



A Literature Review on the Integration of Digital Servitization, Value Co - Creation, and Frugal Innovation: A Conceptual Framework for Sustainable Performance

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Abstract

This study synthesizes prior research on digital servitization, value co-creation, frugal innovation, and sustainable performance through a systematic literature review. A structured search of major academic databases identified 118 articles published between 2015 and 2025, of which 41 peer-reviewed studies were retained for analysis. The findings show that sustainability outcomes are strongly associated with innovation strategies, particularly frugal innovation, which acts as a key mechanism linking innovation to performance. Digital servitization supports interaction between firms and stakeholders, enabling value co-creation and collaborative problem solving, which contributes to the development of frugal innovation. However, these constructs are often examined separately, and their combined relationships remain limited and largely conceptual. To address this gap, this study proposes a conceptual framework in which digital servitization and value co-creation drive frugal innovation, which in turn enhances sustainable performance. The framework provides a foundation for future empirical research.

Keywords: Digital Servitization, Value Co-Creation, Frugal Innovation, Sustainable Performance

Introduction

Organizations are under increasing pressure to enhance competitiveness while addressing sustainability challenges such as resource constraints, environmental impacts, and stakeholder expectations. In response, firms must adopt innovation strategies that improve efficiency while supporting long-term sustainability (Wang et al., 2016; Wu et al., 2025).

A key transformation is the shift from product-centric to service-oriented business models, known as servitization (Tukker, 2015; Visnjic et al., 2018). Supported by digital technologies, this evolves into digital servitization, enabling improved customer interaction, service delivery, and value creation (Kohtamäki et al., 2019; Sjödin et al., 2020). For example, manufacturing firms increasingly use digital solutions to provide predictive maintenance and performance-based services.



At the same time, value creation is increasingly viewed as a collaborative process. Value co-creation emphasizes joint value generation through interaction and knowledge exchange among firms, customers, and partners (Prahalad & Ramaswamy, 2004; Vargo & Lusch, 2016), facilitated by real-time communication and information sharing.

Frugal innovation represents another important stream, focusing on delivering essential value with minimal resource use, cost, and complexity (Zeschky et al., 2014; Hossain, 2016). It is particularly relevant under sustainability pressures, as it promotes efficiency-oriented solutions aligned with sustainability goals (Pansera & Owen, 2018; Singh et al., 2023).

Despite growing attention, these constructs are often studied in isolation. Limited research integrates digital servitization, value co-creation, and frugal innovation to explain their combined influence on sustainable performance, encompassing economic, environmental, and social dimensions (Zhou et al., 2024). This fragmentation restricts understanding of how digital transformation and collaboration jointly support sustainability.

To address this gap, this study focuses on four complementary constructs: digital servitization (technological foundation), value co-creation (collaborative mechanism), frugal innovation (efficiency-oriented outcome), and sustainable performance (final outcome). Accordingly, this study systematically reviews the literature and develops a conceptual framework explaining how digital servitization and value co-creation contribute to frugal innovation, which in turn enhances sustainable performance.

Objectives

1. To synthesize prior studies on digital servitization, value co-creation, frugal innovation, and sustainable performance through a systematic literature review.
2. To examine the relationships among digital servitization, value co-creation, and frugal innovation as identified in existing literature.
3. To develop a conceptual framework explaining how digital servitization and value co-creation contribute to frugal innovation and, in turn, enhance sustainable performance.

Concept Theory Framework

Digital servitization refers to the integration of digital technologies with service-oriented business models, enabling firms to enhance service delivery, monitor product usage, and develop new value propositions (Behl et al., 2023; Bigdeli et al., 2018). These capabilities are particularly important in supporting customer interaction, operational flexibility, and data-driven decision-making within service ecosystems.

Within these ecosystems, value is increasingly created through collaboration among



multiple actors. Value co-creation describes the processes through which firms, customers, and partners jointly generate value through interaction, knowledge sharing, and problem solving (Prahalad & Ramaswamy, 2004; Vargo & Lusch, 2016). This collaborative mechanism is essential for understanding customer needs and enhancing service outcomes.

Frugal innovation focuses on developing solutions that provide essential functionality while minimizing cost and resource usage (Hossain, 2016; Liu et al., 2025). It emphasizes efficiency, affordability, and simplicity, which are critical characteristics for organizations operating under resource constraints and sustainability pressures.

Sustainable performance represents the outcome of these processes and is typically reflected in economic, environmental, and social dimensions (Zhou et al., 2024; Wu et al., 2025). It captures the ability of firms to achieve long-term value while maintaining responsible resource utilization.

The literature suggests that digital servitization facilitates value co-creation by enabling continuous interaction and information exchange between firms and stakeholders. Through this collaboration, organizations gain deeper insights into user needs and operational constraints, which support the development of frugal innovation. In turn, frugal innovation contributes to sustainable performance by promoting cost efficiency and resource-conscious solutions.

Based on this synthesis, this study proposes a conceptual framework in which digital servitization enhances value co-creation and directly supports frugal innovation, while value co-creation further strengthens the development of frugal innovation. Frugal innovation subsequently contributes to sustainable performance.

Materials and Methods

This study adopts a systematic literature review approach to synthesize research on digital servitization, value co-creation, frugal innovation, and sustainable performance. Systematic reviews provide a transparent and structured process for identifying, evaluating, and synthesizing relevant studies.

The literature search was conducted using major academic databases, including Scopus, ScienceDirect, Emerald Insight, Wiley Online Library, and MDPI. To ensure the relevance and timeliness of the analysis, the review focused on studies published between 2015 and 2025. Search keywords included combinations of “digital servitization,” “servitization,” “value co-creation,” “frugal innovation,” and “sustainable performance,” using Boolean operators to refine the results.

The study selection process was conducted in four stages. In the identification stage, the initial search yielded 118 potentially relevant articles. In the screening stage, titles, abstracts, and keywords were reviewed, resulting in the exclusion of 52 articles that



were not directly related to innovation, servitization, collaboration, or sustainability outcomes. In the eligibility stage, the remaining 66 articles were assessed based on predefined criteria, including (1) publication in peer-reviewed journals, (2) relevance to the core constructs, (3) availability of full-text articles, and (4) publication in English. During this stage, 25 articles were further excluded due to limited relevance or insufficient theoretical contribution. Finally, in the inclusion stage, 41 journal articles were retained for detailed analysis.

The selected studies were analyzed to identify recurring themes, key constructs, and relationships among digital servitization, value co-creation, frugal innovation, and sustainable performance. The synthesis focuses on how these constructs interact and contribute to sustainability-oriented outcomes.

Results

The systematic search initially identified 118 studies related to digital servitization, value co-creation, frugal innovation, and sustainable performance. After screening for relevance, conceptual fit, and publication quality, 41 peer-reviewed journal articles were retained for the final synthesis. The temporal distribution indicates that this research area is relatively recent and rapidly expanding. Of the 118 records identified, 95 studies (80.51%) were published between 2021 and 2025, with 66 studies (55.93%) published between 2023 and 2025, suggesting a significant increase in scholarly attention in recent years.

1. Distribution of Key Constructs

The analysis reveals a strong emphasis on sustainability-related outcomes within the reviewed literature. As shown in Table 1, sustainable performance is the most frequently examined construct, appearing in 40 of 41 articles (97.56%). This dominance indicates that sustainability outcomes serve as the primary focus and ultimate objective across the research domain.

Table 1: Integrated Construct and Relationship Synthesis (N = 41)

Category	Construct / Relationship	Number of Articles	Supporting Studies (APA 7)
Research Construct	Sustainable Performance / Sustainability Outcomes	40 (97.56%)	Liu et al. (2025); Wu et al. (2025); Zhou et al. (2024); Singh et al. (2023); Shubin et al. (2022); Dima et al. (2022); Wang et al. (2016)



Category	Construct / Relationship	Number of Articles	Supporting Studies (APA 7)
Research Construct	Frugal Innovation	21 (51.22%)	Hossain (2016); Hossain & Simula (2022); Zeschky et al. (2014); Sant'Ana et al. (2025); Pansera & Owen (2018); Mishra & Sharma (2021)
Research Construct	Servitization / Digital Servitization	20 (48.78%)	Bigdeli et al. (2018); Bigdeli et al. (2024); Kohtamäki et al. (2019); Sjödin et al. (2020); Visnjic et al. (2018); Behl et al. (2023)
Research Construct	Value Co-creation	7 (17.07%)	Prahalad & Ramaswamy (2004); Vargo & Lusch (2016); Lim et al. (2018); Putri et al. (2025); Behl et al. (2023)
Key Relationship	Digital Servitization → Value Co-creation	3 (7.31%)	Behl et al. (2023); Bigdeli et al. (2024); Visnjic et al. (2018)
Key Relationship	Digital Servitization → Frugal Innovation	4 (Conceptual Support)	Liu et al. (2025); Zhou et al. (2024); Sant'Ana et al. (2025)
Key Relationship	Value Co-creation → Frugal Innovation	4 (Conceptual Support)	Prahalad & Ramaswamy (2004); Vargo & Lusch (2016); Hossain (2016)
Key Relationship	Frugal Innovation → Sustainable Performance	5 (Conceptual Support)	Liu et al. (2025); Wu et al. (2025); Singh et al. (2023); Shubin et al. (2022); Wang et al. (2016)

Frugal innovation is the second most prominent construct, identified in 21 studies (51.22%), underscoring its role as a key mechanism linking innovation strategies to sustainability outcomes. Servitization and digital servitization follow closely, appearing in 20 studies (48.78%), reflecting the increasing importance of digital service transformation.



In contrast, value co-creation appears in only 7 studies (17.07%), indicating that collaborative and interaction-based explanations remain underdeveloped. This imbalance suggests that while sustainability outcomes and efficiency-oriented innovation are well established, the underlying collaborative processes have received comparatively limited empirical attention.

At the relationship level, the most frequently discussed linkage is between frugal innovation and sustainable performance. However, relationships involving digital servitization and value co-creation, particularly their combined influence on frugal innovation, are less examined and are often conceptual rather than empirical. This pattern indicates a stronger focus on outcomes than on the upstream mechanisms through which digital transformation and collaboration support sustainability.

2. Implications for Conceptual Framework Development

The synthesis of the reviewed studies reveals a recurring structural pattern connecting the four key constructs. Digital servitization facilitates closer interaction between firms and stakeholders through the integration of digital technologies and service-based offerings. These interactions enable value co-creation by supporting information exchange, user feedback, and collaborative problem-solving.

Value co-creation, in turn, contributes to the development of frugal innovation by allowing firms to better understand user needs and operational constraints. These insights support the design of cost-efficient and resource-conscious solutions. Frugal innovation subsequently contributes to sustainable performance by promoting efficiency, cost reduction, and responsible resource utilization across economic, environmental, and social dimensions.

Although this structure appears consistently across the reviewed studies, it is rarely examined as an integrated model. Therefore, the findings highlight the need for a more comprehensive framework that links digital servitization, value co-creation, frugal innovation, and sustainable performance within a unified analytical perspective.

Accordingly, this study proposes the conceptual framework illustrated in Figure 1, in which digital servitization influences value co-creation and directly supports frugal innovation, while value co-creation further strengthens frugal innovation. Frugal innovation subsequently contributes to sustainable performance.

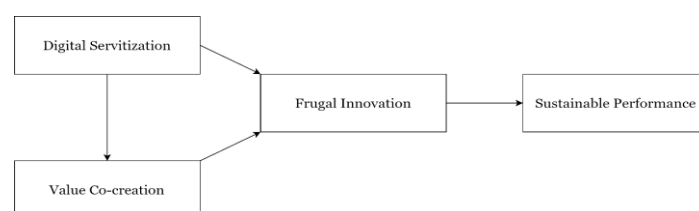


Figure 1: Conceptual framework derived from the systematic literature review



Conclusions and Discussion

This study synthesizes prior research on digital servitization, value co-creation, frugal innovation, and sustainable performance through a systematic literature review. The findings indicate that sustainability outcomes are strongly associated with innovation strategies, particularly frugal innovation, which emerges as a central mechanism linking strategic initiatives to performance outcomes.

The results further suggest that digital servitization plays a critical role in enabling closer interaction between firms and stakeholders. Through digital technologies, firms can facilitate continuous communication and data exchange, which support value co-creation processes. These collaborative interactions allow organizations to better understand user needs and operational constraints, thereby contributing to the development of frugal innovation. In turn, frugal innovation enhances sustainable performance by promoting cost efficiency, resource optimization, and responsible value creation across economic, environmental, and social dimensions.

However, the analysis also reveals that existing research tends to examine these constructs in isolation. While the relationship between frugal innovation and sustainable performance is well established, the roles of digital servitization and value co-creation as enabling mechanisms remain comparatively underexplored. This fragmentation highlights the need for a more integrated perspective that explains how digital transformation and collaborative processes jointly contribute to sustainability-oriented innovation.

The conceptual framework proposed in this study addresses this gap by linking digital servitization and value co-creation to frugal innovation, which subsequently influences sustainable performance. This framework provides a structured explanation of how digital service strategies and collaborative value creation processes can be aligned to achieve sustainability outcomes.

From a theoretical perspective, this study contributes by integrating four key constructs that have largely been examined independently in prior literature. The findings extend existing research by highlighting the complementary roles of technological capability, collaborative processes, and efficiency-oriented innovation in explaining sustainable performance.

From a practical perspective, the results suggest that organizations should not rely solely on technological investment or innovation capability in isolation. Instead, firms should combine digital servitization with collaborative value co-creation practices to support the development of frugal innovation. This integrated approach can help organizations design cost-efficient and resource-conscious solutions that align with sustainability goals, particularly in industries facing increasing competitive and environmental pressures.



This study has several limitations. The analysis is based on a selected sample of peer-reviewed journal articles and may not capture all relevant studies. In addition, the proposed framework is conceptual and has not been empirically validated.

Future research may examine the proposed relationships empirically across different industries and organizational contexts. Such studies would help validate the framework and provide deeper insights into the mechanisms through which digital servitization and value co-creation contribute to frugal innovation and sustainable performance.

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