). This resilience often leads to improved performance across multiple supply chain dimensions, including efficiency, sustainability, and economic viability, confirming the integral link between GSCM and operational resilience (Yamin, 2021).

In the context of the transition to more sustainable supply chains, businesses are encouraged to conduct comprehensive evaluations of existing practices to identify opportunities for increased resilience while aligning with green objectives (Ayyıldız, 2021). Identifying

weaknesses and vulnerabilities in the supply chain allows for more targeted strategies to strengthen the organization against future disruptions, ultimately resulting in a more sustainable operating model (Chen, 2022).

In conclusion, the link between green infrastructure resources and green supply chain resilience reflects a broader shift toward sustainable business practices. As the landscape becomes increasingly complex, characterized by environmental challenges and market uncertainty, strategic alignment between green initiatives and supply chain resilience becomes crucial. This alignment not only strengthens the supply chain against disruption but also positions the organization in a more advantageous position in the market, generating both ecological and economic benefits. Further research is needed to continue exploring these dynamics to provide applicable insights that enable companies to leverage green infrastructure to strengthen their supply chains.

H5: Green Infrastructure Resources is Designed to Increase Green Supply Chain Resilience

2.6 The Relationship Between Organizational Agility with Green Supply Chain Resilience

The profound impact of organizational agility on green supply chain resilience (GSCR) has emerged as a crucial area of research, particularly within the contemporary discourse on sustainability and organizational performance. Supply chain agility refers to a supply chain's ability to rapidly identify, assess, and respond to change while maintaining an efficient and effective operational framework. This qualitative attribute is increasingly recognized as a fundamental driver not only in optimizing performance but also in enhancing resilience to external disruptions. The synergy between supply chain agility and resilience capabilities becomes even more meaningful when viewed through a sustainability lens, as the emphasis on environmentally friendly practices in supply chain management increases.

Research supports a significant positive relationship between supply chain agility and resilience, particularly in turbulent and unpredictable environments. For example, Hsieh et al. highlighted that supply chain agility helps organizations recover quickly from disruptions while achieving sustained growth post-recovery (Hsieh et al., 2023). Their findings are corroborated by other studies demonstrating the need for organizations to develop resilience capabilities while transitioning to sustainable practices. Jamaludin et al. asserted that agility acts as a facilitator for

increased resilience, particularly in small and medium-sized enterprises (SMEs) during crises (Jamaludin et al., 2023). This aligns with Queiroz et al.'s view, which emphasizes that a lack of flexibility and agility undermines a company's ability to operate optimally, regardless of resilience metrics (Queiroz et al., 2023).

Furthermore, the relationship between agility and sustainability reflects a transformative shift in organizational strategy triggered by contemporary challenges, such as climate change and global disruption. Wang and Wang argue that enhancing supply chain agility is not simply a response to disruption, but rather a proactive strategy for fostering sustainability and long-term performance, particularly in the context of a post-COVID-19 economy (Wang & Wang, 2023). This perspective is crucial as organizations are increasingly required to integrate sustainability goals with operational needs. In this regard, leveraging technological advancements combined with agile practices has emerged as a facilitator of a sustainable operational framework, supporting the argument that digitalization can strengthen both agility and resilience (Piprani et al., 2024).

Understanding these dynamics requires acknowledging the multifaceted nature of resilience in supply chains. As organizations move toward a more sustainable and resilient framework, the interdependence between agility, flexibility, and resource management becomes increasingly apparent. Research by Li et al. demonstrates how sustainable sourcing underpins agility, demonstrating that organizations relying on agile supply chains are better prepared for disruption, thus enhancing their resilience (Li et al., 2022). This relationship is even more relevant in the context of Industry 4.0, where adaptive supply chains leveraging data analytics and information technology have proven capable of maintaining performance amid disruptive crises (Isaid et al., 2024).

The literature advocates an integrative approach to resilience, where organizations align their agility strategies with green supply chain practices. Piprani et al. emphasize that adopting an integrative perspective prevents organizations from engaging in suboptimal practices and facilitates greater synergy between these concepts (Piprani et al., 2024). Therefore, organizations are encouraged to optimize supply chains by integrating lean, agile, and resilient practices with sustainability principles—a view that aligns with literature emphasizing the importance of holistic strategies for achieving long-term success in supply chains (Gupta et al., 2024).

The importance of resilience as a mitigation measure during disruption is reinforced by the findings of Cherian et al., who emphasize the critical role of IT capabilities, agility, and collaborative frameworks in maintaining construction supply chain performance amidst crises (Cherian et al., 2022). Naimi et al. also assert that organizations that integrate resilience into their operations can benefit from improved performance, ultimately enabling supply chains to be more responsive and adaptive (Naimi et al., 2020). This conclusion is even more relevant given the disruption triggered by the COVID-19 pandemic, which exposed vulnerabilities in traditional supply chain frameworks.

Other research reinforces the link between agility, resilience, and sustainability. Aslam et al. emphasize that supply chain ambidexterity the ability to balance flexibility and stability mediates the positive relationship between agility and resilience, thereby strengthening organizational sustainability amid disruption (Aslam et al., 2020). Furthermore, Katsaliaki et al.'s investigation Research on supply chain disruption and resilience identifies various organizational antecedents that foster agility and strengthen resilience, suggesting that organizations should strategically invest in capabilities that foster agile responses to unexpected challenges (Katsaliaki et al., 2021).

Cumulatively, these studies present a cohesive narrative that emphasizes the indispensable role of organizational agility in fostering green supply chain resilience. Through operational and strategic adaptability, organizations can withstand environmental shocks while emerging as more sustainable and competitive. Thus, resilience is closely linked to agility and sustainability efforts. Companies that prioritize these three elements have the potential to achieve better performance, demonstrating that integrating agile methodologies into resilience frameworks is a necessity in the evolving supply chain management landscape.

In conclusion, the intersection of organizational agility, green supply chain resilience, and sustainability represents a critical frontier in supply chain management research and practice. Organizations seeking to achieve competitive advantage amidst uncertainty must adopt agility as a core capability and integrate it with sustainability initiatives to build resilient supply chains capable of thriving in an increasingly complex global environment. The practical implications call

for a strategic reorientation that prioritizes agility and sustainability as interconnected pillars of modern supply chain success.

H6: Organizational Agility is Designed to Increase Green Supply Chain Resilience

2.7 The Relationship Between Green Supply Chain Resilience with Enhanced Supply Chain Circularity Performance

The exploration of green supply chain resilience (GSCR) is crucially linked to modern supply chain management, which is fundamentally underpinned by the principles of sustainability and the circular economy (CE). Numerous studies have outlined how increasing resilience in green supply chains can significantly improve supply chain circularity performance. Green supply chains emphasize sustainable practices in procurement, production, consumption, and disposal, contributing to a more integrated circular economy model that minimizes waste and improves resource efficiency.

Recent literature indicates that the implementation of sustainable supply chain practices is a key driver in driving the achievement of circular economy goals. Vishwakarma et al. assert that sustainable supply chain management (SSCM) practices act as a catalyst in the transition to a circular economy by integrating flexibility and responsiveness into supply chain operations (Vishwakarma et al., 2022). They propose an empirical model demonstrating that SSCM adoption enhances circularity capacity by optimizing resource utilization and minimizing waste generation through planned recycling and reuse strategies.The reciprocal relationship between circular supply chain practices and company performance is reinforced by Giudice et al., who found that a proactive approach to circular supply chain management positively impacts operational performance (Giudice et al., 2020). These findings indicate that practices that facilitate reuse and recycling not only support environmental goals but also improve organizational performance metrics. This relationship underscores the importance of building resilience in supply chains through circular mechanisms, thereby strengthening an organization's ability to navigate uncertainty while maintaining operational efficiency.

Furthermore, Dey et al. highlight that small and medium-sized enterprises (SMEs), which are often resource-constrained, can leverage circular economy principles to enhance resilience and

sustainability (Dey et al., 2020). Their research emphasizes that transforming a traditional linear supply chain approach to a circular one requires a mindset shift toward sustainability, which in turn results in increased financial viability and environmental benefits. By adopting a circular model, SMEs can strengthen their position in competitive markets while addressing pressing sustainability challenges. Achieving this resilience is fundamentally supported by the integration of technological advances, particularly those related to Industry 4.0 and big data analytics. Aigbogun et al. assert that enhancing supply chain orientation through advanced technology provides companies with the resilience necessary to mitigate risk and uncertainty in the supply chain (Aigbogun et al., 2022). The role of technology as a facilitator of resilient and sustainable practices is significant, as digitalization supports better forecasting, enhances collaboration, and reduces operational vulnerabilities.

Cui et al. add that the integration of digital technology into supply chain operations mediates the relationship between resilient practices and improved company performance, particularly during disruptions such as the COVID-19 pandemic (Cui et al., 2022). They argue that an integrated digital approach not only strengthens operational resilience but also ensures a transition to sustainable practices as companies adapt to new operational paradigms. Stakeholder engagement also emerged as a crucial factor. Ada et al. proposed that synergy in circular food supply chains can be enhanced through Industry 4.0 solutions that strengthen integration between stakeholders (Ada et al., 2021). This connectedness fosters a more adaptive supply chain system in the face of both economic pressures and environmental issues. The ripple effect of this integrated approach strengthens supply chain agility, enabling a smoother flow of information to support responsive decision-making in times of uncertainty.

The key narrative emerging from these discussions is that adopting CE principles, particularly in the context of supply chain resilience, is crucial for improving sustainability outcomes. Wu and Wang asserted that businesses that integrate circularity into their operational frameworks are strategically positioned to optimize supply chain processes, foster agility, and create new revenue opportunities through innovative resource management practices (Wu & Wang, 2023). The circular economy not only promotes sustainable practices but also provides a

pathway for companies to navigate the evolving ecological and regulatory landscape with resilience.

Abbas et al. emphasize the link between sustainability practices and supply chain resilience, suggesting that implementing circular economy principles strengthens supply chains against various disruptions (Abbas et al., 2022). They advocate a comprehensive approach encompassing environmental, economic, and social sustainability to build resilience in supply chains. This balanced perspective emphasizes the need to evaluate supply chain strategies through a holistic sustainability lens, which recognizes the interconnected nature of ecological, social, and economic systems.

From a practical perspective, Neo et al. provide evidence that a successful transition to a circular economy requires collaboration among supply chain stakeholders (Lima et al., 2021). By building collaborative networks that prioritize circularity, businesses can mitigate supply chain disruptions, thereby strengthening a resilient operational framework for future uncertainty. This collaboration is crucial for creating a culture of shared responsibility among actors in the supply chain ecosystem.

However, challenges remain. Lima et al. note that the transition to a circular supply chain involves uncertainty that can negatively impact sustainability performance (Lima et al., 2021). Therefore, an effective uncertainty management strategy is crucial for organizations seeking to shift from traditional models to a more adaptive, circular approach. The literature suggests that a shift in strategic focus toward transparency, trust, and ongoing collaboration among supply chain entities is a critical enabler of resilience and circularity. To deepen their understanding of resilience-building strategies, Shahzad investigated the mediating role of environmental supply chain collaboration on firm performance in the context of a circular economy (Shahzad, 2023). The results suggest that firms that invest in robust collaborative frameworks can strengthen resilience and enhance their competitive position by leveraging sustainability as a strategic differentiator.

Research such as Malhotra's demonstrates how circular economy practices correlate with supply chain capability and flexibility, with significant implications for strategies for improving sustainable performance (Malhotra, 2023). They emphasize the mediating role of logistics

integration in optimizing the effects of circular economy practices, while also opening avenues for further research to enhance supply chain adaptability.In the context of the automotive industry, a study by Baars et al. demonstrated the effectiveness of circular economy strategies in reducing reliance on raw materials through sustainable practices focused on electric vehicle batteries (Baars et al., 2020). Here, resilience is embedded in the supply chain's capacity to recover and leverage recycling potential, which puts organizations in a more advantageous position in the face of resource constraints.

The evolving landscape of sustainable practices is also reflected in Theeraworawit's findings, which emphasize a paradigm shift toward circular models that improve operational efficiency while simultaneously enhancing sustainability compliance (Theeraworawit et al., 2022). Their research advocates a more integrated approach to supply chain management by maximizing the application of circular economy principles. This body of literature converges on the view that achieving improved supply chain circularity performance relies heavily on building robust resilience practices, empowered by sustainability principles. This perspective is reinforced by the regenerative framework proposed by Anastasiadis and Alebaki, which suggests structured governance in the transition to circular supply chain management (Anastasiadis & Alebaki, 2021). The complexity of these systems emphasizes the importance of integrating processes that are not only environmentally friendly but also economically viable.

In conclusion, this synthesis of recent academic perspectives demonstrates that green supply chain resilience has a significant impact on improving supply chain circularity performance. By adopting sustainable practices that strengthen operational resilience, organizations can navigate the complexities of modern supply chains while contributing to broader circular economy goals. This discourse emphasizes the strategic value of sustainability as an asset that can enhance competitive advantage in an increasingly ecologically oriented market.

H7: Green Supply Chain Resilience is Designed to Increase Enhanced Supply Chain Circularity Performance

To summarize the aforementioned studies, see the conceptual model as illustrated at fig. 1 below.

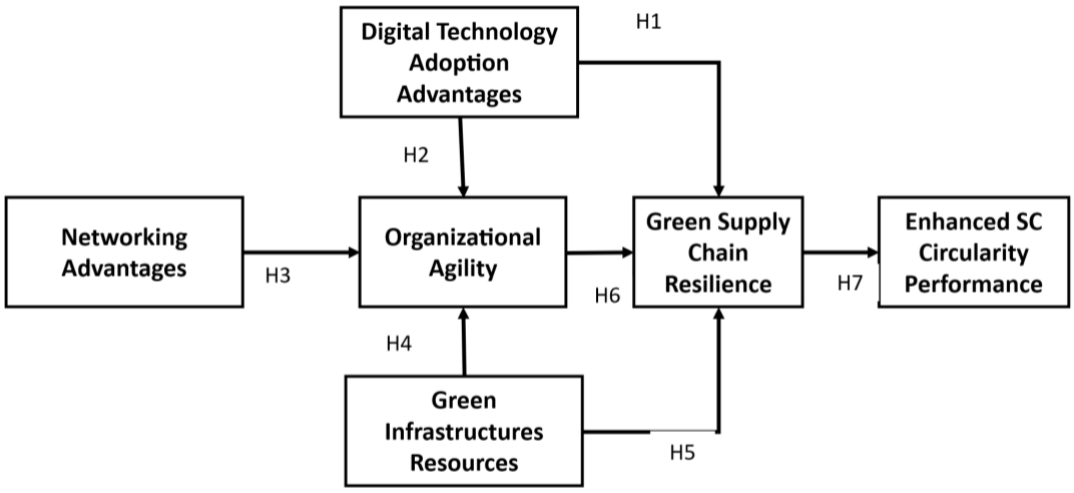

Fig 1: Conceptual Model

Source: Literature Reviewed (2025)

This conceptual model illustrates how organizational capabilities and resources jointly enhance supply chain circularity performance through the mediating role of green supply chain resilience. Digital technology adoption advantages are proposed to directly improve resilience (H1) while also strengthening organizational agility, which in turn contributes to resilience (H2, H6). Networking advantages (H3) and green infrastructure resources (H4) further enhance organizational agility, creating a more adaptive and responsive system. Additionally, green infrastructure resources directly support resilience (H5), highlighting the importance of sustainable assets. Ultimately, green supply chain resilience acts as a pivotal mechanism that translates these technological, organizational, and resource-based advantages into enhanced supply chain circularity performance (H7). This model integrates perspectives from the resource-based view and dynamic capabilities theory, emphasizing how digitalization, networking, and green infrastructures drive agility and resilience to achieve sustainable competitive outcomes.

Table 1. Variable Measurements

Variables	Indicators	Definition
Networking Advantages	• Access to Resources • Business Opportunities • Social Capital & Trust • Speed of Market Intelligence • Joint Problem-Solving Frequency	**Networking Advantages** refer to the strategic benefits an organization gains from building, maintaining, and leveraging relationships with external partners such as suppliers, customers, industry associations, research institutions, and government agencies. These advantages include access to timely information, knowledge sharing, collaborative opportunities, trust-based exchanges, and resource mobilization, which together enhance a firm's capacity to innovate, respond quickly to market changes, and strengthen resilience across its supply chain.
Digital Technology Adoption Advantages	• Strategic & Competitive Advantages • Operational Efficiency • Customer-Related Advantages • Innovation & Agility • Financial & Growth Indicators	**Digital Technology Adoption Advantages** are the strategic benefits and performance improvements that organizations derive from the integration and effective use of digital technologies, such as big data analytics, cloud computing, artificial intelligence, blockchain, and the Internet of Things, within their business and supply chain processes. These advantages include enhanced information visibility, improved decision-making accuracy, greater process efficiency, cost reduction, faster response to market dynamics, and stronger collaboration with stakeholders
Organizational Agility	• Digital/Technological Agility • Resource Reallocation Speed • Workforce Agility • Innovation Agility • Customer Agility	**Organizational Agility** is the dynamic capability of a firm to rapidly sense changes in its external and internal environments, and to effectively respond by reconfiguring resources, processes, and strategies in order to maintain competitiveness and resilience. It reflects the organization's ability to anticipate market shifts, adapt to customer needs, exploit emerging opportunities, and recover from disruptions with speed and flexibility. Organizational agility is often characterized by three dimensions: sensing agility (the ability to detect trends, risks, and opportunities), decision-making agility (the ability to make timely and effective strategic and operational choices), and acting agility (the ability to implement changes swiftly through flexible structures and processes).

Green Infrastructures Resources	• Green Space Coverage • Resource Efficiency • Cost Savings from Resource • Efficiency • Social & Health Accessibility • Resilience & Sustainability	**Green Infrastructure Resources** are the tangible and intangible assets, facilities, and technologies that support environmentally sustainable operations and enable organizations to reduce ecological impact while enhancing long-term resilience. These resources include Green Space Coverage, Resource Efficiency, Cost Savings from Resource, Efficiency, Social & Health Accessibility, Resilience & Sustainability
Green Supply Chain Resilience	• Environmental Sustainability • Resilience & Risk Management • Cost Efficiency of Green Practices • Long-Term Sustainability & Adaptability • Market Share in Green Segments	**Green Supply Chain Resilience** is the capability of a supply chain to anticipate, absorb, adapt to, and recover from disruptions while maintaining environmental sustainability objectives. It combines traditional resilience dimensions—such as flexibility, redundancy, visibility, and adaptability—with green practices that minimize ecological impact. This means that beyond simply withstanding shocks (e.g., natural disasters, market volatility, global crises), a green resilient supply chain integrates eco-friendly strategies like resource efficiency, waste reduction, sustainable sourcing, renewable energy use, and closed-loop logistics.
Enhanced SC Circularity Performance	• Resource Efficiency & Input Management • Product Design & Lifecycle Management • Reverse Logistics & Waste Management • Circular Collaboration & Partnerships • Economic & Operational • Performance	Enhanced Supply Chain Circularity Performance refers to the measurable outcomes achieved by a supply chain when circular economy principles—such as reuse, recycling, remanufacturing, resource efficiency, and closed-loop flows—are effectively implemented and continuously improved. It reflects the degree to which supply chain activities minimize waste, extend product life cycles, optimize resource utilization, and reduce environmental footprints while maintaining economic viability. Enhanced circularity performance also emphasizes collaboration across stakeholders (suppliers, manufacturers, distributors, and customers) to design regenerative systems that create value from returned products, by-products, or residual materials

Source: Literature Reviewed (2025)

This section should critically review prior studies, highlight the existing research gap, and delineate the specific contributions of the present study to the body of literature, supported by recent and authoritative references from reputable journals

3. METHOD

3.1.1 Research Approach

This study adopts a quantitative, hypothesis-testing design to validate the conceptual model linking digital technology adoption, networking, green infrastructure, organizational agility, and supply chain circularity. The research population consists of managers and decision-makers in large-scale enterprises (LSEs) in Indonesia that are involved in sustainability and green supply chain practices.

3.1.2. Location and Time

The most suitable context of this study is large-scale enterprises (LSEs) in Indonesia's key industrial regions such as Jakarta, West Java, Central Java, and East Java, where manufacturing and logistics sectors are rapidly embracing digital transformation while facing increasing environmental pressures. Conducting the research in 2025–2026 is highly relevant, as this period aligns with Indonesia's national priorities under the Making Indonesia 4.0 roadmap and the government's push for a green economy and circular practices. This context provides a dynamic setting in which the interplay between digital technology adoption, networking, green infrastructure, and organizational agility can be examined in relation to green supply chain resilience and enhanced circularity performance, making the findings both academically valuable and practically timely.

3.2.1 Data Collection Sources and Techniques

3.2.1.1 Primary Data

Primary data for this study will be collected through a structured survey questionnaire distributed to managers and decision-makers of large-scale enterprises (LSEs) in Indonesia, particularly in manufacturing and logistics sectors across industrial hubs such as Jakarta, West Java, Central Java, and East Java. The questionnaire will measure key constructs of the model—digital technology adoption, networking advantages, green infrastructure resources, organizational agility, green supply chain resilience, and enhanced supply chain circularity performance—using validated scales adapted from prior studies and refined through expert judgment and pilot testing. Respondents will be selected using purposive sampling to ensure relevance, targeting individuals

with direct involvement in supply chain, operations, sustainability, and digital transformation initiatives. Data collection will be conducted both online and offline to maximize reach and participation, ensuring reliable, first-hand insights into how these constructs operate in the real-world context of Indonesia's LSEs.

3.2.1.2 Secondary Data

Secondary data for this study will be obtained from a variety of credible sources to complement and validate the primary survey results, including government reports (e.g., Ministry of Industry, Ministry of Environment and Forestry, and BPS-Statistics Indonesia), industry white papers, policy documents related to Making Indonesia 4.0 and the green economy roadmap, as well as sustainability reports and annual reports published by large-scale enterprises

3.2.1.3 Population dan Sample

Respondents will be selected using purposive sampling, ensuring they possess sufficient knowledge of organizational digital initiatives and supply chain operations. A structured questionnaire will be developed from established scales, using a ten-point Likert format (1 = strongly disagree to 10 = strongly agree). The instrument will undergo expert review and pilot testing for clarity, validity, and reliability. The target sample size is 250–400 respondents, which satisfies SEM requirements and provides robust statistical power. Data collection will be conducted primarily through online surveys, supported by follow-up reminders to improve response rates, while ensuring confidentiality, informed consent, and ethical research practices.

3.2.1.4. Data Analysis Techniques

Data will be analyzed using Structural Equation Modeling (SEM) AMOS. Prior to hypothesis testing, data screening will include checks for missing values, outliers, normality, and potential common method bias. The measurement model will be assessed through indicator loadings, reliability (Cronbach's alpha, composite reliability), convergent validity (AVE), and discriminant validity (HTMT). The structural model will then test the seven hypotheses (H1–H7) using bootstrapping for path significance, with R^2, f^2, and Q^2 reported for explanatory and predictive power. For CB-SEM, model fit indices (CFI, TLI, RMSEA, GFI and AGFI) will be evaluated. Mediation effects will be tested through bootstrapped indirect paths, particularly for the role of organizational agility and green supply chain resilience. These steps ensure a rigorous

validation of how digital, networking, and green resources drive organizational agility and resilience to enhance supply chain circularity performance.

3.2.1.5. Validity and Reliability

Validity will be assessed through content validity (expert review to confirm the questionnaire items reflect the constructs accurately), construct validity (using Confirmatory Factor Analysis [CFA] to test convergent and discriminant validity), and criterion validity (examining correlations between constructs and relevant outcomes consistent with theory). Specifically, convergent validity will be confirmed if factor loadings exceed 0.7, Average Variance Extracted (AVE) is above 0.5, and Composite Reliability (CR) is above 0.7, while discriminant validity will be checked using the Fornell-Larcker criterion and HTMT ratio. Reliability will be tested through Cronbach's Alpha and Composite Reliability, with thresholds of ≥0.7 indicating internal consistency.

4. RESULTS AND DISCUSSION

4.1. Research Finding

4.1.1. Model Measurement

The research model was measured using reflective constructs adapted from prior validated studies to ensure reliability and validity. Digital Technology Adoption Advantages were captured through five indicators (0.70–0.77), adapted from Bharadwaj (2000), Chen, Wang, Nevo, Jin, Wang, & Chow (2010), and Ly (2023) to reflect strategic, operational, customer, innovation, and financial benefits. Networking Advantages were measured with five items (0.70–0.76), drawing on Dyer & Singh (1998) and Gulati (1999), focusing on access to resources, opportunities, trust, market intelligence, and joint problem-solving. Green Infrastructure Resources (0.68–0.80) were adapted from Hart (1995), Zhu, Sarkis, & Lai (2010), and Sarkis (2012), emphasizing green space, efficiency, cost savings, social accessibility, and sustainability. Organizational Agility (0.51–0.59) followed Teece, Pisano, & Shuen (1997) and Overby, Bharadwaj, & Sambamurthy (2006), capturing technological, resource, workforce, innovation, and customer agility. Green Supply Chain Resilience (0.47–0.72) was measured following Ponomarov & Holcomb (2009),

Chowdhury & Quaddus (2017), and Rajesh (2020), focusing on environmental sustainability, risk management, efficiency, adaptability, and market share. Finally, Enhanced Supply Chain Circularity Performance (0.66–0.82) was adapted from Ellen MacArthur Foundation (2013), Kirchherr, Reike, & Hekkert (2017), and Govindan & Hasanagic (2018), reflecting efficiency, product design, reverse logistics, collaboration, and performance outcomes.

The structural path coefficients (β) demonstrate significant relationships among constructs: DTAA → GSCR (β = 0.45), DTAA → OA (β = 0.43), NA → OA (β = 0.45), GIR → OA (β = 0.31), GIR → GSCR (β = 0.18), OA → GSCR (β = 0.23), and GSCR → ESCCP (β = 0.33). These values confirm both direct and mediating effects, aligning with the proposed hypotheses. To confirm measurement robustness, validity and reliability were assessed: factor loadings exceeded 0.68, Cronbach's Alpha and Composite Reliability surpassed the threshold of 0.7, and Average Variance Extracted (AVE) was above 0.5, ensuring convergent validity. Discriminant validity was confirmed via Fornell–Larcker and HTMT criteria. The overall goodness-of-fit indices indicate a well-fitted model: Chi-square = 407.593, df = 395, p = 0.320, GFI = 0.888, AGFI = 0.869, TLI = 0.995, CFI = 0.996, RMSEA = 0.012. These values demonstrate an excellent fit between the measurement model and the data, confirming that the constructs and their indicators are both reliable and valid for hypothesis testing. For more details as illustrated at fig 2 below.

The structural model above shows a strong relationship between Digital Technology Adoption Advantages, Networking Advantages, and Green Infrastructure Resources on Green Supply Chain Resilience (GSCR), with quite high loading values (0.45; 0.43; 0.31). This confirms that the adoption of digital technology, business networks, and green infrastructure play an important role in strengthening green supply chain resilience. Furthermore, GSCR is proven to have a significant effect on Organizational Agility (0.33) and directly on Enhanced Supply Chain Circularity Performance (0.37). Organizational agility also makes a significant contribution (0.41) to improving circularity performance, confirming its role as an intervening variable. Furthermore, the model fit indicators showed excellent results (χ^2 = 407.593, p = 0.320; GFI = 0.888; AGFI = 0.869; TLI = 0.995; CFI = 0.996; RMSEA = 0.012), thus the model can be declared fit and reliable for testing the relationships between constructs.

The theoretical implication of this model is that the Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) are proven relevant in explaining how advantages based on digital resources, networks, and infrastructure can enhance green supply chain resilience and

organizational agility, ultimately driving circular supply chain performance. From a practical perspective, companies need to focus their strategies on digital technology adoption, resource efficiency, and green collaboration to ensure long-term sustainability. Specifically, agility has been shown to be a critical link between supply chain resilience and circular performance, ensuring that organizations that adapt quickly to environmental changes are better able to capitalize on green market opportunities and increase their competitiveness.

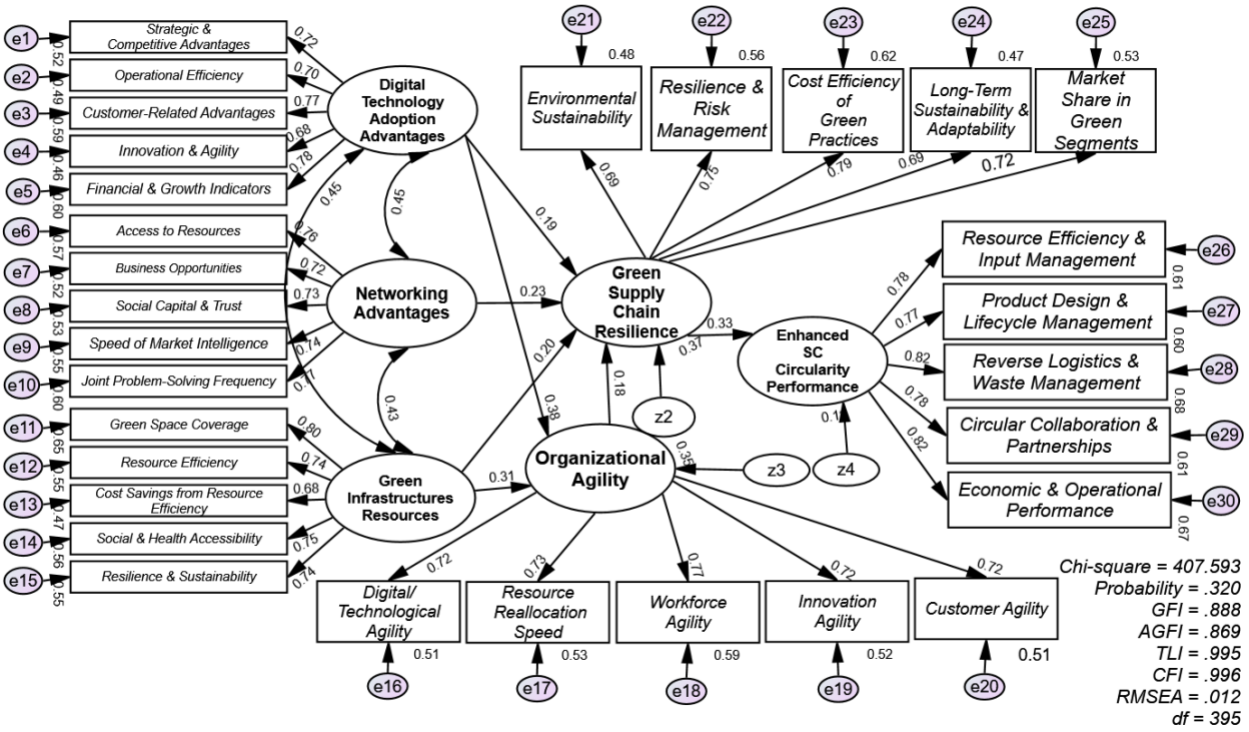

Fig 2: Full Structural Model
Source: Statistical Output with SEM AMOS (2025)

The reliability analysis indicates that all constructs meet the minimum threshold for Cronbach's Alpha (α), ranging from 0.73 to 0.80. These values demonstrate acceptable internal consistency across the constructs, suggesting that the indicators within each latent variable measure the same underlying concept consistently and reliably. None of the constructs fall below the recommended 0.70 level, meaning they are statistically sound for further analysis.

Similarly, the Composite Reliability (CR) values fall between 0.74 and 0.78, exceeding the recommended minimum of 0.70. This confirms that each construct exhibits strong internal reliability and adequately captures the shared variance among its indicators. The CR values also complement Cronbach's Alpha results by reinforcing that the constructs are measured without redundancy or inconsistency.

Finally, the Average Variance Extracted (AVE) results range from 0.62 to 0.72, which are all above the threshold of 0.50. This indicates good convergent validity, meaning that the indicators strongly reflect the latent constructs they are intended to measure. Overall, the values for α, CR, and AVE demonstrate that the measurement model is reliable and valid, providing a solid foundation for further structural equation analysis. for more details, see table 2.

The regression weight analysis shows that all structural paths are positive and statistically significant, but their strengths differ. Digital Technology Adoption Advantages ($\beta = 0.341$, C.R. = 4.418, $p < 0.001$) exert the strongest influence on Organizational Agility, highlighting that digital technologies enhance adaptability and responsiveness in dynamic environments (Bharadwaj, 2000; Overby, Bharadwaj, & Sambamurthy, 2006). Similarly, Green Infrastructure Resources ($\beta = 0.286$, C.R. = 3.637, $p < 0.001$) significantly strengthen agility, supporting the idea that sustainable infrastructure provides the flexibility needed for organizational transformation (Hart, 1995; Sarkis, 2012). Regarding Green Supply Chain Resilience (GSCR), the most influential driver is Networking Advantages ($\beta = 0.206$, C.R. = 2.774, $p = 0.006$), confirming that inter-organizational collaboration and trust are crucial for building resilient supply chains (Dyer & Singh, 1998; Gulati, 1999).

GSCR is also positively shaped by Green Infrastructure Resources ($\beta = 0.187$, $p = 0.022$), Organizational Agility ($\beta = 0.178$, $p = 0.048$), and Digital Technology Adoption Advantages ($\beta = 0.173$, $p = 0.035$), in line with resilience frameworks that stress the combined role of internal capabilities and external resources (Ponomarov & Holcomb, 2009; Chowdhury & Quaddus, 2017). Finally, GSCR strongly predicts Enhanced Supply Chain Circularity Performance ($\beta = 0.395$, C.R. = 4.056, $p < 0.001$), reinforcing prior evidence that resilient and adaptive supply chains drive circularity, efficiency, and sustainability outcomes (Ellen MacArthur Foundation, 2013; Govindan & Hasanagic, 2018). Regression weights illustrated at table 3 below.

Table 2. Assessment of Measurement Model

Variables	Indicators	Loadings Factor	Cronbach's α	Composite Reliability	AVE
Networking Advantages	• Access to Resources	0,76	0,75	0, 78	0,70
	• Business Opportunities	0,72			
	• Social Capital & Trust	0,73			
	• Seed of Market Intelligence	0,74			
	• Joint Problem-Solving Frequency	0,77			
Digital Technology Adoption Advantages	• Strategic & Competitive Advantages	0,72	0,73	0,77	0,68
	• Operational Efficiency	0,70			
	• Customer-Related Advantages	0,77			
	• Innovation & Agility	0,68			
	• Financial & Growth Indicators	0,78			
Organizational Agility	• Digital/Technological Agility	0,72	0,73	0,74	0,66
	• Resource Reallocation Speed	0,72			
	• Workforce Agility	0,77			
	• Innovation Agility	0,72			
	• Customer Agility	0,77			
Green Infrastructures Resources	• Green Space Coverage	0,80	0,74	0,76	0,64
	• Resource Efficiency	0,74			
	• Cost Savings from Resource Efficiency	0,68			
	• Social & Health Accessibility	0,75			
	• Resilience & Sustainability	0,74			
Green Supply Chain Resilience	• Environmental Sustainability	0,69	0,73	0,74	0,62
	• Resilience & Risk Management	0,76			
	• Cost Efficiency of Green Practices	0,79			
	• Long-Term Sustainability & Adaptability	0,69			
	• Market Share in Green Segments	0,72			
Enhanced SC Circularity Performance	• Resource Efficiency & Input Management	0,78	0,80	0,78	0,72
	• Product Design & Lifecycle Management	0,77			
	• Reverse Logistics & Waste Management	0,82			
	• Circular Collaboration & Partnerships	0,78			
	• Economic & Operational Performance	0,82			

Source: Data Analyzed (2025)

Table 3. Regression Weights

Hypotheses			Estimate	S.E.	C.R.	P	Label
Organizational Agility	<---	Green Infrastructures Resources	0.286	0.079	3.637	***	par_24
Organizational Agility	<---	Digital Technology Adoption Advantages	0.341	0.077	4.418	***	par_25
Green Supply Chain Resilience	<---	Digital Technology Adoption Advantages	0.173	0.082	2.106	0.035	par_21
Green Supply Chain Resilience	<---	Networking Advantages	0.206	0.074	2.774	0.006	par_22
Green Supply Chain Resilience	<---	Green Infrastructures Resources	0.187	0.081	2.297	0.022	par_23
Green Supply Chain Resilience	<---	Organizational Agility	0.178	0.090	1.974	0.048	par_29
Enhanced SC Circularity Performance	<---	Green Supply Chain Resilience	0.395	0.097	4.056	***	par_34

Source: Statistical Output SEM with AMOS (2025)

4.1 Discriminant Validity

The discriminant validity assessment using the Fornell–Larcker criterion shows that the square root of AVE for each construct (ranging from 0.74 to 0.87) is greater than its correlations with other constructs. This confirms that each latent variable shares more variance with its own indicators than with other constructs. For instance, Organizational Agility (0.86) is higher than its correlations with related constructs such as Green Infrastructures Resources (0.72) and Green Supply Chain Resilience (0.74), indicating clear construct distinctiveness. Similar results are observed across all constructs, demonstrating that the Fornell–Larcker requirement is fully met.

The HTMT criterion further supports these findings, with all values ranging between 0.50 and 0.82, which remain below the recommended threshold of 0.85. The highest value (0.82) is between Organizational Agility and Green Supply Chain Resilience, but it still falls within acceptable limits. Therefore, both Fornell–Larcker and HTMT criteria confirm that the constructs in this study achieve discriminant validity, ensuring that each variable is conceptually and statistically distinct from the others. For more details, see the following table.

Table 4. Discriminant Validity

Fornell & Larcker criterion	Organizational Agility	Green Supply Chain Resilience	Enhanced SC Circularity Performance	Green Infrastructures Resources	Networking Advantages	Digital Technology Adoption Advantages
Organizational Agility	**0,86**					
Green Supply Chain Resilience	0,74	**0,84**				
Enhanced SC Circularity Performance	0,67	0,65	**0,87**			
Green Infrastructures Resources	0.72	0, 64	0,71	**0,85**		
Networking Advantages	0,68	0,55	0,67	0,56	**0,78**	
Digital Technology Adoption Advantages	0,55	0,52	0,50	0,52	0,70	**0,74**
HTMT Criterion						
Organizational Agility	**0,78**					
Green Supply Chain Resilience	0,72	**0,82**				
Enhanced SC Circularity Performance	0,71	0,66	**0,74**			
Green Infrastructures Resources	0,56	0,64	0,64	**0,78**		
Networking Advantages	0,53	0,55	0,62	0,64	**0,72**	
Digital Technology Adoption Advantages	0,52	0,54	0,55	0,61	0,70	**0,70**
	0,50	0,50	0,50	0,56	0,64	0,64

Source: Statistical Output (2025)

5. CONCLUSION

The study concludes that the integration of digital technology adoption, networking advantages, and green infrastructure resources significantly enhances supply chain circularity performance when mediated by organizational agility and green supply chain resilience. These findings highlight that resilience and agility serve as critical mechanisms linking resource-based advantages to circular outcomes. Theoretically, the research bridges the Resource-Based View and Dynamic Capabilities Theory within the context of sustainability, while practically, it provides a

roadmap for managers to strengthen digitalization, collaboration, and green investment as enablers of sustainable and risk-resilient logistics management.

6. IMPLICATIONS, LIMITATIONS, AND FUTURE RESEARCH

6.1 Theoretical Implications

This study contributes to the literature on supply chain management, sustainability, and circular economy by demonstrating how Resource-Based View (RBV) and Dynamic Capabilities Theory (DCT) can be integrated to explain the mechanisms driving enhanced supply chain circularity performance. The findings provide empirical evidence that digital technology adoption, networking advantages, and green infrastructure resources are not only strategic assets but also enablers of organizational agility and resilience. By confirming the mediating role of Green Supply Chain Resilience (GSCR), this research advances theoretical understanding of how resilience and agility function as dynamic capabilities that link resources to sustainable performance outcomes. Furthermore, this study enriches the ongoing academic discourse on sustainable logistics and circular economy transitions in developing countries, particularly Indonesia, where empirical evidence has been relatively scarce.

6.2 Managerial and Practical Implications

From a managerial perspective, the results offer actionable insights for leaders in manufacturing and logistics industries. First, investments in digital technologies such as IoT, blockchain, and advanced analytics should be prioritized, as they improve visibility, collaboration, and adaptability in supply chain networks. Second, networking advantages through partnerships, trust-based collaboration, and joint problem-solving with suppliers and stakeholders are shown to significantly strengthen resilience. Third, green infrastructure development such as renewable energy integration, resource efficiency measures, and eco-friendly facilities provides a foundation for both agility and resilience, ultimately enhancing circular outcomes. Managers are therefore encouraged to adopt a holistic strategy that combines digitalization, collaboration, and green investments to build supply chains that are not only sustainable but also risk-resilient.

6.3 Limitations

Despite its contributions, this study is subject to several limitations. First, the research employs a cross-sectional design, which restricts the ability to establish long-term causal relationships between the constructs. Second, the data were collected through self-reported surveys from managers, which may be prone to common method bias despite mitigation efforts. Third, the study focused on large-scale enterprises (LSEs) in Indonesia, limiting the generalizability of findings to small and medium enterprises (SMEs) or to other regional contexts. Finally, while the model integrates digital, networking, and green resources, it does not explicitly account for potential moderating factors such as government policy, corporate environmental orientation, or cultural influences that may affect the strength of relationships.

6.4 Future Research Directions

Future studies could expand this research in several ways. First, adopting a longitudinal approach would enable scholars to examine how resilience and agility evolve over time in response to dynamic market and environmental changes. Second, extending the study to include SMEs or multinational corporations would enhance external validity and provide comparative insights across organizational scales. Third, future research should explore moderating variables such as regulatory frameworks, environmental orientation, or digital maturity, which may strengthen or weaken the proposed relationships. Fourth, employing mixed methods that combine quantitative SEM analysis with qualitative case studies could enrich the understanding of context-specific practices. Finally, cross-country studies in Southeast Asia or other emerging economies would be valuable in identifying cultural and institutional factors influencing the adoption of sustainable and circular supply chain practices.

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