

# DIGITAL-SUSTAINABLE SUPPLY CHAINS: A RESOURCE-BASED VIEW FRAMEWORK FOR COMPETITIVE ADVANTAGE

## 1 INTRODUCTION

Digital transformation and sustainability in supply chains emerge as prominent topics in the contemporary organizational context, altering how companies manage their operations (Tsolakis et al., 2023). Their combination refers to the strategic use of technologies and sustainable practices in various sectors of the economy. This implies using technological innovations to promote environmental, economic, and social sustainability, i.e., Triple Bottom Line (TBL) (Islam et al., 2023). Such integration provides competitive advantages, reduces adverse environmental impacts, and meets the growing demands of stakeholders for transparency and corporate social responsibility (Matthess et al., 2022; Wiegand & Wynn, 2023).

However, applying these concepts in practice and synergistically is not a trivial task. Supply chain managers face numerous challenges when balancing digital efficiency's imperatives with sustainability principles, including high energy and natural resource consumption, inadequate governmental support, organizational vision and strategy, insufficient planning and technical knowledge, and others (Caiado et al., 2022). From another perspective, digital transformation will not always equate to environmental benefits. There is a paradox between these constructs: while digitalization can offer solutions to environmental degradation, it can also be highly detrimental through high energy consumption and waste from the disposal of technological equipment (Sarkis et al., 2021).

Numerous review articles in this context can be found in the literature. However, most of them have a unilateral focus, ranging from a specific technology like blockchain (Wu et al., 2022), a particular practice such as Lean and Green (Despeisse et al., 2022), or even focusing on a single dimension of sustainability, such as economic (Cricelli & Strazzullo, 2021) or environmental (Dayioğlu & Türker, 2021), thereby lacking a holistic view for integrating these themes.

Thus, this article's distinctive feature lies in addressing the three thematic axes (digital transformation, sustainability, and supply chains) integrated through the theoretical lens of the Resource-based View (RBV) Theory as a strategy for obtaining competitive advantage. In doing so, this article aims to address the following research question: How can supply chains utilize technological and managerial resources to achieve *competitive advantages while promoting sustainable performance?*

## 2 THEORETICAL BACKGROUND

Regarding the theories commonly used in supply chain practices when evaluating digitalization and sustainability attributes, Schilling and Seuring (2023) highlight the following theoretical foundations: Resource-Based View Theory, Dynamic Capability Theory, Information Processing Theory, Institutional Theory, Practice-Based View Theory, Stakeholder Theory, and Transaction Cost Theory. Among these possibilities, this study adopts RBV theory as its theoretical basis for two reasons: (i) due to its widespread adoption and (ii) its focus on both tangible and intangible resources and supply chain capabilities.

This approach analyzes companies' competitive advantage through the conscious and optimized use of their internal resources. It provides a modern explanation for the heterogeneity in firm performance, in contrast to traditional paradigms such as the structure-conduct-performance (SCP) paradigm (Vallandro & Trez, 2013).

According to Barney (1991), resources include all assets, capabilities, and knowledge that enhance a company’s efficiency. These can be tangible (e.g., equipment) or intangible (e.g., brand), and are grouped into physical, human, and organizational capital. To generate a competitive advantage, resources must meet the VRIO criteria: be valuable, rare, inimitable, and organizationally aligned.

Despite criticism of RBV theory for focusing on internal resources while neglecting external factors such as demand (Lacaze et al., 2024), authors like Salamah et al. (2023) emphasize the relevance of this approach in identifying digital resources and capabilities that most contribute to competitive advantage and, subsequently, improved supply chain performance.

### 3 METHODOLOGY

The Systematic Literature Review (SLR) was adopted as the research method. SLR involves the systematic exploration and analysis of previously published knowledge to ensure the replicability of the research and reduce the bias of subjectivity commonly associated with the method (Prodanov & Freitas, 2013). Frame 1 presents the Research Protocol used in this study.

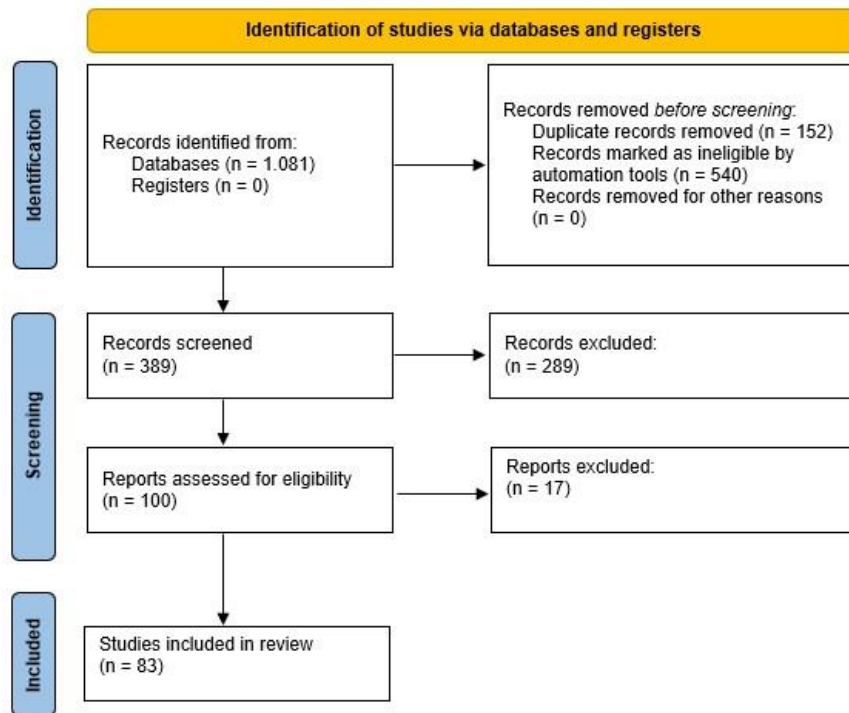
Frame 1 - Research Protocol

<b>Indexing databases</b>	Scopus and Web of Science (WoS)
<b>Time frame</b>	2013 - 2024
<b>Thematic Axes</b>	Thematic Axis 1: Digital Transformation Thematic Axis 2: Sustainability Thematic Axis 3: Supply Chain
<b>Searching String</b>	<i>(“digital transformation” OR digitalization OR digitalisation) AND (sustainability OR sustainable) AND (“supply chain”)</i>
<b>Initial Filters</b>	- Only documents of type "Articles" and "Reviews"; - Only documents in English and Portuguese.
<b>Eligibility Criteria</b>	Number of citations
<b>Evaluation Criteria</b>	Inclusion: - Articles discussing digitalization and sustainability in an integrated aspect within the context of supply chains. Exclusion: - Articles that only list keywords as quoted expressions; - Articles that do not meet the scope of this research, i.e., those that did not fully address the three thematic axes of the research.

Source: authors.

The search for papers was conducted in the Scopus and Web of Science databases, as highlighted in Frame 1. Their comprehensiveness justifies the choice of these repositories in indexing the prominent and most important international journals in various fields (Govindan & Hasanagic, 2018). For the analysis of the Bibliographic Portfolio (BP), the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology, as developed by Moher et al. (2009), was adopted, as illustrated in Figure 1.

Figure 1 - PRISMA Flow Diagram



Source: Adapted from Moher et al. (2009).

Regarding the Screening process, it is highlighted that the papers were independently evaluated by the authors, meaning each author assessed the articles' relevance without being influenced by others' judgments. Only the articles that had unanimous agreement remained in the sample. As a result of this evaluation, 289 articles were excluded, resulting in 100 papers. Of these, 17 articles were excluded during the eligibility analysis, resulting in a final BP comprising 83 articles.

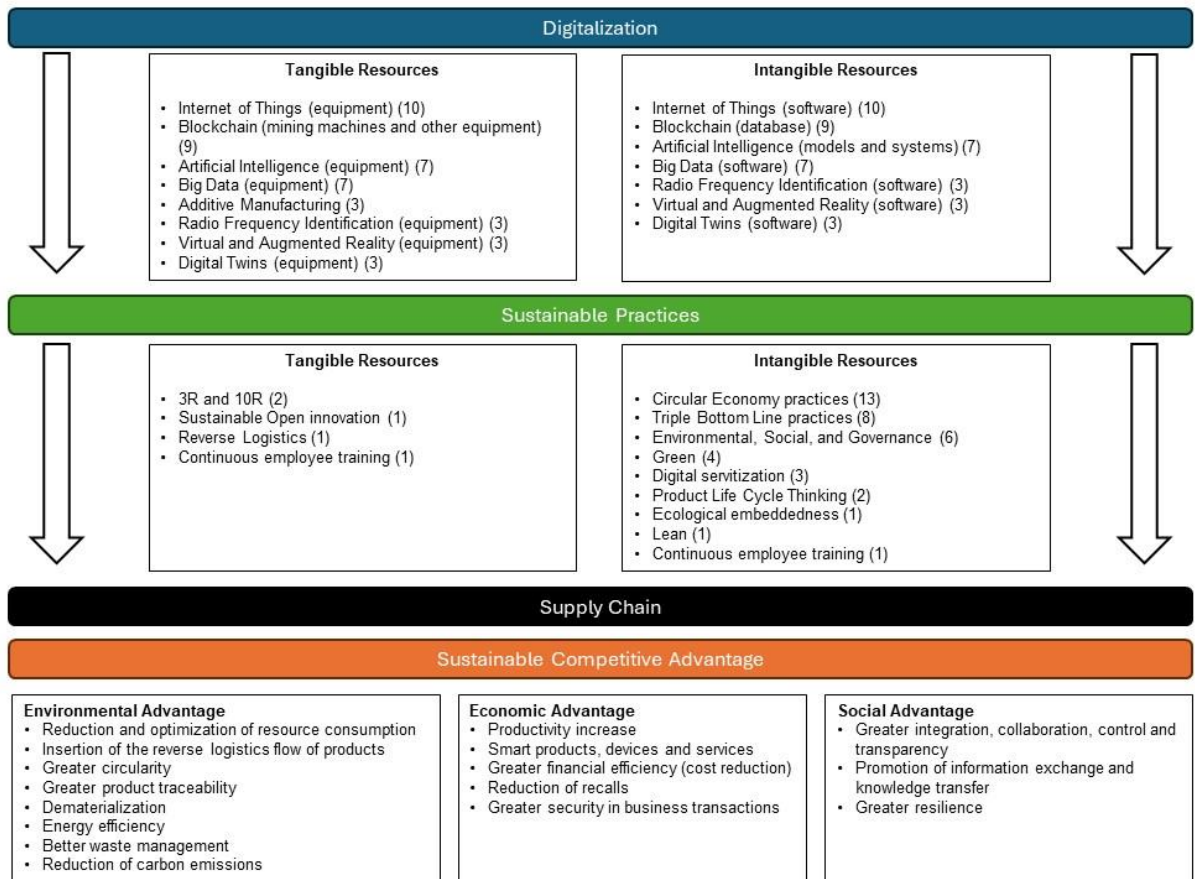
For the eligibility assessment, the articles were classified in descending order by the number of citations, and a cutoff threshold of 95% was used. However, it is common for recent works to have few citations. Thus, of the 5% of excluded works, those published in the last four years (2021, 2022, 2023, and 2024) were returned to BP to avoid the selection bias.

#### 4 ANALYSIS AND DISCUSSION OF THE RESULTS

The number of publications on digitalization and sustainability in supply chains has increased significantly, with a 66.1% average annual growth rate and 72.3% of studies published between 2022 and 2024, indicating a rising academic interest. Most works (82%) are empirical, reflecting a shift toward practical applications rather than theoretical exploration. Geographically, research is concentrated in Europe and Asia, with notable contributions from countries such as China, India, the United Kingdom (UK), and Italy. These trends are linked to regional priorities, such as China's environmental challenges and the UK's leadership in circular economy initiatives (Dissanayake & Weerasinghe, 2022; Velenturf et al., 2019).

Regarding the content analysis, a framework was developed to demonstrate the relationships between digitalization and sustainable practices for competitive advantage, considering RBV theory, as depicted in Figure 2.

Figure 2 - Integrative Framework of Digitalization and Sustainability



Source: authors.

Note: The numbers in parentheses indicate the number of articles that address a specific technology or practice.

The examination of the BP revealed that digitalization enables sustainability, facilitating its practices, and that this interaction brings gains for organizations in all three dimensions of sustainability (Umar et al., 2023). However, it is possible to verify that social advantages still need to be explored more as a competitive advantage, confirming a gap that has existed in the literature for a long time (Caiado et al., 2022). Additionally, digital technologies and sustainable practices have been categorized as tangible and intangible resources within the supply chain, as advocated by the RBV. This categorization considered the definition of tangible (materializable in the physical world) and intangible (immaterial in the physical world). For example, the connectivity of systems in an IoT network is an intangible resource of the organization used to improve the efficiency of its operations. However, for this to be possible, equipment such as sensors and computers or servers is needed to process the data, allowing the connection of multiple systems. Similarly, the practice of sustainable open innovation will result in the prototyping of new products, which are conceivable in the physical world and, therefore, seen as a tangible resource. This approach not only provides an overview of the resources utilized by supply chains to generate competitive advantage but also offers insight into their nature.

## 5 CONCLUSION

This article aimed to investigate the integration between digitization, as part of digital transformation, and sustainability in supply chains through a critical analysis of the existing literature. This resulted in a conceptual framework under the theoretical lens of the Resource-based View Theory.

The obtained results demonstrated numerous technologies, including Blockchain, IoT, Big Data, AI, among others, and their relationship to sustainable practices such as Triple Bottom Line, Circular Economy, ESG, digital servitization, green and lean, in generating competitive advantage and promoting sustainable performance within supply chains. For example, the use of IoT and Big Data Analytics to monitor the performance of engine parts, contributing to preventive maintenance and lower emissions due to deregulation (green and digital servitization), or even the use of Digital Twins in prototyping new products, reducing the need for consumption of materials and, consequently, the waste generated (dematerialization and Circular Economy). Thus, it became evident that this relationship positively affects the chains by promoting efficiency gains and cost reduction (economic impact), as well as dematerialization, improved waste management efficiency, control of carbon emissions (environmental impact), and greater resilience and transparency among its links (social implications).

Thus, this article provides valuable insights for managers and the academic community seeking to understand the dynamism of these concepts and their practical-theoretical implications. Furthermore, it offers theoretical contributions by fostering discussion in the literature, considering the identified scarcity of works that address these constructs holistically.

As a limitation, it is worth noting that the proposed framework is a theoretical representation of the relationships between these constructs and should, therefore, be validated through empirical studies that confirm these relationships. Moreover, we recognize that the impact of cultural differences, regulatory frameworks, and institutional contexts is a crucial factor in the adoption and effectiveness of digital technologies and sustainability practices within supply chains, and this aspect warrants in-depth study. So, future research should address these issues to enhance the robustness and practical utility of these findings and provide a more nuanced understanding of the integration between digitization and sustainability in supply chains.

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