11th International Conference on Business Servitization

November 7-8 2024

Lisbon

Nova School of Business and Economics

Book of Abstracts

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11th International Conference on
Business Servitization

(ICBS 2024)

Focal theme: Unlocking Unique and Intelligent Digital Solutions:
The Pivotal Role of Frontier Technologies (Blockchain and AI)
in Servitization

Lisbon, Portugal, November 7-8, 2024

Book of Abstracts. 11th International Conference on Business Servitization (ICBS 2024)
1st edition © 2024 OmniaScience (Omnia Publisher SL)
www.omniascience.com

DOI: https://doi.org/10.3926/serv2024
ISBN: 978-84-128130-4-3
DL B 22005-2024
Cover design: OmniaScience
Cover photo: © DouDou - Fotolia.com

Foreword

Welcome to 11th International Conference on Business Servitization

This book abstracts summarizes the proceedings of the **11th International Conference on Business Servitization (ICBS 2024)**, held at Nova School of Business and Economics – Lisbon, Portugal. On this edition, the conference places a special emphasis on the focal theme: Unlocking Unique and Intelligent Digital Solutions: The Pivotal Role of Frontier Technologies (Blockchain and AI) in Servitization

The convergence of technologies like the Internet of Things, big data, and cloud computing allows remote connectivity to physical assets, giving rise to what is now known as digital services. Digital services refer to the integration of digital elements and technologies into business structures, processes, and models, leading to the transformation of traditional pure product or pure service models. This shift enables companies to offer bundled digital solutions that combine products, services, and software-hardware systems, unlocking higher value-generation potential.

These digital solutions leverage technological building blocks to enhance product operation, provide real-time access to data, and continuously reconfigure service design for an improved user experience. In essence, there is a digital service component that is a source of digital innovation, capable of dynamic revamping based on consumer patterns. This evolution is crucial for aligning business models with evolving customer needs.

Despite the growing importance of digital services for the competitiveness of servitized manufacturers and productized service firms, there are threads and challenges, such as user exclusiveness, data security, and data analysis automatization. We argue that there is a need to explicitly study the role of frontier technologies such as blockchain and the artificial intelligence to overcome these boundaries for the growth of such digital solutions.

Blockchain is a decentralized and secure distributed ledger technology that records transactions across a network of computers. It enhances digital solutions by providing transparency, traceability, and security throughout the supply chain. Each transaction or data entry is stored in a block, linked to the previous one, forming an immutable chain. This ensures trust and accountability, reducing the risk of fraud and errors. Also, different designs of blockchain, or in general distributed ledger technologies, enable new possibilities for organizations to share a ledger in a decentralized and distributed manner and in near-real time obtain critical information for their operations. In manufacturing, blockchain can streamline processes such as supply chain management, production tracking, and quality control opening new ways to safely communicate critical information across the supply chain. Smart contracts, which are self-executing agreements with coded terms, enable automated and transparent interactions between parties, consistency in the execution, and efficiency gains. Another noteworthy characteristic of (programmable) blockchains is to facilitate the creation of unique tokens opening the possibility for exclusive digital services and representation of real-world assets in a digital realm. This is evident in the rise of NFTs (Non-Fungible Tokens), which enabled the creation of digital collectibles, but also the rise or organizations that tokenized natural resources, real estates, and other physical objects. One intriguing question is how tokenization offers new ways to servitize physical objects, and contribute both to profit and social welfare. Another interesting question is how the unique tokens enhance manufacturers' capacity to incorporate exclusive digital services into their portfolios.

Artificial Intelligence (AI), either in the context of generative AI (e.g., ChatGPT, Llama, SORA, Gemini, Mistral, MidJourney, Falcon, etc.), or in the context of Narrow AI, which refers to solving specific problems with the application of machine learning algorithms, empowers systems to learn and make predictions or decisions without explicit programming. In manufacturing, artificial intelligence can significantly enhance digital services by analyzing vast amounts of data, identifying patterns, enhance communication, and making real-time decisions. It enables predictive maintenance, optimizing equipment performance, reduction of downtime, quality control, but also new ways to engage in problem solving, innovation, and interactions with customers. A combination of frontier technologies, including advanced robotics, artificial intelligence, and sensors, create new opportunities for manufacturers and other organizations to rethink their business models and operations from the scratch.

Overall, artificial intelligence plays a crucial role in transforming manufacturing processes by leveraging data to improve decision-making, operational efficiency, and the overall effectiveness of digital services. However, more research is needed to explore how artificial intelligence enables an improved and even completely new servitization strategy.

This year's edition of the International Conference on Business Servitization (ICBS) aims to debate and shape such critical questions for the future development of the field. Accordingly, the focus of this year is set at the intersection of two increasingly essential topics for servitization that have not yet been sufficiently linked in academia: digital services and frontier technologies with the focus on artificial intelligence and blockchain.

ICBS is a conference traditionally targeted to business professionals, policy makers and researchers. While the focus of this year's conference will be the Pivotal Role of Frontier Technologies in Servitization, as in previous editions the organizers also endeavour to connect works related to other relevant issues linked with servitization such as: business engineering, strategy, business models, international business, operations management and supply chain management. The conference will engage current research on the field of servitization, which focuses both on theoretical developments and on practical applications of the methods and techniques. The conference aims to provide a platform for researchers and practitioners from both academia as well as industry to meet & share the cutting-edge developments in the field of servitization.

Topics

Special sessions on specific topics are also encouraged. Topics of interest mainly include, but not limited to:

Blockchain and digital services

- Case studies bringing insight to the research at the intersection between blockchain, servitization and digital services.
- Conceptual or qualitative research showing the role of NFTs in servitization and digital services.

- Connection between data security and enhanced servitization outcomes, especially in relation to blockchain.

Artificial intelligence and digital services
- Investigate AI's role in autonomous service-based solutions and digital service innovation.
- Explore digital servitization for scalable and customized solutions in manufacturing.
- Explore AI's future role in servitization and conduct critical assessments in solution delivery and digital services.

Machine learning and digital services
- Machine learning applications for servitization.
- The use of machine learning techniques for an improved understanding of the functioning of service business models.
- Comparative case studies showing how machine learning is used in different contextual conditions withing servitization.
- Conceptual models differentiationg the role of machine learning and artificial intelligence in servitization and digital services.

Business engineering
- Industry 4.0 - Hybridization of the physical and digital worlds.
- Internet of things, Cloud Computing, and Sensors enabled services.
- Service system and Service network design.
- Tools and toolkits for engineering servitization processes.
- Smart manufacturing, big data and machine learning for services development.

Business models and strategy

- Partnerships, strategic alliances, outsourcing, joint-ventures, M&As and servitization.
- Advanced business services and collaborative practices in business model innovation.
- The internationalization of product-service offering.
- Digital service innovation.
- Financial, legal and risk aspects of services.
- Talent management, human resources, and recruitment needs.
- Resilience, agility, ambidexterity and other firm capabilities.

Supply chain management and marketing

- The role of blockchain and machine learning in boosting digital services within logistics and supply chain management.
- Servitization and collaborative supply chain management.
- Internet of things and linking channels.
- Product-service innovation processes and organizational performance indicators.
- Green Supply chain management and product-service innovation.
- Servitization and customer value perception.
- Servitization role on business ecosystems and networked production systems.

Territorial Servitization

- Economic assessment of the impact of collaborative product-service innovation on the firm and territorial competitiveness.
- What are the antecedents, moderators/mediators, and outcomes of knowledge-intensive service-manufacturing collaborations on organizational resilience and performance?

- Conceptualization and provision of evidence on collaborative approaches to cluster and industrial district policies formed by multi-sector, including manufacturing and service, firms.
- Do KIBS firms offer opportunities for local manufacturing SMEs to outsource service provision? And for multinationals to reshoring their production to the home country? Which is the relevance of geographical distance when it comes to transferring knowledge from service to product firms?

Ferran Vendrell-Herrero, Director Scientific Committee
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PRESENTED AT

11TH INTERNATIONAL BUSINESS SERVITIZATION CONFERENCE

Parallel Session 1

Digital Service Innovation in Manufacturing and Supply Chains

Co-Chairs: Heiko Gebauer & Marin Jovanovic

Exploring Digital Service Innovation and Service Readiness in B2B

Lorea Narvaiza, José Antonio Campos
University of Deusto
María Luz Martín Peña, Eloísa Díaz Garrido
Rey Juan Carlos University

Abstract

Digital service innovation (DSI) involves offering new services by manufacturers' using digital technologies to create value for both manufacturers and their customers. Despite the interest in studying DSI, there are still some gaps related to the service readiness of both the customer and the manufacturer. This study aims to explore service readiness in B2B when new digital services are offered considering both the manufacturer's and the customer's perspective at the same time. The study adopts a qualitative approach, specifically a case study method, to explore service readiness in DSI in B2B contexts. Interview data are collected from both manufacturers' managers and from several of its customers' managers. The study uncovers the multifaceted nature of DSI and the interdependencies between customer and manufacturer organizational readiness.

Keywords: Digital service innovation, organizational factors, service readiness, B2B.

Theoretical framework

Digital service innovation (DSI) refers to innovations in manufacturers' service offerings using digital technologies that create value for manufacturers and their customers (Raddats, Naik

& Bigdeli, 2022; Sjödin, Parida, Kohtamäki & Wincent, 2020; Opazo-Basáez, Vendrell-Herrero & Bustinza, 2022). In addition to a technical dimension, DSI involves a customer dimension (Raddats et al., 2022), to deliver highly customised service-oriented value propositions - through more direct and collaborative, digitally enhanced provider-customer relationships (Kowalkowski et al., 2024). In this sense, "readiness" refers to a state of psychological and behavioral preparedness to act (Weiner, 2009) and in this context, "service readiness" is defined as the inclination to embrace and use new services (Vaittinen, Martinsuo & Ortt, 2018). Previous literature has paid attention, on one hand, to customer organizational readiness for digital services (Gentner, Stelzer & Brecht, 2017; Vaittinen & Martinsuo, 2019). Other research stream has studied manufacturer's organizational readiness for digital services (Lokuge, Sedera, Grover & Dongming, 2019; Machado, Winroth, Almström, Ericson Öberg, Kurdve & AlMashalah, 2021). Although customer and manufacturer organizational readiness for digital service have been studied separately, considering both perspectives at a time could offer meaningful insights (Narvaiza, Campos, Martín-Peña & Díaz-Garrido, 2024). Echoing this line of thought, several scholars acknowledge the importance of exploring the two concepts together (Vaittinen & Martinsuo, 2019). Based on our literature review, we found that no study, so far, has considered to study both customer and manufacturer organizational readiness jointly. And a new concept emerges, that is, "digital service readiness".

Building upon the extant literature, there is a gap in our understanding of how digital service readiness is manifested in both customer and manufacturer domains. To gain further insights in digital service readiness and contribute to the evolving discourse on the topic, the aim of this study is to answer the following research question:

RQ1: How do the organizational dimensions of customer service readiness and manufacturer service readiness manifest themselves in DSI in a B2B context?

Method

Considering the exploratory nature and the complex social context with manufacturers and customers involved, we follow a qualitative approach and, particularly, we use the case study method. Case studies are particularly appropriate when complex social phenomena are considered in their real context (Yin, 2003). They are also suitable for theory building or testing when theory is based on context (Gioia, Corley & Hamilton, 2012). This study is based on a single exploratory case study, which is suitable when the assessed action has no clear, single set of outcomes (Yin, 2018). The interview data are collected from several managers from manufacturers and several of its customers.

Expected findings and implications

This study aims to make both theoretical and practical contributions. From a theoretical perspective, we seek to extend the literature on Digital Service Innovation (DSI) in Business-to-Business (B2B) contexts. Specifically, we intend to elucidate how the organizational dimensions of customer service readiness and manufacturer service readiness manifest in B2B environments during DSI implementation. The results of our study have contributed to the formulation of a new term "digital service readiness". Additionally, from a managerial perspective, we aim to offer actionable insights that can inform practice in this topic.

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Unlocking Unique and Intelligent Digital Solutions: The Pivotal Role of Frontier Technologies (Blockchain and AI) in Servitization

Kristina Zabala, Lorea Narvaiza, Carmela Peñalba-Aguirrezabalaga, Arantza Zubiaurre
University of Deusto

Abstract

Using digital service innovation to boost a customization business model: implications for logistics and supply chain management

Keywords: Digital service innovation (DSI), Supply Chain Management (SCM), partnerships, data-driven innovation, business model.

Purpose and research question

Service innovation powered by digital technologies is driving a transformative shift in business-to-business (B2B) industries. Studies on innovation in B2B markets often neglect service innovation and its potential (Kowalkowski, Wirtz & Ehret, 2024). Digital services innovation (DSI) have been largely ignored in the mainstream literature on service innovation (Opazo-Basáez, Vendrell-Herrero & Bustinza, 2022). DSI combines service management and technological innovation research streams, creating a new paradigm of industrial competitiveness aimed at enhancing value creation within business ecosystems (Opazo-Basáez et al., 2022). DSI serves as a pioneering source of technological innovation, where digital technologies, interconnectivity, data, and learning drive the development of new digital service offerings also named digital servitization (Vendrell-Herrero, Bustinza, Parry & Georgantzis, 2017; Bustinza, Gomes, Vendrell-Herrero & Shlomo, 2018; Gebauer, Paiola, Saccani & Rapaccini, 2021). This enables firms to dynamically align business model components with users' and customers' needs (Rabetino, Kohtamäki & Huikkola, 2023). Drawing on the literature on service innovation (Singh, Akbani & Dhir, 2023) and digital servitization (Vendrell-Herrero et al., 2017; Bustinza, et al., 2018; Gebauer et al., 2021), DSI represents a novel strategy in Logistics and Supply Chain Management (L&SCM) facilitating direct customer sales (Pizzichini, Temperini & Caboni, 2023). However, and even though there is emerging research on the role of digitalization in L&SCM, there is still a significant gap in the literature regarding how new digital technologies can enhance service delivery across business settings (Kowalkowski, et al. 2024; Rabetino et al., 2023). Specifically, a deeper understanding of inter-organizational collaboration is required to assess whether the current concepts of supply chain partnerships remain valid in a digitilized SCM context (Hofmann, Sternberg, Chenm Pflaum & Prockl, 2019). In addition, there is a need to investigate how actors of the ecosystem integrate systems (Narvaiza, Campos, Martín-Peña & Díaz-Garrido, 2024), upgrade capabilities and redefine roles in the Supply Chain and how to combine proprietary logistics and third-party logistics (Janné & Rudberg, 2022). These elements position logistics as a central source of competitive advantage.

This paper aims to contribute to existing gap by analyzing the relationship between DSI and L&SCM through a case study. In-depth interviews will be conducted to explore how a data-driven digital service strategy (Opresnik & Taisch, 2015) can transform the supply chain when introducing a business model based on a customization service (Zabala, Campos & Narvaiza, 2022). So, it aims to address the following research question:

RQ: How does data-driven Digital Service Innovation strategy changes the supply chain when implementing a business model based on a customization service?

Extending the boundaries of a company, and considering collaboration with customers and suppliers, as a method to enhance results is largely considered on the supply chain management literature (Stevens, 1989). With the DSI trend and from an institutional factors' perspective (systems, structures, functions, practices and culture), it is crucial to investigate whether DSI can create tensions in L&SCM processes and activities, potentially leading to a paradox of DSI (Gebauer, Fleisch & Friedli, 2005). As the study company's customization business model necessitates a shift from externalizing logistics functions to retailers to adopting a more internalized logistics approach, tensions are expected to arise between the company and its retailers. Therefore, our goal is to build a comprehensive framework of major challenges when adopting DSI in a B2B context and to discuss how to overcome them to fully realize the expected benefits of DSI within L&SCM.

Methodology

The study follows a grounded theory approach to inductively explore how the data-driven digital service innovation changes the supply chain when implementing a business model based on a customization strategy. It is based on an in-depth case study on a B2B setting.

Findings: Research in progress

We expect the results to provide us with valuable insights into whether and how the data-driven digital service innovation changes the supply chain. We aim to initiate a productive discussion on the barriers and explore strategies to overcome them.

Implications

The study contributes to extending the recently emerged study of challenges of DSI for L&SCM to consider the customization business model as a solution proposition of tacit and explicit knowledge components and highlighting the barriers that hinder the potential of DSI in the B2B case study.

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Exploring Manufacturer-Digital Supplier Collaboration for Digital Service Innovations

Chris Raddats

University of Liverpool

Beheshte Momeni

University of Vaasa

Dipti Rathi, Ali Bigdeli

Aston University

Abstract

Digital service innovations (DSIs) include the integration of digital technologies such as IoT, cloud computing, and predictive analytics to enhance service offerings and internal processes. Digital suppliers play a critical role in the development and delivery of DSIs. However, there is limited understanding of how manufacturers collaborate with digital suppliers to develop DSIs. This research aims to investigate collaboration for DSIs between manufacturers and digital suppliers. The paper presents an exploratory multiple-case study based on three DSI types (business enabler, service enhancement, digital service offering) in six manufacturers and their digital suppliers. The findings illustrate collaboration models for these DSI types, examining coordination and cooperation approaches. The study broadens the investigation of digital servitization beyond manufacturers to include digital suppliers, enhancing the understanding of collaboration approaches. Adopting an inter- organizational collaboration perspective, it reveals coordination and cooperation across DSI types.

Keywords: Digital service innovations (DSIs), collaboration, coordination, cooperation.

Introduction

The servitization process demands greater integration of digital technologies such as IoT, cloud computing, and predictive analytics (Rabetino, Kohtamäki & Huikkola, 2023). Manufacturers leverage these technologies to create innovative services and enhance existing offerings and internal processes, known as DSIs (Opazo Basáez, Vendrell-Herrero & Bustinza, 2024). Previous work identified three main types of DSIs: business enabler (e.g., combining remote monitoring and logistics management), service enhancement (e.g., remote maintenance solutions) and digital service offering (e.g., predictive maintenance solutions) (Raddats, Naik & Bigdeli, 2022). Manufacturers play a key role in identifying market opportunities, customer needs, and designing DSIs (Solem, Kohtamäki, Parida & Brekke, 2022). However, successful DSIs depend not only on manufacturers' capabilities but also on their ability to effectively collaborate with digital suppliers (Dalenogare, Dain, Ayala, Pezzotta & Frank, 2023). Although past research has explored the transition from product-centric models to digital services, the need to investigate inter-organizational collaboration in DSIs remains (Kowalkowski, Wirtz & Ehret, 2024). This collaboration goes beyond transactional relationships, requiring a deep understanding of each actor's role and interdependencies. Thus, this research aims to investigate collaboration models between manufacturers and digital suppliers to develop different DSI types. We identified two research questions (RQs):

RQ1: How do manufacturers and digital suppliers collaborate to develop different types of DSI?

RQ2: How do the perspectives of collaboration differ between manufacturers and digital suppliers?

Through an exploratory study of eight cases, the study identifies collaboration approaches for different DSI types and the differing perspectives between manufacturers and digital suppliers.

Theoretical Background

Digital Service Innovations

Technological advancements in IoT, intelligent automation, and digital platforms are reshaping service innovation (Kowalkowski et al., 2024), creating new revenue models and streamlining service delivery (Raddats et al., 2022). DSIs refer to "*the strategic use of digital technologies to (re)model service design, delivery, and individualization, leading to innovative offerings, improved operations, and enhanced service value creation.*" (Opazo Basáez, Vendrell-Herrero, Bustinza & Raddats, 2024).

Developing DSIs involves new actors, redefined roles, and reconfigured resources (Kowalkowski et al., 2024; Sklyar, Kowalkowski, Tronvoll & Sörhammar, 2019). Recent literature highlights the critical role of collaboration with digital suppliers, such as cloud platform providers, data integrators, and software companies, to acquire new capabilities (Momeni, Raddats & Martinsuo, 2023; Smania, Osiro, Ayala, Coreynen & Mendes, 2024).

While most literature focuses on manufacturers' perspectives, there is a growing recognition of the need to investigate the role of digital suppliers (Ferreira & Lind, 2023). A few recent studies have started exploring collaboration in a particular DSI context (e.g., Narvaiza, Campos, Martín-Peña & Díaz-Garrido, 2023). However, there is still a gap in understanding collaboration models between manufacturers and digital suppliers for different DSI types.

Inter-organizational Collaboration

This paper adopts an inter-organizational collaboration perspective from organizational studies to understand collaboration models (Gulati, Wohlgezogen & Zhelyazkov, 2012). In line with Gulati et al. (2012), this paper uses 'collaboration' as an umbrella term for coordination and cooperation approaches between firms from inter-organizational interactions. Coordination involves defining goals and tasks and managing interdependence through plans and schedules (Castañer & Oliveira, 2020; Gulati et al. 2012). Cooperation involves the joint effort of different organizations working together towards common objectives, with a mutual understanding of each party's roles and benefits (Gulati et al. 2012; Tee, Davies & Whyte, 2019).

Research Method

This paper is an exploratory multiple-case study based on eight DSIs. We selected European manufacturers that offer complex industrial systems and services, actively developing DSIs together with their digital suppliers. Thus, we collected dyadic data with both actors discussing the same DSIs. We conducted 30 interviews with top-level executives and DSI experts in six manufacturers (16 interviews) and eight digital suppliers (14 interviews). Data analysis followed abductive coding through a series of iterations and comparisons between the theoretical frameworks and the empirical findings. The unit of analysis is DSI type.

Findings

The findings revealed the coordination and cooperation approaches that underpin collaboration for each DSI type. For RQ1, the findings indicate increased coordination via information sharing when moving from business enabler to service enhancement and digital service offerings. In terms of cooperation, the findings reveal that business enabler require limited cooperation, while service enhancement involves extensive goal alignment between manufacturers and digital suppliers. Digital service offerings in turn increase resource sharing and require relational trust between manufacturers and digital suppliers to share innovative ideas, and priorities risks. We develop a framework to map DSI types and collaboration approaches. For RQ2, this framework is used to distinguish the collaboration approaches of manufacturers and digital suppliers revealing differences in their understanding of collaboration.

Conclusions

This study expands the scope of inquiry about digital servitization beyond the traditional manufacturer's perspective, recognizing the crucial viewpoints of digital suppliers for successful DSIs (Dalenogare et al., 2023). By doing so, the findings contribute the discussion about the multi-actor perspective, for which most prior research has considered the downstream (rather than upstream) context (Raja & Frandsen, 2017; Reim, Sjödin & Parida, 2019; Story, Raddats, Burton, Zolkiewski & Baines, 2017).

Our study envisages coordination and cooperation as a spectrum rather than dichotomy that characterize collaborations in DSIs. Furthermore, by revealing the differences in the understanding of collaboration approaches between manufacturers and digital suppliers the study highlights the opportunities and challenges that may enhance or impede the implementation of the DSIs.

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The Origins of Digital Service Innovation (DSI): Ontology and Future Research Perspectives

Josip Marić

EM Normandie Business School, Paris (France)

Mirjana Pejić-Bach

University of Zagreb (Croatia)

Abstract

Purpose: The purpose of this study is to disclose ontology of DSI as a novel concept in servitization community, explore the research context and themes (i.e. technological and industrial sectors) where DSI emerges, unveil methodological complexities of the research on digital servitization and DSI and provide guidelines for future research avenues regarding DSI.

Design/methodology/approach: Bearing in mind the relative novelty of DSI as a concept in servitization literature, the authors adopted a systematic literature review approach to identify 111 peer-reviewed articles published in English language and available in business and management disciplines via scholar databases (Scopus). The analysis of literature discloses descriptive and thematic insights regarding digital servitization and DSI.

Findings: The study provides valuable insights from the descriptive and thematic analyses where classification of articles per publication year, citations, methodology/type of the paper, geographical location of data collection, as well as industrial sector and technological contexts are discussed. Moreover, the unique value of this study is observed through its specific focus on the characteristics of DSI-related literature.

Originality/value: The study is among the first of its kind to provide extensive descriptive and thematic insights on the available literature dealing with digital servitization and DSI, mapping out prior research across a wide spectrum of publication outlets and illustrating the chronological evolution of research on digital servitization and DSI.

Keywords: Digital service innovation, DSI, Digital servitization, Servitization, Systematic literature review.

Digital Service Innovation for Smarter Production: Servitized-AI progress towards Smart Products

Esteban Lafuente

School of Business, Costa Rica Institute of Technology (ITCR), Cartago, Costa Rica

Yancy Vaillant

Department of Strategy, Entrepreneurship and Innovation, TBS Education, France

Ajax Persaud

Telfer School of Management, University of Ottawa, Canada

Abstract

The proliferation of smart products, equipped with sensors and connectivity, has significantly enhanced value creation through remote monitoring, control, optimization, and autonomization. While the potential of digital tehnologies from these products is well-recognized, true smart capabilities require more than mere data collection; they necessitate AI-augmented Digital Service Innovation (DSI). This study posits that integrating AI with digital servitization strategies enables manufacturers to develop advanced smart products. Utilizing a unique dataset from 576 Spanish manufacturing firms for 2023, the study employs an ordered probit model with sample selection to assess the impact of servitization and AI-intensive strategies on smart product development. Findings reveal that only the combined implementation of servitization and AI strategies significantly advances a product's smart capabilities. This research underscores the critical role of DSI in the progression of smart products through monitoring, control, optimization, and autonomization stages.

Keywords: Smart products, Digital Service Innovation, Artficial intelligence, Servitization, Smart analytical capabilities

Extended Abstract

A growing number of products are being augmented with added sensors and connectivity that contribute to increasing their value creation potential through enhanced remote monitoring, control, optimization, as well as autonomization capabilities; transforming them into so-called smart products (Porter & Hepplemann, 2014; 2015). Much emphasis has been placed on the big data generated by such smart products, as well as on the scalable customization capacity that such product-based inteligence can offer to manufacturers (Berente, Gu, Recker & Santhanam, 2021; Raff, Wentzel & Obwegeser, 2020; Vendrell-Herrero, Bustinza & Vaillant, 2021). However, in order to be able to reach these benefits and be 'smart', products need more than just sensors and data collection abilities (Opazo Basáez, Vendrell-Herrero, Bustinza & Raddats, 2024; Rabetino, Kohtamäki & Huikkola, 2024). We propose in this study that to advance up the smart product capability scale and offer true autonomized smart products, manufacturers require AI-augmented Digital Service Innovation (DSI).

For instance, the company Kone has incorporated sensors into its elevators (Ayala, Rodrigues, Cannarozzo, Frank & Saccani, 2025). But it is only through the use of artificial intelligence to analyze the collected data that their elevators truly developed the remote condition monitoring and optimization service capabilities that warrant the 'smart' adjective (Qvist-Sørensen, 2020). Similarly, Tesla utilizes AI and machine learning techniques to anticipate maintenance issues, enabling their vehicles to self-notify its owners about the need for maintenance or even to self-diagnose and remediate identified problems autonomously (Ayala et al., 2025;

Tredinnick, 2017). Such smart products rely heavily on DSI, where digital servitization strategies and artificial intelligence meet to generate the capabilities that make them 'smart' (Opazo et al., 2024; Paschou, Rapaccini, Adrodegari & Saccani, 2020; Rabetino et al., 2024).

DSI strategically utilizes digital and AI-intensive strategies to redefine service design, delivery, and customization, leading to innovative offerings, operational enhancements, and increased value creation (Opazo-Basáez et al., 2024). By doing so, DSI becomes the skills and knowhow that are able to cuisine into 'smart capabilities' the raw ingrediants that connected-devices and sensor-augmented products can potentially generate (Kohtamäki, Rabetino, Einola, Parida & Patel, 2021; Vaillant & Lafuente, 2024). The standard framework for the 'smart capabilities' of products presents a nested structure depending on the product's degree of analytic capabilities. This classification progresses through a sequence of monitoring, control, optimization, and autonomous capabilities (Porter & Heppelmann, 2014). The analysis proposed in this paper therefore studies whether manufacturers implementing servitization and utilizing AI-intensive strategies are more likely to have products with more advanced analytically smart capabilities in terms of their progression across the monitoring, control, optimization, and autonomization nested abilities.

To do so a unique database was collected using a survey designed specifically for this research, which encompasses a sample of 576 Spanish manufacturing firms for 2023.

The core results of the full model estimated via ordered probit model with sample selection indicate that the implementation of servitization and AI-intensive strategies by manufacturers do significantly contribute to develop products with more advanced analytically smart abilities, in terms of their progression towards fully autonomous smart products. However, this positive association was only statistically significant when servitization and AI-intensive strategies were both jointly implemented by manufacturers, consistent with a DSI approach. For manufacturers implementing either servitization strategies or AI-intensive strategies on their own, the adoption of these strategies were not found to play a significantly positive role on the progression of the manufacturers' products towards more advanced analytically smart capabilities.

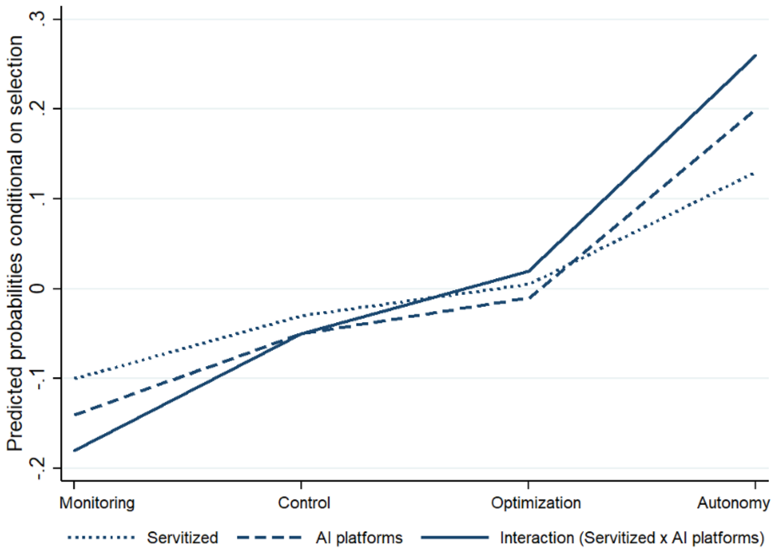

Figure 1. Smart product scale progression

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Parallel Session 2

Servitization Strategies and Business Models

Co-Chairs: Vinit Parida & Johan Frishammar

Business Models Innovation Patterns in Servitization

Francisco J. Luque-Hernandez, Oscar F. Bustinza

University of Granada

Ferran Vendrell-Herrero

University of Edinburgh

Manuel Rios de Haro

University of Granada

Abstract

New business models expand the current innovation portfolio and support advancements in both product and process innovation. When such business model innovations incorporate service innovation within manufacturing contexts, they are commonly recognized as servitization business model changes. This research endeavors to elucidate the principal business model patterns linked with servitization. By scrutinizing nearly sixty business model patterns delineated in the business model navigator framework, this study delineates the primary business models embraced and the prevalent interconnections among them within servitization contexts. The novelty of this investigation lies in enriching the existing categorization of business models associated with servitization, broadening the conventional servitization business model continuum to encompass the product business model, service-agreement business model, process-oriented business model, and performance-oriented business model. Contributions manifest in elucidating the complementary nature of business models, identifying comparative patterns across different sectors that elucidate variations in servitization performance, exploring the

transferability of these models among sectors, and offering tailored business model recommendations aligned with the firm's objectives.

Keywords: Servitization, business models navigator, innovation.

Predominant Business Models in Servitized firms

Business models are built around understanding the customer served, the value proposition offered, the resources, capabilities, value chain involved, and the related revenue model (Gassmann, Frankenberger & Csik, 2020). Business model innovation complements other forms of innovation, such as product and process innovations. Considering that servitization includes changing from a product-centered to a service-centered business model, the current research analyzes the specific business models used in servitization contexts, exploring the interconnections between them and shedding light on the heterogeneities inherent to servitization (Bustinza, Lafuente, Rabetino, Vaillant & Vendrell-Herrero, 2019; Bustinza, Vendrell-Herrero & Gomes, 2020; Vendrell-Herrero, Bustinza, Opazo-Basáez & Gomes, 2023).

Gassmann & Frankenberger (2020) propose sixty business model innovation patterns that describe how a firm creates and captures value. Any further business model can be conceptualized as a reconfiguration and creative adaptation of these patterns. These non-technological business model innovations complement other types of technological innovation, such as product, service, or process innovation (Coreynen et al., 2024). In Table 1 below, we display, as an example, 21 of the business model innovation patterns followed by manufacturers that implement servitization strategies (Bustinza, Vendrell-Herrero, Davies & Parry, 2024).

#G&F	ID	BUSINESS MODEL INNOVATION PATTERN	EXAMPLES	SERVITIZATION TYPE
1	BM1	ADD-ON	Bosch, Mercedes, Tesla	After sales (Baines et al., 2017)
6	BM2	CASH-MACHINE	Dell	Pre-sales + 48. SUBSCRIPTION
11	BM3	DIGITIZATION	CDs and mp3	Products and services as substitutes/complements (Parry et al., 2013)
14	BM4	EXPERIENCE SELLING	Harley Davidson, NIO	Service membership
15	BM5	FLAT RATE	Porsche	Service membership
20	BM6	GUARANTED AVAILABILITY	IBM, HILTI, OTIS, MITSHUBISHI, SCHINDLER	Advanced services + 15. FLAT RATE (Baines et al., 2017)
23	BM7	INTEGRATOR	Würth	Servitization going downstream (Wise & Baumgartner, 1999)
25	BM8	LEVERAGE CUSTOMER DATA	Tesla	Servitization through Smart Products (Porter and Heppelmann, 2014)
26	BM9	LICENSING	Basf, Bosch	Servitization through outsourcing (Bustinza et al., 2015)
27	BM10	LOCK-IN	Hewlett-Packard	Servitization through lock-in customers (Bustinza et al., 2015)
29	BM11	MAKE MORE OF IT	Porsche, Bosch	Servitization by offering consulting, training… (Brax & Visintin, 2017)
30	BM12	MASS CUSTOMIZATION	Levi's, Adidas	Servitization paradox standardization-customization. Modular solutions (Jovanovic et al., 2024)
32	BM13	OPEN BUSINESS	IBM	Servitization-Productization
35	BM14	PAY PER USE	Daimler	Servitization by pay per use products (Parry et al., 2013)

#G&F	ID	BUSINESS MODEL INNOVATION PATTERN	EXAMPLES	SERVITIZATION TYPE
38	BM15	PERFORMANCE-BASED CONTRACTING	Xerox, Basf	Servitization by advanced services offerings (Baines et al., 2017)
40	BM16	RENT INSTEAD OF BUY	Porsche	Leasing (Brax & Visintin, 2017)
41	BM17	REVENUE SHARING	Apple	Servitization by advanced services offerings (Baines et al. 2017)
47	BM18	SOLUTION PROVIDER	Heidelberg Printing Machines, Tetra Pack, 3M	Servitization through Total Solutions (Brax & Visintin, 2017)
48	BM19	SUBSCRIPTION	HILTI, DELL	Payment model (Brax and Visintin, 2017)
54	BM20	USER DESIGN	Cisco	Payment model (Brax and Visintin, 2017)
56	BM21	SENSOR AS A SERVICE	Panasonic	Servitization through Smart Products (Porter & Heppelmann, 2014)
57	BM22	VIRTUALIZATION	NVIDIA	Servitization and digital twins (West et al., 2020)
58-59	BM23	OBJECT SELF-SERVICE AND POINT OF SALE	Würth, GOOGLE glasses	Servitization through Smart Products (Porter & Heppelmann, 2014)

Note: #G&F refer to the number each business model has in Gassmann & Frankenberger (2020). ID is allocated by authors and is used in the correlation heatmap.

Table 1. Main Business Model Innovation patterns in servitization contexts.

The Business Model Navigator (BMI) interactive database provides various examples of manufacturers that have adopted servitization, utilizing either a single or a combination of business model innovations. From the BMI database we have linked 47 firms to their different business model pattern Figure 1.

By generating a correlation heatmap of the main business model innovation patterns implemented in servitization contexts

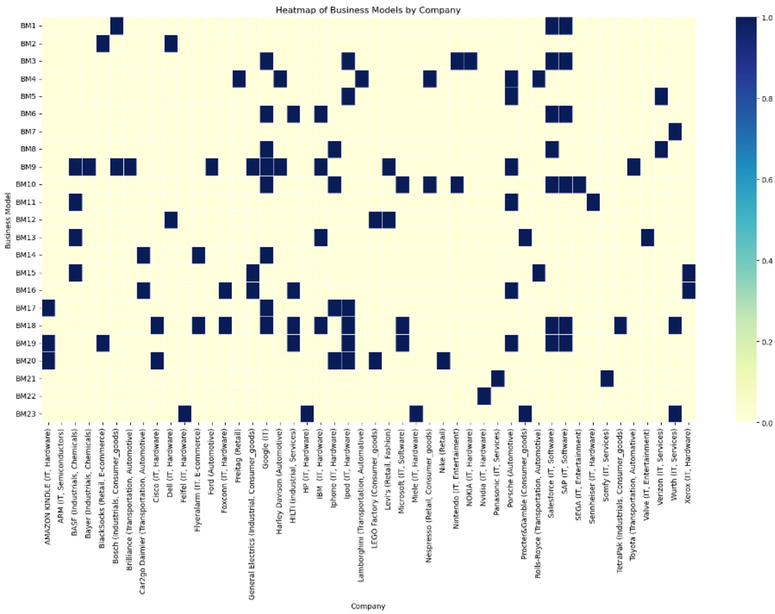

Figure 1. Heatmap of Business Models by company

(Figure 2), we can identify, for instance, the predominant business models adopted by computers and electronic goods manufacturers. The most prevalent business models in the technology industry seem to be “Digitization”, “Solution provider”, “Open business”, “User design,” and “Performance-based contracting”. Based on the observed correlations, these business models appear to be interconnected, suggesting that they could complement each other within a comprehensive business strategy.

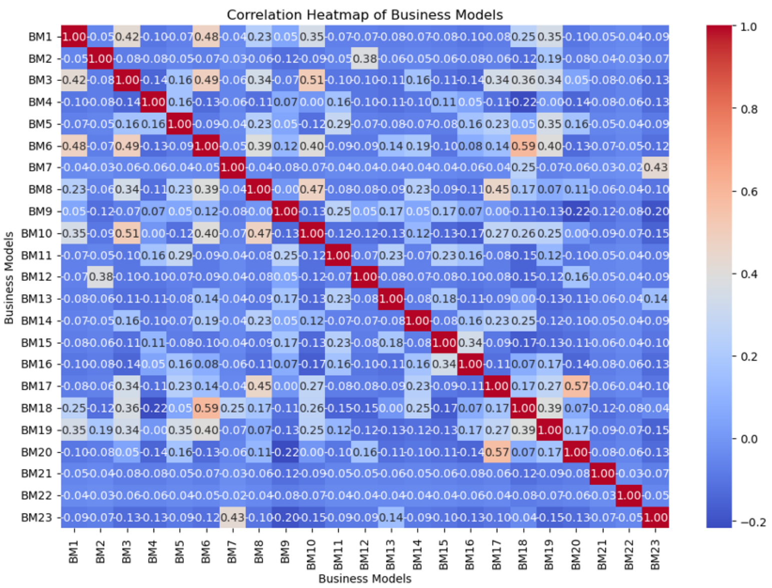

Figure 2. Correlation heatmap between Business Model Innovation patterns in servitization

Conceptual Servitization Business Models Map

Considering the various manufacturing sectors, we can distinguish, for instance, the predominant business models followed by hardware and software manufacturers. Following this analysis, we can illustrate the interdependencies between business models, the firms implementing them, and the sectors in which these firms operate (Figure 3).

With this data, we can conduct a thorough analysis of how different servitized manufacturing companies are involved in various business model innovations. Here are some observations that arise from the analysis:

- Identification of focus areas: It can be observed which companies are more focused on certain business models. For example, companies like Amazon Kindle and Nespresso are closely associated with the "Cash-Machine" concept, suggesting a focus on business models that generate revenue continuously. These firms prioritize servitization strategies as a stable revenue stream (Baines, Bigdeli, Bustinza, Shi, Baldwin & Ridgway, 2017).
- Identification of opportunities and threats: By examining term associations, we can identify areas where one company is heavily involved while others are not. For instance, if a company is highly associated with the concept of "Mass Customization", it could indicate a competitive advantage in the ability to customize products or services on a large scale. These servitized manufacturers could be facing the industrializer trajectory (Kowalkowski, Windahl, Kindström & Gebauer, 2015). However, if a company lacks association with terms like "Digitization" or "User Design", it could indicate a gap in technology adoption approaches or servitization-digitalization paradox (Kohtamäki, Einola & Rabetino, 2020).
- Comparative within-industry analysis: Comparing how different companies in the same industry are involved in specific terms can reveal sector trends (Bustinza, Lafuente, 2019). For example, looking at automotive companies like Ford, Lamborghini, and Porsche, we can identify which terms are more prevalent in these companies and how they differ in their business models approaches.

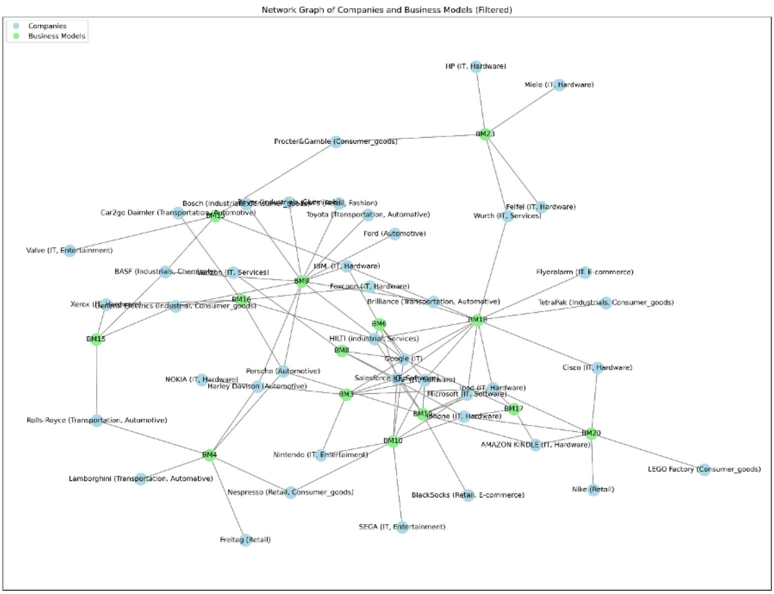

Figure 3. Network Graph of Business Model Innovation patterns in servitized manufacturers.

- Evaluation of innovation and adaptability: Associations with terms like “Flat Rate”, “Subscription”, and “Rent Instead of Buy” may indicate a tendency toward customer-oriented flexible business models (Parry et al., 2013). Conversely, associations with terms like “Lock-In” could indicate a more traditional customer retention strategy (Bustinza, Bigdeli, Baines & Elliot, 2015).

From here, an analysis of the effect of business model implementation in servitized manufacturers will help quantify the impact of these models on those firms compared to their sector counterparts. We believe that this approach can be instrumental in selecting service-related revenue models for manufacturers and redefining servitization business models for academic researchers.

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Microfoundations for Digital Servitization: Organizational Design,Routines, and Individual Agency

Rodrigo Rabetino, Marko Kohtamäki, Nayeem Rahman, Tuomas Huikkola
University of Vaasa, Finland

Abstract

The paper combines digital servitization research with business model innovation and microfoundations literature. Business model (re)configuration processes towards digital servitization call for specific organizational microfoundations. The paper builds on a case study of three established companies in the Finnish power electricity sector and focuses on microfoundations for digital servitization-related business model innovation. We address the following research question: How do microfoundations drive BMI for digital servitization? In doing so, we explore the realm of microfoundations in strategy and organization theory and investigate the interplay between microfoundational components underlying business model innovation for digital servitization, including individual agency, organizational routines, and organizational design. While outlining the interaction mechanisms, the paper emphasizes the pivotal role of people, mainly managerial cognitive capabilities. Among the main findings, the study concludes that …. Thus, this study complements earlier research on digital servitization strategies, revenue models, and business model configurations, providing a framework for guiding business model innovation in the digital servitization context.

Keywords: Digital servitization, microfoundations, business model innovation, strategic change.

Introduction

Based on connectivity and digital technologies, smart connected products transform business logic in many industries. However, as digital technologies become widely available and accessible, business model innovation (BMI) will be the natural source of competitive advantage (Rachinger, Rauter, Müller, Vorraber & Schirgi, 2019). Digitally-enabled BMI enables a transition from products to product-service-software offerings, known as digital servitization (Kohtamäki, Henneberg, Martinez, Kimita & Gebauer, 2019), requiring a set of organizational microfoundations to support such transformation (Ott & Eisenhardt, 2021). Although research on microfoundations (Chirumalla, Leoni & Oghazi, 2023) or BMI (Linde, Sjödin, Parida & Gebauer, 2020; Tian, Coreynen, Matthyssens & Shen, 2021) in digital servitization exists, not many studies focus on examining the microfoundations of BMI for digital servitization, calling for further research.

The present study addresses the following research question: How do organizational microfoundations drive BMI for digital servitization, and how do they interplay along the different stages of the BMI process? In doing so, the paper contributes to prior research on digital servitization strategies (Mosch, Schweikl & Obermaier, 2021; Paiola & Gebauer, 2020) and revenue models (Linde, Frishammar & Parida, 2021) and business model innovation for digital servitization (Kohtamäki, Rabetino, Parida, Sjödin & Henneberg, 2022).

Theoretical background

Digitalization as an enabler of BMI for servitization

Big data and connectivity enable new value and revenues through BMI and the integration of product-service-software offerings (Kiel, Arnold & Voigt, 2017). Technologies such as IoT (Naik, Schroeder, Kapoor, Ziaee Bigdeli & Baines, 2020; Rymaszewska, Helo & Gunasekaran, 2017) and AI (Sjödin, Parida, Palmié & Wincent, 2021) are essential in such a process, unlocking BMI potential towards digital servitization (Linde et al., 2021). Yet, the transition disrupts servitizing firms, calling for reconfiguring and aligning organization structures, processes, routines, and resources (Coreynen, Matthyssens, & Van Bockhaven, 2017; Huikkola, Kohtamäki & Rabetino, 2016). According to Arnold, Kiel and Voigt (2016), digital servitization substantially impacts all elements of corporate management and BMI, requiring particular microfoundations to succeed (Rabetino, Kohtamäki & Gebauer, 2017).

Microfoundations for BMI towards digital servitization

Digital servitization calls for BMI, which, in turn, implies a profound organizational change, typically determined by managerial skills and cognition, organizational structures, processes, routines, and practices, providing microfoundations for dynamic capabilities (Chirumalla et al., 2023) and BMI (Foss & Saebi, 2018; Ringvold, Saebi & Foss, 2023). Besides external industry-related drivers, opportunities for BMI will be defined by the organizational structure, strategy, and organizational routines. However, affective, cognitive, and behavioral skills (Helfat & Peteraf, 2015), such as management's leadership and ability to develop and refine BMs (Teece, 2018) and perform the required organizational change, are essential too (Ringvold et al., 2023).

Methodology

Using purposeful sampling (Patton, 2015), the paper draws on a qualitative exploratory multiple-case study that includes 12 interviews from three medium-sized Finnish energy utilities that have introduced new digital service-based business models. After transcribing and coding the interviews, we created the data structure following Gioia, Corley, and Hamilton (2013) to guide the analysis and conceptualization.

Findings and Conclusions

The study presents an exhaustive analysis of the interaction of the microfoundations for the different stages of digitally-enable business model innovation for servitization (ideation, generation, and implementation), focusing on drivers, interactions, and mechanisms influencing the process at various levels: strategy and organizational structure, practices and social interactions that generate new processes and routines, and the individual agency involved in the emergence of these processes (considering cognitive and behavioral aspects). In doing so, the paper discusses the role of employees, middle managers, and top-management teams and how social interactions create new practices that become institutionalized into routines. Additionally, the paper shows the role of organizational structure and strategy in influencing routines and individual behavior.

However, acknowledging this research is early stage, both the findings and its contributions will likely change as the study proceeds, and should be treated as preliminary results.

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Unlearning as a Facilitator for Servitization? Conceptualizing the Role of Abandoning the Old on the Way Toward New Service-Based Business Models

Jens Poeppelbuss, Annette Kluge

Ruhr-Universität Bochum

Abstract

Industries like mechanical engineering face significant challenges in servitization due to deeply ingrained product-centric practices. While it is accepted that servitization requires companies to develop new capabilities, the need for unlearning obsolete routines and mindsets, which can be perceived as a barrier to successful transformation, has so far been overlooked. This conceptual work explores the role of unlearning and intentional forgetting (U/IF) in facilitating servitization. U/IF involves discarding obsolete knowledge that hinders organizational effectiveness, thus supporting organizational change and innovation. By integrating U/IF with findings from servitization research, we propose an integrated framework that addresses both the development of new capabilities and the abandonment of obsolete knowledge. This dual approach may help to reconcile the paradoxes inherent to servitization. It also offers an additional perspective that helps companies develop a comprehensive strategy toward service-based business models. We suggest future research directions that analyze servitization from an explicit U/IF perspective.

Keywords: Servitization, Unlearning, Intentional Forgetting, Capabilities.

Introduction

Servitization has been defined as a "transformational process of shifting from a product-centric business model and logic to a service-centric approach" (Kowalkowski, Gebauer, Kamp & Parry, 2017, p. 7) that requires a company to redefine its business model and strategy, reconfigure its resource base, and transform its routines and shared norms and values (Kowalkowski et al., 2017). Today, opportunities for servitization also emerge through digitalization as data-driven services can complement product offerings or transform the overall business logic of manufacturers towards customer-centric service and solution business, which is reflected in the notion of digital servitization (Ebel, Jaspert & Poeppelbuss, 2022; Kowalkowski et al., 2017). The transformation toward a service-oriented and increasingly digital business model leads to challenges in industries like mechanical engineering that have previously followed a predominantly product-centric approach to innovation (Ebel et al., 2022; Paiola & Gebauer, 2020). With customer-centricity as a key attribute of new (digital) service offerings, companies from such industries need to adapt their previous product-centric and technology-driven ways of thinking (Töytäri, Turunen, Klein, Eloranta, Biehl & Rajala, 2018), as well as their capabilities (Castka, Donovan & Sousa, 2024; Kanninen, Penttinen, Tinnilä & Kaario, 2017).

Capabilities for Service-Based Business Models

Capability development is seen as essential for successful servitization (Kanninen et al., 2017), and the lack of adequate internal resources and capabilities has been identified as a barrier to developing new digital service offerings (Klein, Bielhl & Friedli, 2018). Kindström (2010) identifies six capabilities that servitizing companies need to acquire, including, e.g., those to promote and explain advanced service-intensive value propositions and to develop new revenue mechanisms based on customer operations and profitability. More frameworks describe the servitization process as one that urges companies to develop and acquire new capabilities (e.g., Castka et al., 2024; Kanninen et al., 2017; Ulaga & Reinartz, 2011). While these frameworks are relevant to provide a roadmap for the required organizational learning during servitization, they overlook that most organizations have well-functioning, highly overlearned routines and operational capabilities that possibly impede the organizational transformation and need to be unlearned and forgotten parallel to the servitization process. The need to cope with such product-oriented legacies is particularly apparent from paradoxes that companies typically face during servitization, e.g., "building a customer orientation vs. maintaining an engineering mindset" (Kohtamäki, Einola & Rabetino, 2020).

Unlearning and Intentional Forgetting

The concepts of unlearning and intentional forgetting (U/IF) reflect the abandoning of once-useful mindsets and acquired routines that were effective in the past but now limit success (Kluge, 2023). That is, the company managers "work to forget established knowledge that was, or is perceived to be, a barrier to increased organizational effectiveness" (de Holan, Phillips & Lawrence, 2004, p. 1611). U/IF is supposed to ensure a company's survival during crises, facilitate organizational change and learning, and improve innovativeness (Klammer, Grisold, Nguyen & Hsu, 2024). It involves attitudes and processes that deliberately impede the recall of certain organizational memory items from organizational storage bins, such as individual or team memories or routines and practices, to adapt to the changing affordances in the (market) environment (Kluge, 2023; Kluge & Gronau, 2018). U/IF proposes that processes and technical systems (e.g., information systems that "forget") need to be designed in a way that they deliberately impede the recall of certain organizational memory items (e.g., what has been successful in the past but does not match market requirements in the future), and do not provide these memory items and information elements any more (Kluge & Gronau, 2018).

Generally, U/IF interventions can assume different forms and they significantly depend on context (Klammer et al., 2024). They unfold within and across multiple levels, such as individuals, groups/teams, or the organization (Klammer et al., 2024; Kluge, 2023). They may focus on abandoning the old (exploration) or disciplining the new exploitation (Kluge, 2023). Regarding the U/IF content, organizations need to determine whether (based on their history) they need to forget/unlearn success beliefs (we are successful and market leader because…) or failure beliefs (we should not do… because we encountered in our history that…), whether the organization's U/IF approach is open-ended (without a clearly defined objective yet) or goal-directed (with a clear strategic goal in mind). Finally, the organization needs to consider how these decisions regarding U/IF will affect intra-organizational information processing, knowledge transfer, and knowledge sharing (Kluge, 2023).

Integrated Framework

It is reasonable to assume that the pace and the smoothness of servitization in companies depends on their ability to unlearn and forget previously successful ways of doing business and to unlearn highly overlearned routines, e.g., those that resemble a strong orientation towards products and their technical features. However, servitization research has not applied the U/IF concepts yet. We propose that U/IF is an important process – in addition to capability development – to successfully servitize. In particular, combining these two perspectives offers the opportunity to explicitly frame servitization as a transformation that needs to accomplish both: disciplining new capabilities and abandoning old knowledge that is perceived as a barrier.

We combine the concepts from servitization and U/IF research into an integrated framework (Figure 1). We conceptualize servitization as a transformation that is achieved through interventions that help both build capabilities relevant to service-based business models and abandon obsolete knowledge. The capabilities given in the top half of Figure 1 are exemplary ones inspired by existing works on capability development in the realm of servitization (Kindström, 2010, 2010; Ulaga & Reinartz, 2011). The bottom half reflects on the U/IF process variables (e.g., U/IF of routines or beliefs) as put forward by Kluge (2023) in the context of servitization processes (e.g., abandoning established routines for new product development). Both servitization and U/IF are usually portrayed as organizational phenomena. However, the idea of U/IF implies that individuals and groups/teams also need to be considered "as organizations do not have cognitive capabilities per se" (Klammer et al., 2024). Following recent U/IF frameworks (Klammer et al., 2024; Kluge, 2023), we therefore consider these three levels in our framework, too. The overall servitization processes including the capability development and U/IF processes depend on context, which may involve organizational and other factors (Klammer et al., 2024).

The presented framework is a first attempt to integrate the ideas of U/IF into servitization research. Adopting concepts from psychology, it provides a novel and interdisciplinary perspective on what the servitization transformation entails for organizations. We consider it to be especially promising for better understanding and potentially reconciling the paradoxes that servitization often poses to product-oriented manufacturing companies (Kohtamäki et al.,

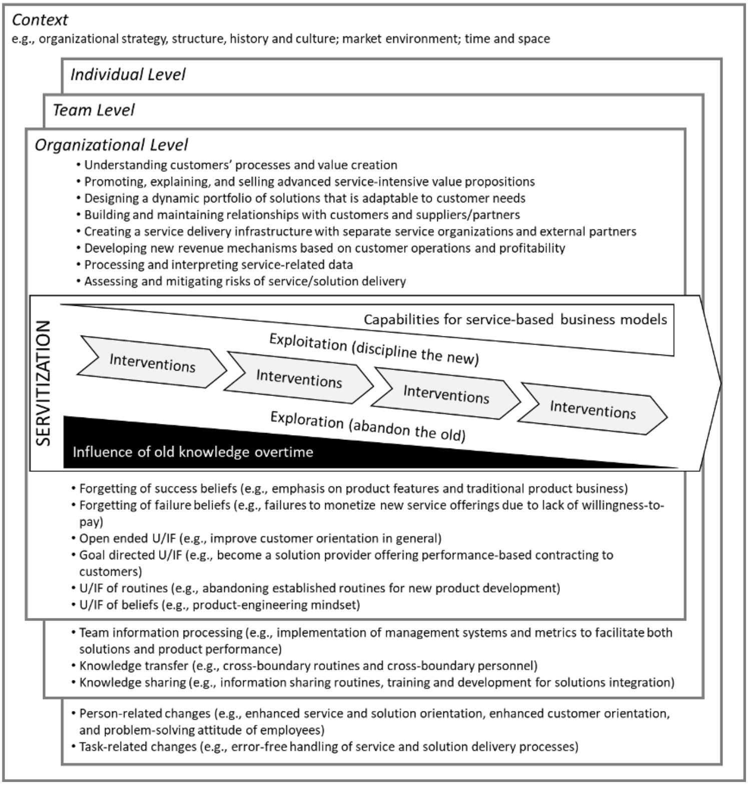

Figure 1. Integrated Framework.

2020) across the interdependent levels of individuals, teams, and organization. At the conference, we would like to discuss with our fellow academic colleagues the potential directions for future research that can be derived from integrating the U/IF concepts and servitization. These can include the re-analysis of existing case study data from the U/IF perspective with its multiple levels (individuals, teams, organization) or the initiation of action research projects with interventions targeting both capability development and U/IF.

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Co-Creation for Service Portfolio Reconfiguration in Digital Servitization

Ion Iriarte, Iker Legarda, Ariane Atxa

Mondragon Unibertsitatea

Abstract

Value proposition design in digital servitization requires alternative design approaches to avoid what is known in servitization literature as the "service paradox," where significant efforts in expanding the service business result in more service offerings, yet fail to produce the expected increase in returns. This paper presents a single case study where co-creation participatory practices have been used to conceptually reconfigure the service portfolio of an equipment goods manufacturer immersed in a digital servitization process. Using a design research approach, a participatory approach where knowledge is created through design practice, we describe how, in the analysed case company, human-centred service design's co-creation and visualization practices contributed to enhancing participants' creativity, boosting common understandings about possible problems and solutions, and engaging key employees with the digital servitization strategy outlined by the general management of the manufacturer. In line with previous research, the article suggests these co-creation practices and visualization tools as a beneficial mechanism for consensual strategic decision-making in relation to the company's service offerings in digital servitization.

Keywords: Digital servitization, service portfolio, co-creation, visualization tools, service design.

Introduction

The conjunction of servitization and digitalization opens new opportunities for manufacturers (Favoretto, Mendes, Oliveira, Cauchick-Miguel /& Coreynen, 2022). However, it also entails a change in the value proposition and, in some cases, the overall business model of the manufactures, which brings significant risks (Chávez, Unamuno, Despeisse, Johansson, Romero & Stahre, 2023). One of these risks is the inability to develop a suitable value proposition, resulting in unmet expectations and endangering the servitization process initiated. Many manufacturers, especially SMEs, find it challenging to articulate consistent service portfolios that are oriented towards their customers' needs (Gebauer, Fleisch & Friedli, 2005). This paper presents a single case study in which co-creation participatory practices were used to conceptually reconfigure the service portfolio of an equipment goods manufacturer undergoing a digital servitization process. It also details the benefits obtained by the manufacturer through this practice.

Research methodology

The study focuses on a single case of an equipment manufacturer that wanted to reconfigure its current service portfolio. We used research through design approach, which employs methods and processes from design practice (Zimmerman & Forlizzi, 2008). The researchers participated in intervention, action, and reflection cycles to gradually gather and contextualize knowledge while developing the solution. Data was collected through the researchers' observation of the co-creation practices and interviews with the general manager and the service manager of the manufacturer after the intervention.

The intervention was structured as follows: a group of 8 people was formed, including the company's main managers and some senior service technicians. Using the divergent and convergent thinking logics inherent to Design Thinking, participants in a workshop were first asked to collectively critically review the current portfolio, which was visualized through a tree diagram. Second, they were tasked with reconfiguring the portfolio based on the needs of several archetypal customers presented by the researchers. This exercise involved two steps: initial individual reflection followed by collective reflection. The premise given to participants was to think in terms of function—serving their customers, not their products. Consequently, the portfolio was reorganized by grouping, renaming, combining, eliminating existing services, and adding new ones. As a result, a new diagram was created. To conclude the session, a collective vote (Dot Voting) was conducted to prioritize the outlined services for further development in subsequent stages.

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Findings

Based on the observation of the practice and the interviews with the participants after the intervention, we can infer that co-creation and visualization practices contributed to enhancing participants' creativity in the workshop, boosting common understandings about possible problems and solutions in the existing service offering, and engaging key employees (key service technicians) with the digital servitization strategy outlined by the general management of the manufacturer. In line with Solem, Kohtamäki, Parida and Brekke (2021), Nguyen, Lasa, Iriarte, Unamuno and Galfarsoro (2022) or Iriarte, Hoveskog, Ngoc, Legarda, Uranga, Nazabal et al. (2023) the results in this article suggest that service design's co-creation practices and visualization tools are beneficial mechanisms for consensual strategic decision-making in relation to the company's service offerings in digital servitization. Future research could study how this type of practices can be legitimized in manufactures.

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Entry Modes for Managing Servitization and Digital Servitization Transitions: Exporting Companies

Zecheng Li
University of Edinburgh

Abstract

In today's era of globalization and digitalization, servitization and digital servitization are gradually being widely adopted by enterprises, thereby enhancing the interests and competitiveness of enterprises. Meanwhile, many companies today are eager to reduce their dependence on the local market by exploring overseas markets, which makes the combination of servitization or digital servitization and entry modes arouse extensive discussions in the academic. The aim of this study is to evaluate entry modes for managing servitization transition for exporting companies. The main argument of this research is how exporting companies international their services. And this research plans to develop a conceptual matrix with the Eclectic Paradigm (OLI), which for evaluating combinations of different types of services and entry modes.

Keywords: Servitization, Entry modes, Service Complexity, Market Commitment.

Introduction

With the in-depth research of researchers on servitization, the current academic and business generally believe that servitization will not only improve the financial, strategic, and marketing interests of enterprises, but also help enterprises solve the challenges of business growth (e.g., Baines, Lightfoot & Kay, 2009; Raddats, Naik

& Bigdeli, 2022). Meanwhile, Research has shown that using digital technologies, such as IoT analytics and AI will help enterprises to transform into a service-oriented business model, which can enhance or completely change the characteristics of enterprises' traditional delivery services (Kohtamäki, Parida, Patel & Gebauer, 2020). In addition, driven by the development of globalization, in order to reduce the dependence on the domestic market, an increasing number of enterprises begin to seek new business opportunities, customers, and resources by internationalizing their services and products (Li, Qian & Qian, 2015). According to Parida, Sjödin, Lenka and Wincent (2015) pointed out that manufacturing firms adopting the product service business model increasingly need to enhance their revenue by providing services to the global market. Thus, this research aims to evaluate the entry modes for different stage of services.

Literature Review

Service Continuum

Regarding the discussion of service level, many scholars have also proposed different models. For example, Tukker (2004) proposed three service types, namely product-oriented, usage-oriented, and result-oriented. Specifically, the product-oriented service model still focuses on selling the product itself, while adding some more basic additional services. Additionally, although the usage-oriented service model still sells traditional products, the company does not focus on selling products as its main goal. Instead, services are provided to consumers in the form of leasing, pooling, or sharing. Results-oriented service models usually require suppliers to provide more complex and advanced services to meet customers' customized needs (Tukker, 2004). In addition, based on the model of Tukker (2004), Baines and Lightfoot (2013) proposed three service types:

Base, intermediate, and advanced services. The classification of service types by this model is basically consistent with the model proposed by Tukker (2004). However, some people point out that the three service types proposed by Tukker (2004) have the shortcomings of being general and difficult to distinguish, making it difficult to distinguish today's diverse service types (Parida, Sjödin, Wincent & Kohtamäki, 2014). Through a review of relevant literature, Brax and Visintin (2017) proposed a more detailed and comprehensive classification of service stages, which we illustrate in Table 1 in comparison to less developed stage models (Tukker, 2004; Baines & Lightfoot, 2013; Kowalkoski, Windahl, Kindström & Gebauer, 2015).

Eclectic Paradigm

Dunning (1988; 1993) explained multinational enterprise activities through the eclectic theory of international production. Dunning (1988) believes that knowledge must be owned, that is, firms need to have ownership advantages in order for cross-border expansion to occur. According to the eclectic paradigm proposed by Dunning (1988), a company can succeed in internationalization because it has: a) Compared with competitors in foreign markets, the organization has knowledge-giving advantages, that is, ownership advantages. For example, having intellectual property rights in terms of proprietary technology, management knowledge, or global brands. b) The organization can benefit from the regional advantages conferred by cross-border competition. c) The organization can minimize transaction costs in imperfect markets and thus has internalization advantages. Therefore, Dunning's eclectic paradigm is also known as the OLI paradigm, which is ownership (O), location (L), and internalization (I).

Key articles \ Key stages	Service Continuum I	II	III	IV	V	VI	VII	VIII
Brax & Visintin (2017)	Product with limited support	Installed and supported products	Complemen-tary service	Product-oriented solutions	System leasing	Operating services	Managed service solutions	Total solutions
Tukker (2004)	Product-oriented services, needed during the use phase of the product as maintenance or to improve their use as logistic services.			Use-oriented services as product lease, renting, sharing, or pulling services.		Result-oriented services, including activity maintenance, pay per service unit, or functional result services.		
Baines & Lightfoot (2013)	Base services are associated to an effective provision of the product (e.g., warranty product and spare parts provision).			Intermediate services guarantee that product is properly maintained, therefore focused on product conditions (e.g., scheduled maintenance, repairs, operator training, condition monitoring).		Advanced services are focused on providing capabilities that arise from the performance of the product. (e.g., customer support agreement, revenue and risk sharing contracts).		
Kowal-kowski et al. (2015)	Product oriented: Manufacturer			User oriented customization based Availability provider: growing from product-oriented to use-oriented		Performance provider Growing from use-oriented to result-oriented		
				User oriented scale based Industrializer': standardizing and scaling down previously used-oriented offerings.				

Table 1. Service Stages (Adapted from Gomes, Lehman, Vendrell-Herrero & Bustinza, 2021).

Research Objectives

By combining OLI with servitization theory, this study considers if an exporting firm wants to sell its services or add services to its products. Will they adopt the same entry mode that they sell its products? In addition, since there are different stages of services. This research considers that different stages of the service will adopt different entry modes. Therefore, the argument of this research is how to international different types of services. In order to evaluate this argument, this research plans to create a matrix to assess the service and entry mode combination (Table 2).

	Service Continuum							
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
Service Stage	Product with limited support	Installed and supported products	Comple-mentary service	Product-oriented solutions	System leasing	Operating services	Managed service solutions	Total solutions
Strategically Relevant	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location	Non-remote	Non-remote	Non-remote	Non-remote	Remote	Non-remote	Non-remote	Non-remote
Strategically: Internal/ External	External	External	External	Internal	Internal	Internal	Internal	Internal
Process Knowledge: Internal/ External	Internal	Internal	External	Internal	Internal	Internal	Internal	Internal
Proposed Entry Mode for Service	**Remain Domestic**	**Outsource**	**Licensing**	**Export**	**FDI**	**Greenfield Invest-ments**	**Mergers and Acquisi-tions**	**FDI**

Methodology

Based on the above research objectives, this research will adopt qualitative methods. Since the matrix is a conceptual innovation, this research requires observing the business activities of multinational companies or organizing interviews to collect empirical cases for evaluation. This research aims to collect 5 to 8 cases, and the data will be collected through face-to-face interviews and focus groups. And the samples will be selected from UK, EU and Chinese companies.

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Parallel Session 3

Customer-Centric and Direct-to-Customer Strategies

Co-Chairs: Glenn Parry & Ali Bigdeli

AreCustomers Ready for Digital Service Innovation? A Study on Customers' Procurement of Smart MRO Offerings

Clemens Friedl

University of Antwerp

Emanuela Delbufalo

Università Europea di Roma

Paul Matthyssens

University of Antwerp - Milano Bicocca

Abstract

Digital servitization (DS) and smart servitization are popular value-adding strategies, esp. in commoditized contexts (we use Digital Service Innovation- DSI – as generic term encompassing both concepts). The approach has a high profit potential but many challenges need to be faced by digital service innovators, whereby the literature focuses more on the supplier side than on the customer side. This study analyzes customer data gathered in cooperation with RS, a multinational company in the sale of MRO and components for the electronics and industrial sectors, to gain insight into procurement strategies for Maintenance, Repair, and Operations (MRO) items and services. A classification of customers is developed from both the supplier's and the buyer's perspectives showing two core dimensions of readiness toward smart servitization offerings: purchasing maturity and digital maturity. The framework describes different purchasing behavior towards value-added MRO offerings. It allows hypothesizing about effective smart servitization-based marketing approaches toward different market segments and potential customer migration strategies.

Keywords: Digital servitization, inter-firm collaboration, tensions, agricultural machinery industry.

Introduction

Digital servitization in manufacturing enables enhancement of smart solutions and customer value (Huikkola, Kohtamäki, Rabetino, Makkonen & Holtkamp, 2022; Lafuente, Vaillant & Rabetino, 2023; Soellner, Helm, Klee & Endres, 2024), however, financial benefits may lag performance expectations (Kohtamäki, Parida, Patel & Gebauer, 2020; Opazo-Basáez, Vendrell-Herrero & Bustinza, 2022).

Both, internal alignment problems and the complex nature of the transformation process (Baines, Bigdeli, Sousa & Schroeder, 2020; Benedettini, Neely & Swink, 2015) and external inhibitors such as "market fragmentation, distance to customers, customers' unwillingness to collaborate and share vital information, lack of demand ability, and their (i.e., the customers') service-for-free attitude" (Matthyssens & Vandenbempt, 2010) p. 708) are pinpointed as the key reasons for the difficult roll-out of servitization and DSI. Customers might not be ready to realize the 'value-in-use' (Prohl & Kleinaltenkamp, 2020; Yang & Leposky, 2022) of these offerings, impeding effective digital solution implementation and disadvantaging firms.

In the context of DSI, customers can face an additional barrier because digital transformation must be realized on top of servitization (Isikli, Yanik, Cevikcan & Ustundag, 2017). We question if customers are ready for smart servitization, particularly in commoditized markets. The study targets MRO supplies considered "routine" and "non-critical" by procurement, having limited bottom-line impact and complexity (Kraljic, 1983). MRO, part of indirect spend, is often bought based on price comparisons (Cox, Chicksand, Ireland & Davies, 2005). MRO purchasing evolved from focusing on reducing direct transaction costs (Bechtel & Patterson, 1997), over the streamlining of procurement and inventory management towards more advanced strategic sourcing approaches supported by electronic procurement systems and Vendor Managed Inventory (Maestrini, Luzzini, Shani & Canterino, 2016), to reduce transaction costs and improving efficiency of indirect spend to which MRO belongs (Gebauer & Segev, 2000).

Problem statement

For decades business marketers in the MRO sector have pursued differentiation strategies to combat commoditization, by using differentiation approaches such as Vendor Managed Inventory (VMI) (Dubois, 2003; Maestrini et al., 2016; Siponen, Haapasalo & Harkonen, 2019), consignment stock policy (Dubois, 2003; Gelderman & Semeijn, 2006; Srai & Lorentz, 2019) and enhanced supplier integration such as Outcome Based Contracts (Baptista, Mota & Santos, 2022; Gadde & Snehota, 2000). However, still today, cost orientation remains prevalent in procurement practices (RS, 2023; Stegehuis, von Raesfeld & Nieuwenhuis et al., 2023). In fact, MRO suppliers face slow market acceptance for advanced product-service offerings and seek to understand customer readiness to adopt smart solutions that integrate advanced purchasing capabilities and digital technologies (McKinsey & Company, 2019; Vaittinen & Martinsuo, 2019). Both dimensions influence how customers perceive and adopt value-added MRO offerings, such as Digital Service Innovation (DSI).

As MRO suppliers continue to have difficulties persuading customers of buying smart product-service systems (PSS), servitization scholars pinpoint internal reasons such as lack of internal alignment (Alghisi & Saccani, 2015) and complex coordination required between suppliers and buyers (Matthyssens, Vandenbempt & Weyns, 2008).

Stegehuis et al. (2023) suggest both internal alignment to enhance organizational competences, and external alignment to build strong relationships with customers are required.. In fact, transitioning to value-added solutions such as VMI and service platforms, involves technological maturity and shifts in supplier-buyer purchasing maturity (Isikli et al., 2017; Mouzas & Naudé, 2007). A co-evolution of buyer and seller along the 'staircase to heaven' (see Figure 1), towards higher 'value added' (Matthyssens et al., 2008) is needed.

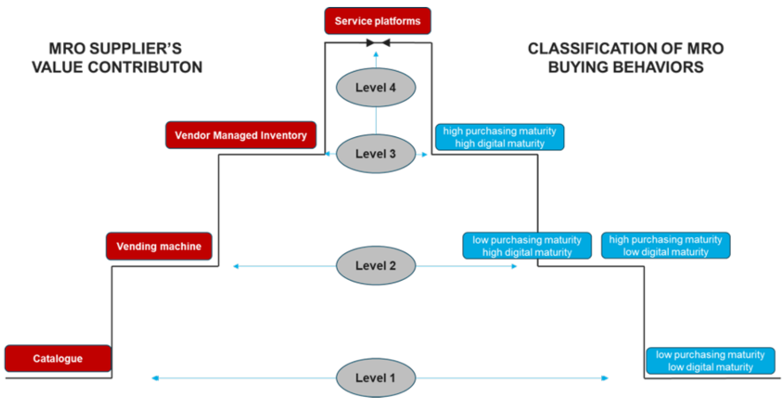

Figure 1. adopted 'staircase to heaven' towards higher 'value added' (Matthyssens et al., 2008).

We assume that in this commoditized sector, MRO suppliers might be faced with an imbalance along their DSI journeys toward higher value added: customers might stay lower on the staircase than their suppliers, e.g., a supplier as RS might offer platform-based integral services, while customers expect only basic logistics services. Among others, the imbalance might be due to customer limitations like unwillingness to leave existing (price-, volume-oriented) purchasing approaches, limited perceived value-in-use, risk aversion, and/or lack of implementation capabilities (McKinsey & Company, 2019; RS, 2023)

We hypothesize that deep insight in customers' MRO procurement will reveal which types of customers have more potential to embrace smart MRO services. Thereby we can discern substantial differences in customer attitudes and capabilities toward MRO helping distinguishing priority customers from less attractive customers for DSI generated smart PSS.

Research method

We adopt a collaborative action research methodology (Coghlan, 2011; Coughlan & Coghlan, 2002; Crespin-Mazet & Dontenwill, 2012; Näslund, Kale & Paulraj et al., 2010), to explore how MRO/ indirect spend procurement strategies and practices are being pursued by companies and identify different types of customers. Data collection involved establishing a focus group, designing a theoretical framework, developing and distributing a comprehensive questionnaire to over 1,200 RS customers, and analyzing 97 complete responses. We map customers' readiness for the adoption of smart MRO product-service offerings. The readiness of customers for embracing smart MRO offerings is determined by a) their procurement maturity, based on Schiele (2007) and b) their digital maturity, based on Isikli et al. (2017); Roland_Berger (2021).

The resulting classification of MRO buying behaviors and key distinguishing dimensions informs supports enhancement of MRO procurement strategies (Figure 2). This participatory approach integrates theoretical insights and practical experiences, aiming to enhance smart servitization-based marketing approaches. We classify case companies into four types of readiness levels and describe corresponding value-adding strategies per level.

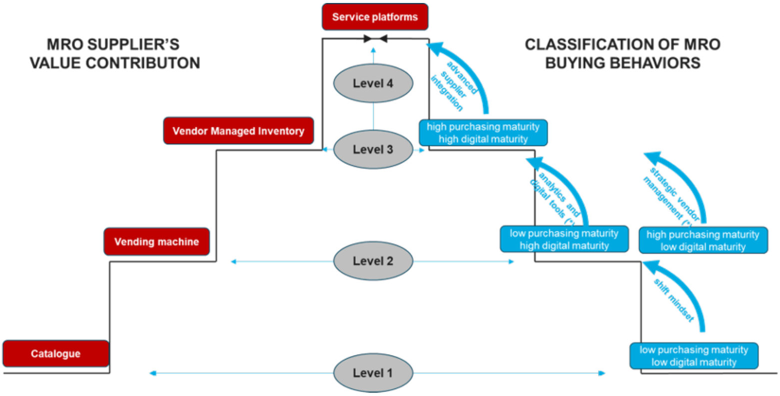

Figure 2. adopted 'staircase to heaven' towards higher 'value added' (Matthyssens et al., 2008).

Contribution

We contribute to the understanding of DSI in commoditized markets, in general, and MRO in specific, by offering a demand-side perspective leading towards a framework and a basis for segment-based marketing strategies for smart solutions. MRO providers can tailor their services and strategies to better meet the needs of different customer segments, fostering a more successful transition to smart servitization and optimizing DSI.

To the procurement literature we deliver actionable recommendations for companies to enhance their procurement and digital maturity, thereby improving their efficiency and effectiveness in MRO procurement. We add to the existing body of literature on digital transformation, procurement maturity, and servitization in the MRO industry, providing valuable insights for both researchers and practitioners. We thereby claim our approach will show from a dyadic perspective how through deep customer insight and related segmentation, companies can cope with the digitalization paradox (Gebauer, Fleisch, Lamprecht & Wortmann, 2020).

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Mobile Application Services and Customer Value Perception

Sanja Marinkovic

University of Belgrade, Faculty of Organizational Sciences, Serbia

Vukasin Lukic

WestWay Technology, Serbia

Abstract

The focus of the research is customer satisfaction and value perception related to a new mobile application in retail. This paper presents characteristics of mobile applications valued by customer, considering the specifics of mobile application design. Research was conducted among Lidl application users in Serbia, as it is one of the major companies in the retail industry that is perceived as to customer neds and values. Consumer attitudes towards specific mobile application were collected by online survey and included 100 participants and 26 questions. For brands such as Lidl, it is important to develop good communication with its customers and to present not only the products but also the company values. Many aspects of the application can contribute to that goal. The main finding is that in this case majority of users appreciate many features of the mobile application as a part of the wider customer experience.

Keywords: Mobile application, customer, retail

Introduction

Service quality has a positive and significant influence on customer satisfaction (De Leon, Atienza & Susilo, 2020). Utilitarian value is the main driver of overall satisfaction of customers (Karjaluoto, Shaikh, Saarijärvi & Saraniemi, 2019). Digital transformation led to a significant change in the way brands communicate with their customers and mobile applications have become an essential part of business operations. Marketers can personalize advertising and marketing communication messages by leveraging data on individual preferences, movement patterns, co-located social connections, and other individual-specific variables. As a result, mobile devices offer a one-of-a-kind personalization marketing opportunity. In the context of mobile advertising, mobile display advertisements result in favourable attitudes toward products and purchase intentions.

Interactivity, functionality, visual design, connection to social networks, and other features of mobile applications contribute to the user experience, impact customer satisfaction and influence their attitude towards the brand. Competition in the mobile application market is significant - consumers choose from thousands of mobile applications and it can be difficult to persuade them to shift to a new one. Therefore, for the investment into the development of a mobile application to be effective it is necessary to ensure that the application meets the needs of target users.

Because of the time-sensitive and location-sensitive nature of mobile media and devices, mobile marketing has the potential to change the retailing paradigm (Shankar, Venkatesh, Hofacker & Naik, 2010) Features like interactive capabilities result in high consumer engagement, which increases users' intent to use the mobile application. Acceptance of mobile applications is an indicator of consistent and positive customer experiences and engagement. In this case, technology acceptance is more than just cost savings; it is also about gaining a competitive advantage and seizing new market opportunities. The ability to continuously engage customers is critical to surviving the market competition, such as the mobile application market (Khrais & Alghamdi, 2021).

Based on literature review, one of the research questions was: How the characteristics of mobile application affect user experience?

Methodology

Research was conducted among Lidl application users in Serbia. The survey included 100 participants on random basis with only requirement to purchase in Lidl and use its application. Consumer attitudes towards specific mobile application were collected by online survey and included 100 participants and 26 questions. The survey was distributed and returned via online channels. All data were collected anonymously.

Findings and discussion

Users of Lidl mobile application valued the following characteristics of the application: organization, design, interactivity, simplicity, content, security, lack of problems, responsiveness and opportunity to give feedback. Each of the listed characteristics contributes to the experience that the consumer has, and many of the characteristics are connected. For example, the application must be easy to use and that is connected with its design and organization.

Two mobile characteristics were emphasized –design and functionality. The design has a specific role as it creates a first impression of the customers and catches their interest to further navigate the application. The users stated that the design contributes a lot to their overall satisfaction with the customer experience and that design can contribute to deciding to purchase the products of the brand. The design also can contribute to the prioritization of certain aspects that are important for the brand image.

The interactivity of the application is one of the characteristics that has less favourable reviews compared to the other characteristics. The results show that it could have a major impact on customer satisfaction, thus it should be improved. The same stands for the application content.

Lidl application developers should focus their efforts on design, not only to make a better impression on new customers but to improve the experience for existing ones. The responses of the research show that great majority of customers see the application highly connected to their needs. They also share the view that opportunities to provide feedback and to have the application that correspond to their needs are of great importance for their overall opinion about the brand. Each of the aspects within functionality can contribute highly to the users' experience. Further development of applications with the use of AI is expected in the future, in line with the growing influence of mobile marketing

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Scaling Digital Service Solutions: Role Dynamics Between OEMs and Service Units

Patricia Carolina Garcia Martin, Vinit Parida

Luleå University of Technology

Abstract

Scaling digital service solutions requires a reconfiguration of roles between OEMs and service units for successful global expansion. To gain a deeper understanding of scaling digital services, we intend to investigate the role dynamics between OEMs and service units. We build mainly on role theory to understand the underlying role transitions, exploring the incongruences and mechanisms deployed by the parties to successfully scale digital services. Qualitative data is collected from two global OEMs and service units in the mining and forestry industry, comprising 23 interviews with 16 informants. Our findings reveal a sequence of role dynamics between OEMs and service units, where inter-role (between the parties) incongruences act as a catalyst for intra-role (within each party) incongruences to emerge. Moreover, validation and identity mechanisms are leveraged through the implementation of joint and internal processes enabling the transitions required to scale. This study provides important managerial implications and theoretical contributions to digital servitization literature.

Keywords: Servitization, scale-up, digital services, role theory.

Introduction

Scaling digital service solutions is becoming an imperative for original equipment manufacturers (OEMs) aiming to compete globally. Research on servitization has pointed to the opportunities that digital services are opening for OEMs to create and deliver additional value to customers across multiple markets (Parida, Sjödin, Lenka & Wincent, 2015; Vendrell-Herrero, Bustinza & Vaillant, 2021). For instance, the dematerialization and automation of processes reduces costs and improves global coordination, facilitating the cross-border rollout of new digital services (Vendrell-Herrero et al., 2021; Reim, Parida & Sjödin, 2016). Similarly, the cumulative data from global operations enhances the agility to predict emerging needs, enabling efficient reconfiguration of digital services over time (Parida et al., 2015; Hartwig, von Saldern & Jacob, 2021). However, scaling digital service solutions is associated with higher complexity, where not only the OEM has a role in the success of global expansion.

Service units –organisations at the front-end of customer relationships– hold a privileged position between the OEM and the customer to achieve global competitive advantages. For instance, the tacit customer knowledge and local market experience of service units represent crucial assets for building global legitimacy of new digital services (Hakanen, Helander & Valkokari, 2017). OEMs, thus, need to integrate service units in the scaling process to maximise the success of the journey. While we are aware of the closer relationship of OEMs with customers (i.e., co-creation), little is known about the reconfiguration of roles and responsibilities of service units. This is of particular importance given the disparity of goals between the parties, where misalignments and ambiguities can prevent the effective cross-border design and implementation of digital services (Sjödin, Parida & Wincent, 2016; Parida & Jovanovic, 2022). This study applies role theory with the purpose of exploring and understanding the role dynamics between OEM and service units for the successful scaling of digital service solutions.

Theoretical Background

Role theory, from social psychology, places the concept of role – social position generated by normative expectations that defines behaviour in a specific social context – as central to phenomena (Biddle, 1986). A key aspect examined under role theory is that of role transitions, where changes in the position call for new behaviours to match the associated expectations (Allen & van de Vliert, 1984). However, incongruences may arise requiring the deployment of mechanisms to maximise the success of the transition (Solomon, Surprenant, Czepiel & Gutman, 1985). We draw on role theory to examine the scaling of digital service solutions through the role transitions of the OEM and its service unit, identifying the role incongruences and role mechanisms driving the success of the journey.

Method

This research builds on a qualitative multiple case study, comprising two Swedish-based global OEMs and its respective service units in the mining and forestry industries. We draw evidence from 23 semi-structured interviews with 16 key informants to examine the role dynamics between the parties scaling digital service solutions (Table 1). Triangulation is achieved using secondary data and quality is enhanced presenting insights to stakeholders.

Figure 1 provides a depiction of the role dynamics identified between OEMs and service units scaling digital service solutions. We explain how the parties navigate role transitions to best address

"They need to trust us in what we're doing. In order to do that, we need to be very clear on what our ambitions are, what role we will play, and what role they will play and what's the win-win. [...] people don't see through really what the change is. They get anxious instead of seeing an opportunity."

the emerging needs of global expansion.

Case A Forestry	Case B Mining
Forestry Service Unit Implementation Coordinator (1) Operational Instructor (1) Head of Global Markets Support (1)	Mining Service Unit Director Marketing and Business Strategy (2) Application Engineer (1) Solution Sales Manager (1)
Forestry OEM Digital Solutions Manager (5) Business Development Manager (2)	Mining OEM Customer Site Performance Services (2) Head of Solution Sales (1) Solution Sales Manager (1) Customer Performance Manager (1) Strategy and Business Developer (1) Customer Project Owner (1) Service Concept & Design Manager (1) Dealer Solution Manager (1)

Table 1. Cases, informants, and number of interviews.

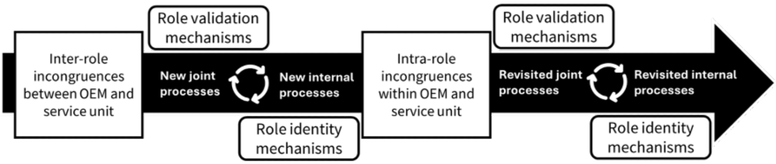

Figure 1. Scaling digital service solutions: A role dynamics framework between OEM and service unit.

Findings revealed how initially, **inter-role incongruence**s between the OEM and the service unit emerge because of changes in expectations. For instance, OEMs aim to achieve progressive lock-ins through the expansion of digital services, requiring closer and stronger relationships with key stakeholders in the customer organisation. Uncertainty emerges as service units expect their position to be threatened by the change in responsibilities. In words of the Strategy and Business Developer of the Mining OEM, there is a **lack of trust** from the service unit that do **not see change as an opportunity:**

Role validation mechanisms are deployed where new joint processes come into play reducing uncertainty and redefining new win-win scenarios. For instance, the Dealer Solution Manager of the Mining OEM explained how they are **establishing protocols** to teach service units how to **target and engage customers** with digital services:

"We want a dramatic approach where dealers start sitting with the customer, listen to what he has to say, and creates the package using our [digital services] [...] It's a transformation of how our dealers do business, how we do business. I created a dealer community, where we start from learning from each other and go out to the market together [...], we teach them to get the ball rolling."

Role identity mechanisms are simultaneously deployed internally, where each party executes a needs analysis and implements the necessary adjustments to support the desired role transition. For example, the Application Engineer of the Mining Service Unit described the creation of a **dedicated team** to **prioritise** the scaling of digital service solutions:

"He has built a team for the last two and a half years. I'm one of the employees now in the team. We are concentrating on this one completely now. [...] Because that's the future, we believe. [...] what we are doing right now, that is trying to understand and trying to bring to the market those digital services that [OEM] are launching, very rapidly."

Over time, **intra-role incongruences** within the OEM and the service unit start to become apparent because of clashes between the established way of working and the redefined working scenario. In other words, the required changes in behaviour are met with organisational reticence and low readiness to adapt and commit to the new roles. For instance, the Implementation Coordinator of the Forestry Service Unit highlighted their **deficient** support architecture in relation to the expected level of **customer support** associated with the digital service provision:

> *"We need to establish the kind of servicing training we've got in the [OEM] brand. We have technical support for mechanical issues [...] Then what we need to have also is a permanent structure to offer knowledge and training. That's included in [digital service solution]. We need to prepare our company to give this continuous support [...] a way to guarantee we will achieve very good performance from the system because [digital service solution] is a very good tool, but we need to put this tool in the right hands."*

At this point, **role validation** and **role identity mechanisms** need to be **revisited**, where established processes are revamped, and new ones are introduced. For instance, the Implementation Coordinator of the Forestry Service Unit described the upcoming training processes to enable the successful provision of digital services:

> *"We have a plan in the coming six months to give many, many trainings for our mechanics and some mechanics from our customers also. Now we are running a training program to prepare 20 mechanics. We are running to prepare 30 operators."*

Conclusion

This study contributes to the servitization literature expanding our understanding of dyads beyond the customer (Sjödin et al., 2016), and into the dynamics of the OEM and its service unit. Our findings expand current knowledge on role conflicts and ambiguities (Lenka, Paridda, Sjödin, Wincent & Eriksson, 2015; Parida & Jovanovic, 2022), evidencing the driving nature of inter-role incongruences as the catalyst for intra-role incongruences to emerge. We contend that the complexities associated with role dynamics form an interplay where addressing misalignments between the parties can expose internal deficiencies otherwise unnoticed. We also demonstrate the applicability of role theory to the field of servitization, opening new avenues to expand on actors' transformation for digital service provision through role identity and validation mechanisms.

Practical contributions provide managers from OEMs and its service units with a framework to assess and enhance the joint scaling of digital service solutions. OEMs can identify areas for improvement and design appropriate service unit training and support programs to minimise role incongruences along the scaling journey. Service units can evaluate the mechanisms currently deployed and ensure their alignment with OEMs' scaling goals to strengthen their role in the design and expansion of new digital services.

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The Rise of Direct-to-Customer: Investigating the Impact of Digitalization, Productivity, and Sustainability on Solution-Oriented Value Architectures

Johanna Knapp

University of St. Gallen, ITEM-HSG

Abstract

This study explores the drivers behind product manufacturers adopting direct-to-customer (DTC) approaches to engage more closely with customers. It examines how digitalization, productivity concerns, and sustainability influence the shift from product to solution-oriented offerings through a two-year qualitative single-case study in the construction industry, focusing on a power tools manufacturer. Findings reveal that digitalization requires seamless integration with customer systems, productivity pressures necessitate customized solutions for efficiency, and sustainability trends demand transparency and lifecycle management. The research highlights the emergence of hybrid value architectures, combining direct and indirect channels, and emphasizes the importance of collaboration between manufacturers and distributors. This study contributes to servitization literature by providing insights into value architectures in distribution partnerships and how manufacturers can navigate evolving market demands.

Keywords: Direct-to-customer (DTC), value architecture, solution business, distribution network.

Introduction and background

Practitioners and scholars alike agree on the potential of solution-oriented offerings, combining products, services, and software to secure competitiveness and respond to changing customer expectations (Davies, Tang Brady, Hobday, Rush & Gann, 2001). An example is John Deere (JD), which transformed its product-centric offering decades ago. Today, JD and its dealers offer agricultural equipment alongside its software and integrated service plans.

Changing customer preferences, driven by digitalization, productivity concerns, and sustainability, are prompting manufacturers to innovate their once product-driven offerings and challenge their overall value architecture. The term "value architecture", originating from business model discussions (O'Cass & Ngo, 2011; Osterwalder & Pigneur, 2010), adopts an ecosystem perspective (Adner, 2021) to explore how companies create and deliver value to customers.

Solution-oriented offerings require more flexible customer channels than traditional product-oriented architectures. Historically, JD relied on dealers for distribution, but these channels became insufficient for advanced offerings. Instead of fully transitioning to direct sales, JD and other manufacturers empower their dealer networks to support new solution-oriented value architectures. Collaborative value architectures leverage existing partnerships, enabling direct customer engagement while avoiding the need to eliminate intermediaries, complementing each other's capabilities (Story, Raddats, Burton, Zolkiewski & Baines, 2017). Various hybrid approaches have emerged, combining direct customer engagement by manufacturers with distributor involvement in value delivery.

This study refers to these hybrid methods as direct-to-customer (DTC) approaches. While most research assumes direct manufacturer-customer relations, complex ecosystems have also been explored. However, value architectures involving distribution partnerships are largely neglected in servitization literature (Garcia Martin, Schroeder & Bigdeli, 2019), particularly regarding the impact of digitalization, productivity, and sustainability on customer requirements and evolving value architectures.

Addressing this gap, this study explores why product manufacturers are increasingly adapting their value architectures to engage more closely with customers and become more involved in downstream activities (Huikkola, Rabetino, Kohtamäki & Gebauer, 2020; Vargo & Lusch, 2004). It focuses on manufacturers' motivations for adopting DTC approaches during the transition to solution-oriented offerings, addressing the question: *How do digitalization, productivity concerns, and sustainability impact the adoption of DTC approaches in a manufacturer's shift to solution-oriented offerings?*

Methodology

This study examines incumbent manufacturers transforming their value architecture through a two-year qualitative single-case study in the construction industry. In 2021, "Tool Inc.", a power tool manufacturer, added solution-oriented offerings to its traditional product-oriented portfolio. Despite addressing pressing customer needs, these new offerings initially struggled. Tool Inc. then increased its involvement in downstream channel functions, shifting towards a DTC approach.

Data collection involved interviews with construction company representatives, site visits, interviews with dealer representatives, and reviews of public reports on dealer initiatives. Participation in 25 project meetings, 10 executive meetings, and three workshops with sales, regional, and marketing experts at Tool Inc. provided further insights.

Findings

This study explores why product companies adapt their value architectures and increasingly engage in downstream activities through DTC approaches. It examines the reasons behind the growing trend of manufacturers allocating more downstream activities in their value delivery while maintaining collaborations with dealers and partners. Several factors drive manufacturers to move closer to customers.

Digitalization: Increasing digitalization demands seamless integration into customers' systems, heightening solution complexity and customization. Historically, distribution partners hindered information flow, creating imbalances. Direct involvement in downstream activities allows manufacturers to gather essential data firsthand, ensuring an accurate understanding of customer needs and delivering tailored solutions. This approach also increases channel flexibility, enabling faster and more personalized interactions.

For instance, tool registration is crucial for large construction companies, involving integration into inventory management software and linking relevant documents such as invoices and service agreements. Traditionally, tools were sold through distributors, requiring customers to register tools themselves. However, direct-selling competitors now pre-register tools before delivery, facilitating seamless digital integration into customers' inventory systems. In a collaborative value architecture, this process becomes more complex as manufacturers sell to distributors, who then sell to customers. Furthermore, dealers often lack the capabilities, infrastructure, and direct incentives to conduct registrations. Tool Inc. increased collaboration with dealers to enable pre-registered tools, thereby maintaining competitiveness. This was achieved by enhancing involvement in logistics and providing increased incentives for dealers to support the registration process.

Productivity: Changing economic conditions and dynamic environments pressure industries to find innovative ways to enhance productivity. Labor shortages, cost pressures, and increasing international competition challenge established companies to maintain their competitive edge. Consequently, customers demand solutions that improve productivity in their value creation and processes, requiring a higher degree of customization. By engaging directly with customers, manufacturers can develop and implement bespoke solutions that address specific productivity challenges, thereby helping customers achieve their operational goals more effectively.

Furthermore, large enterprise customers increasingly require direct engagement with manufacturers due to centralized operations and organization-wide contracts offering advantageous terms. In contrast, regional dealers cannot provide uniform conditions, impeding productivity. DTC approaches enable manufacturers to appeal to large enterprises by facilitating large-scale contracts. For example, Tool Inc. maintains centralized contracts and coordinates value delivery with regional partners, benefiting both the company and distributors by accessing new customer segments and revenue streams.

As processes become more efficient, customers expect seamless integration with supplier systems. While many dealers provide interfaces to procurement platforms for sharing product catalogs and simplifying purchasing, they often do not prioritize the individual representation of each manufacturer in their portfolio. Direct-selling manufacturers excel in optimizing product catalogs and integrating with customer systems. Manufacturers using dealers as intermediaries often lack the opportunity to enhance this aspect of the brand experience. Tool Inc. sought to integrate dedicated catalogs into customer systems, allowing dealer execution of orders, or pursued closer collaboration with dealers to implement a shop-in-shop concept, enhancing brand presence.

Sustainability: Environmental concerns drive the need for direct exchange between customers and manufacturers. Although these concerns have evolved more slowly than initially anticipated, customers now face new regulations, such as sustainability reporting requirements, and need deeper insights into product usage and lifecycles. Direct engagement enables manufacturers to provide the necessary information and support to help customers meet these regulations and achieve their sustainability goals. Furthermore, manufacturers can develop closed-loop systems, ensuring products are recycled or repurposed, thus contributing to a more sustainable future.

With direct customer channels, Tool Inc. can better meet demands for sustainability reporting. Tool usage is optimized through on-site demos and training, reducing wear and extending product life. Tool Inc. offers services like "retire on data" and "reduce to fit" to optimize inventory. They also sell spare parts and facilitate repairs beyond warranty periods, using insights for future product development to enhance sustainability.

Discussion and conclusion

This study examines manufacturers' increasing adoption of DTC approaches transitioning to solution-oriented offerings. It provides a comprehensive analysis of how digitalization, productivity concerns, and sustainability influence value architectures through an in-depth case study in the construction industry. The findings contribute to the ongoing discourse on relevant change drivers and their implications for manufacturers' strategic adaptations. By incorporating the perspectives of manufacturers, distributors, and customers, this study offers a deeper understanding of the servitization process for incumbent manufacturers.

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Parallel Session 4

AI, Digital Transformation, and Digital Innovation in Servitization

Co-Chairs: Rodrigo Rabetino & Oscar Bustinza

A Historical Perspective of Artificial Intelligence as Servitization

Ricardo Coelho da Silva, Leid Zejnilovic

Nova SBE

Extended Abstract

The advent of Generative Artificial Intelligence (Generative AI) and Large Language Models (LLMs) represents a significant change in organizations (Mollick, 2024). We propose that this development embodies the concept of servitization of Complex Products and Systems (CoPS). We argue that CoPS can achieve mass adoption when a general or foundational model of the system exists. This study examines the evolution of AI as CoPS. Specifically, we analyze how LLM tools such as ChatGPT, DALL-E, Gemini, Mistral, and MidJourney have transformed AI from a collection of specialized, often isolated applications into comprehensive, service-oriented solutions. Additionally, these tools have made the integration of digital services in products more prevalent.

The existing literature identifies Complex Products and Systems (CoPS) as a unique analytical category, with innovation processes distinct from those in mass-produced goods (Hobday, 1998; Hobday, Rush & Tidd, 2000). Notably, CoPS feature long life cycles, extended maturation periods, and interdependencies among diverse stakeholders. These characteristics are crucial for the development of underlying technologies and value appropriation (Mazzucato, 2013).

Servitization involves transitioning traditional products into service-based solutions that deliver continuous value to users (Visnjic Kastalli & Van Looy, 2013). Adopting a servitization strategy also provides organizations with new streams of data for continual product development. In the realm of AI, LLMs epitomize this

transition by providing scalable and highly adaptable tools that cater to a wide range of applications (Bouschery, Blazevic & Piller, 2023).
AutoML, RapidMiner, and SAS Enterprise Miner were early attempts to servitize AI, but they fell short because users still needed specific competencies in data science and machine learning to make them work effectively. The true servitization of AI only occurred when companies provided functionalities that eliminated the need for specialized knowledge.
This increasing servitization is not without challenges. In the case of generative AI, there is a high requirement for data, which raises issues in training these models, their deployment, and continuing development (Kulkarni, Mantere, Vaara, van den Broek, Pachidi, Glaser et al., 2023). Their intrinsic unknowability also creates issues in terms of interpretation of their outputs (Moser, Den Hond & Lindebaum, 2022). Additionally, the potential for increasing dependency on these tools creates new relationships between the organization and its users (Satyanarayan & Jones, 2024).
Enhancing servitization in the case of AI therefore involves increasing the 'black boxing' of the technology (Latour, 1987), which reduces user complexity but increases opacity. In other words, as servitization makes tools easier to use, it also makes them more opaque to the user.
This paper investigates the mechanisms by which companies have achieved servitization of AI, including processing vast amounts of data, understanding and generating human-like text, and adapting to various contexts with minimal retraining. The current stage of generalized AI systems is the result of decades of developing increasingly user-friendly products. We outline the evolution of these systems through a historical assessment, drawing on multiple archival data sources to map out how these systems were implemented with increasing servitization. As servitization increased ease of use, we also observed an increasing black boxing of internal processes, changing the relationship between users and tools. This evolution serves as the basis for theorizing the impact of increasing servitization on other systems and tools. We discuss the implications of this shift, focusing on the changing relationship between users' knowledge and the workings of tools in the context of increasing servitization.

Keywords: Servitization, Digitalisation, Smart Product-Service Systems, Socio-technical Systems, Action Design Research.

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Leveraging AI for digital Servitization: An Analysis of Italian B2B Manufacturers

Clara Filosa, Lara Agostini, Anna Nosella

Department of Management and Engineering, University of Padova

Abstract

Digital servitization is increasingly emerging as a new business approach to boost companies' competitiveness. Notwithstanding the growing interest in literature and among practitioners, manufacturing firms struggle to successfully implement this paradigm and reap the benefits deriving therefrom. An explanation lies in the fact that shifting towards digital servitization involves an overall business model (BM) reconfiguration, fundamentally altering the way in which a firm creates, delivers and captures value. This transformation unfolds over time, representing a challenge for manufacturers. Furthermore, while leveraging digital technologies is essential to realize the full potential of digital servitization, understanding how the most advanced ones (e.g., AI) are applied to spur the BM innovation driven by digital servitization remains understudied. Extant literature rarely shows how companies adapt the BM elements to pursue the digital servitization innovation by applying advanced digital technologies. To address this gap and provide a contribution for managers, this article aims at unveiling (a) how AI is leveraged for the provision of advanced digital services and (b) what changes occur in the manufacturers' BMs as a result of the digital servitization implementation by analysis the cases of Italian B2B manufacturers.

Keywords: Digital servitization, AI, business model reconfiguration, B2B manufacturing firms, qualitative case study.

Introduction and relevance of the research

Digital servitization refers to the shift from the traditional product-centered business model (BM) toward a service- and integrated solution-based approach, made possible by cutting-edge digital technologies (e.g, Kohtamäki et al., 2019). By leveraging digital technologies to capture real-time field data and enable remote assets control and handling, manufacturers can adopt a customer- and service-centric lens and give emphasis to customers' experience, providing personalized solutions (e.g., Rabetino et al., 2017). This leads to raise consumer satisfaction and, in turn, implies better results for firms in terms of competitiveness and profitability (Martín-Peña et al., 2019).

In recent literature on the topic, artificial intelligence (AI) is portrayed as an effective enabler for successfully enacting the transformation towards digital servitization (e.g., Abou-Foul et al., 2023). AI is defined as the capability to accurately assess collected data, to elaborate those inputs, to draw conclusions from it, and use this knowledge for decision support by transforming vast and complex volumes of data into insightful understandings (Sjödin et al., 2021). By leveraging these features, companies can provide cutting-edge, and round-the-clock services like performance advisory, remote control, preventive maintenance, and customer support to meet the real customer needs throughout the products' lifecycle, thus implementing the digital servitization transition (Sjödin et al., 2021).

While AI lays the groundwork for a successful digital servitization, utilizing this technology requires new practices, competencies, operational procedures, and business models (BMs) innovation (Sjödin et al., 2021), thus calling for a modification in the value creation, value delivery and value capture dimensions. Succeeding with such implementations poses challenges for the extant companies' modus operandi (Kohtamaki et al., 2019; Sjodin et al., 2020). Consequently, many firms miss out the opportunity to create and deliver value and generate profit from digital servitization (Sjödin et al., 2021). In this domain, the extant literature presents a gap. Specifically, it is necessary to enhance the comprehension of how AI may be effectively applied to promote BM innovation in terms of digital servitization (e.g., Sjödin et al., 2021). In this regard, real-world, concrete examples of how manufactures, in particular business-to-business (B2B) ones, effectively develop and profit from AI-enabled digital services are scant in the up-to-date literature (Sjödin et al., 2023).

To address these lacunas, this study aims at addressing the following research questions:

RQ1: How do manufacturing B2B incumbents leverage AI for the provision of advanced digital services?

RQ2: What changes do the companies' BMs undergo as a result of the adoption of the digital servitization paradigm?

Methodology

To tackle the purpose of this article, we adopt a qualitative case study design, investigating two Italian leading B2B manufacturing firms that have developed integrated solutions, as a function of advanced digital technologies and, in particular, AI, and have consequently adapted their BM accordingly.

Theoretical and managerial contributions

By investigating the implementation of AI-driven digital services by B2B manufacturers, this study contributes to the extant body of literature, by integrating knowledge about digital servitization transition and the AI-leverage lens, with a specific look at the new value creation, value delivery and value capture schemes.

From a practical viewpoint, the article offers guidelines on the effective use of AI in the transition to digital servitization and on the consequent BM adaptation, providing a knowledge base that may assist managers in successfully addressing this new economic paradigm.

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The Future of Digital servitization AI and Blockchain as Digital Platform Enablers

Clarissa A. González Chávez

Chalmers University of Technology

Shaun West

University of Luzerne

Johan Stahre

Chalmers University of Technology

Abstract

Digital platforms enable digital servitization as a global transformation of current businesses and markets that can lead to more sustainable industrial outcomes across complete value chains. The use of platforms in today's digital industrial setting is deemed the only option to successfully deliver data and information at the speed and pace required to create meaningful and valuable digital services. A platform approach provides opportunities connected to the number of users and information sources required to create valuable results, representing both an opportunity and a challenge in its industrial scalability. This study summarises outputs of a project which, through the use cases of three value chains, exemplifies different applications of digital platforms using technological enablers such as AI and blockchain, among others. The results provide an opportunity to bridge the gap in the conceptual integration of how digital platforms with AI and blockchain embedded can support the development of better digital services that promote the outcomes of visibility, transparency, traceability and sustainability.

Keywords: digital servitization, digital platform, sustainability, blockchain, AI.

Introduction

Digital platforms are online frameworks that facilitate the exchange of information, goods, services, or social interactions between users through digital means (Fehrer, Woratschek & Brodie, 2018). Their demonstrated implementation in industrial scenarios is essential to achieve value chains that rely on a solid basis of data characterised by reliability and robustness to create more efficient and sustainable manufacturing processes. Digital platforms have transformed industrial sectors by enabling new business models, enhancing customer engagement, and driving innovation (Assadullah, Faik & Kankanhalli, 2018; Schneider, 2019). It is essential to identify the different requirements and elements needed to enable digital platform utilisation. For instance, processing of data and transformation of data into information that can become knowledge for decision-makers requires some technologies that are highly relevant for the success of digital servitization in an increasingly digital industry, which aligns with the principles of Industry 5.0, referring to human-centeredness, sustainability and resilience, including artificial intelligence (AI) and blockchain. AI can support the transformation from traditionally linear business models to increasingly servitized perspectives (Pezzotta et al. 2022), as it creates value for customers, businesses, and society through its capabilities in internal processes and the integration of resource optimisation with AI for social innovation services (Nicoletti & Appolloni, 2023).

This study summarizes how a research project currently uses a value chain approach to use digital technologies holistically. The approach's applicability has been tested through demonstrators in multiple industrial contexts. An example will be described further in the following subsection.

Artificial Intelligence in Digital Servitization

The use of AI to develop digital services leads to a long list of possible applications. When defined as the ability of computers to perform cognitive functions similar to those of human minds, i.e. perceiving, reasoning, learning, and problem-solving, AI in the digital servitization of manufacturing could provide solutions and thus significantly improve productivity, quality, flexibility, safety, and cost (Arinez, Chang, Gao, Zu & Zhang, 2020). The increased availability of production data opens many opportunities for digital services, including environmental data, process data, production data, and measurement data for quality inspections (Sjödin, Parida & Kohtamäki, 2023).

One of the demonstrators developed and explored in this project has drawn attention to the opposite courses of information and material flows when detecting errors caused by production disturbances and quality issues at second- and third-tier suppliers. The demonstrator developed allows machine learning to create an artificially intelligent system by recognising patterns from large data sets and applying them to new data. From a platform implementation perspective, such data processing allows system users to significantly reduce the number of interactions required to source error data, optimise the process of addressing production errors, and get a better overview of the trends. Using AI and machine learning, the demonstrator tackles linear value chain information flows and addresses interactions required today for extracting information across the value chain of e.g product failures at a tier three supplier which could later create production disruptions at a manufacturing site. Therefore, this inefficient traceability process can benefit from using digital platforms enabled by AI and machine learning to reduce the number of interactions and create transparency through data. The demonstrator provides a solution that can be delivered in a format that benefits from digital servitization principles, ultimately connecting digital servitization, digital platforms, AI, and machine learning for future industrial sustainable solutions.

Preliminary conclusions

This study explores integration of AI and blockchain technologies, within the context of Industry 5.0, to enhance efficiency and sustainability in modern industrial environments through the lens of digital servitization. By examining use cases from three distinct value chains, the research highlights the potential of digital platforms to change industrial processes. Integration of AI and machine learning shows significant improvements in error detection and production efficiency, exemplified by a demonstrator that reduces the number of interactions needed for sourcing error data and optimizing production processes.

The findings suggest that digital platforms enabled by AI and blockchain can effectively address challenges of transparency, traceability, and sustainability in value chains. These technologies provide robust solutions for transforming traditionally linear business models into more dynamic and service-oriented solutions, thus supporting the major principles of Industry 5.0, including human-centredness, sustainability, and resilience.

Future research will focus on further aligning the digital servitization's capabilities with the outcomes observed in the value chain demonstrator. This alignment aims to identify new opportunities for exploiting digital technologies to achieve sustainable industrial solutions. The ongoing exploration of AI and blockchain in digital servitization holds promises for advancing the development of innovative, efficient, and sustainable industrial practices.

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Digital Service Innovation Enablers in the Spanish Manufacturing Sector: An Empirical Analysis

Alberto de la Calle, Inmaculada Freije, Miguel Angel Larrinaga, Ciara O´Higgins, José Vicente Ugarte

University of Deusto

Abstract

Digital service innovation (DSI) is the result of several trends that have impacted companies in recent years, generating both challenges and opportunities for manufacturing companies: digitalization and servitization. Using descriptive analysis and regression models on a sample of more than 2000 Spanish manufacturing companies, this paper studies some key factors affecting the degree of development of Digital Service Innovation within Spanish industries. The research considers the role of digital capabilities both from the perspective of DSI enabler and from the perspective of innovation performance and competitive position. The findings will provide insight for academics, practitioners and policy makers that can be valuable to deepen the still underdeveloped DSI process.

Keywords: digital service innovation, sustainability, digital capabilities, Spanish manufacturing companies.

Objective /Rationale

The last few decades have witnessed a technological revolution, with digitalization representing a pivotal driving force. The advent of digitalization has transformed the manner in which we work, shop and interact, exerting considerable influence on both our personal and professional lives. In the business sphere, organizations have undergone significant changes, including alterations to their processes, capabilities, organizational structures, business areas, supplier and customer relationships, and the ways in which they interact with these entities. In this context, innovation has become a crucial factor for maintaining and expanding market presence.

Furthermore, the distinction between products and services has become increasingly blurred as products have come to incorporate an increasing array of intangible benefits and services, while services have begun to offer tangible benefits and incorporate products. Manufacturing companies have been confronted with a multitude of challenges and opportunities associated with the phenomenon of servitization.

Servitization represents a means of enhancing efficiency and creating value for customers and other stakeholders, particularly through the provision of advanced services. This includes opportunities linked to sustainability, such as the dematerialization of the value chain (Baines, Bigdeli & Kapoor, 2024).

On the other side, the increasing integration of novel technologies has facilitated a transition from a mere digitization of processes to the advent of Digital Servitization (DS). Consequently, conventional business models are undergoing a transformation towards Product Service Models, characterised by the integration of products and services. The advent of new technologies, such as the Internet of Things (IoT) and cloud computing, allows these models to evolve into "Smart PSS" models, where new value propositions can be generated from the most advanced and deepest collection of data, which is now shaping the concept of Digital Servitization (DS). Accordingly, the provision of more personalised, more efficient and more proactive services becomes a possibility, which in turn enables cost reductions for customers, offers greater flexibility and drives greater collaboration – in terms of quantity and transparency – between the members of the value chain towards the customer.

Furthermore, it permits the company to extend its range of products and services (Minaya, Avella & Trespalacios, 2024).

At the confluence of all these trends is Digital Service Innovation (DSI), which captures the changes and opportunities that arise in services as a consequence or cause of technological change and, more specifically, digitalization. Through the strategic use of digital technologies to innovate in service design, delivery and customization, DSI leads to the creation of novel value propositions, improved operations and greater value creation (Opazo-Basáez, Vendrell-Herrero, Bustinza & Raddats, 2024). Even, DSI can help in companies in the Bottom of the Pyramid (Sunder & Modukuri, 2024).

Kohtamaki et al. (2024) surveyed the digital business models (DBM) literature, identifying four types of clusters within what they call Digital Business Models, i.e. models where the firm's logic for value creation, delivery and capture that has been significantly shaped by digital technologies. One of these clusters is called Digital Servitization business Model Innovation.

Rabetino, Kohtamäki and Huikkola (2024) emphasize that, in addition to digital technologies, interconnectivity, data and learning play a crucial role in this context. These factors not only facilitate the creation of new service opportunities but also enable business models to be adapted in a dynamic manner to align with the evolving needs of customers and suppliers. This capacity for dynamism and flexibility is particularly valuable in environments characterised by high uncertainty, as is the case for many companies globally.

However, it should be noted that these opportunities are not without inherent risks and difficulties. The innovation process, along with the related concepts of servitization and digitalization, present significant challenges for companies that must adapt their business models in contexts of intense competitive rivalry and uncertainty.

The literature identifies the difficulty of making the required transformation towards services profitable as the servitization paradox (Gebauer, Joncourt & Saul, 2016). This problem is further compounded by the addition of novel and profound changes. The convergence of two of the most disruptive trends, servitization and digitalization in DS, gives rise to tensions within companies themselves and with other external organizations (Tóth, Sklyar, Kowalkowski, Sörhammar, Tronvoll & Wirths, 2022).

One area where further investigation is recommended is the role of new concepts such as Industry 4.0 in enabling innovation in manufacturing firms (Hofmann, Sternberg, Chen, Pflaum & Prockl, 2019). Kowalkowsli, Wirtz and Ehret (2024) emphasize the significance of the Internet of Things (IoT) in transforming tangible resources into adaptable product-services or digital platforms for integrating resources and stakeholders into service ecosystems.

In this research project, which is based on a comprehensive sample of Spanish manufacturing companies, we will initially examine the role that Industry 4.0 is playing in relation to innovation in processes (from an input perspective: means or training) and in products and services (from an output perspective: innovation in products – services) and in their competitive position. In this way, we will analyse digital technologies in their dual role as enablers and drivers of DSI (Sjödin, Parida, Kohtamäki & Wincent, 2020; Coreynen, Matthyssens, Vanderstraeten & van Witteloostuijn, 2020).

Secondly, the context in which it takes place will be analysed to find out whether certain variables, such as the sector of activity, the size of the company, or the level of internationalization, exert an influence on this process.

This approach will facilitate a more comprehensive understanding of the factors influencing the implementation of DSI and their potential application in the redefinition of business models.

Methods/ Results /Findings

This study utilizes data from the Survey on Business Strategies (Encuesta sobre Estrategias Empresariales-ESEE), developed by the SEPI Foundation, which is affiliated with the Ministry of Finance and Public Function of the Government of Spain. The survey is conducted by the Spanish Ministry of Economics and Competitiveness on the business strategies of Spanish manufacturing companies. The empirical analysis aims to describe Spanish companies in terms of their technology intensity and level of servitization. The analysis is conducted through a descriptive exploratory research study, considering the period from 1990 to 2020 and the development of a regression model. A number of variables will be considered:

- From the input perspective (enablers):
  - In terms of means like Robotics, Augmented or virtual reality cyber-physical systems, Data Management (i.e Cloud computing, Machine Learning, Big Data)
  - In terms of cost effort in this area (i.e. investments, training cost).
- From an output perspective (drivers): in relation to innovation the survey includes variables like Innovation in Management, Processes and Products/Services.

In addition, servitization level, industry, geographical coverage, firm size, and the extent to which manufacturing companies collaborate with customers, suppliers, and competitors, will be considered.

The variables will be aligned with some of the factors that Burton, Story, Zolkiewski and Nisha (2024) consider impediments to the

DSI - external environmental factors, internal firm factors, capabilities, processes and business models, the interactions between the different actors and value capture.

Implication/Conclusions

The advent of servitization and digitization is undoubtedly transforming the operational landscape of contemporary businesses, engendering fresh avenues for innovation while simultaneously presenting a host of challenging and contentious issues that must be confronted. The anticipated findings will provide insight for academics, practitioners and policy makers, facilitating advancement of this DSI process that is currently hindered by numerous knowledge gaps. For researchers, it will facilitate a more comprehensive understanding of the contexts and constraints of DSI. For managers, it will facilitate a more comprehensive understanding and preparation for the implications of the process. For public authorities, it will facilitate the development of policies that foster innovation in services and support the capacity building and organization of companies.

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Parallel Session 5

Digitalization and Circular Economy

Co-Chairs: Yancy Vaillant & Esteban Lafuente

Transition Towards Circularity in Industrial Contexts: A Multi-Actor Business Models Perspective

Taylan Kilinc, Wiebke Reim, Vinit Parida

Luleå University of Technology

Abstract

The transition towards circularity in industrial contexts is critical for sustainable development, yet challenging due to the complexity of ecosystems involved. This study investigates the role of multi-actor business models in addressing barriers and facilitating the adoption of connected energy services to support circular transitions in B2B industrial contexts. Focusing on two industrial automation and motion control manufacturers, the study explores collaborative processes between providers and customers to promote circular economy principles. Utilizing an exploratory case study approach through in-depth interviews with active employees in the transition, the study aims to align data insights on energy use with actionable stakeholder management strategies. Expected findings show that the significance of co-creation, quality-related features, and training programs in achieving circularity are key. This research contributes to the literature on circular economy and industrial sustainability in addition to the literature stream of digital servitization, also offering practical recommendations for fostering multi-actor collaborations and developing sustainable industries.

Keywords: Digital servitization, circularity, multi-actor business models, sustainability.

Introduction

The circularity transitions within industrial firms, facilitated by multi-actor business models, are promising in the current state of rapid technological advancements such as artificial intelligence, the Internet of Things, and autonomous solutions (Sjödin, Parida & Kohtamäki, 2023). Connected energy services through such frontier technologies in digital servitization exemplify the potential for optimizing energy use and supporting circular practices. However, the potential for circularity and the collaborative dynamics required to achieve it remain underexplored.

This study examines the processes and interdependencies among manufacturers, their customers, and essential actors in service provision. It seeks to identify how multi-actor business models can address barriers to creating a structured ecosystem for connected energy services, aiming to align data insights on energy use with actionable steps for customer management and to facilitate effective co-creation practices. Additionally, it explores the role of quality-related features and training programs in supporting circular economy goals.

Through an in-depth analysis of two cases, this study uncovers insights from industrial firms transforming their operations and offerings towards circularity, emphasizing the significance of multi-actor collaborations. The findings offer improved understanding and recommendations for fostering these collaborations and developing viable business structures that support connected energy services and circular economy principles.

By shedding light on the importance of multi-actor business models in achieving circularity, this study aims to contribute to academic research and managerial practices. Specifically, the findings offer practical insights and recommendations for industrial B2B firms on how to enhance customer involvement and develop multi-actor business models towards circularity. Additionally, identifying limitations helps propose future research opportunities to encourage further exploration of the circular economy and the required collaborative dynamics among providers, customers, and primary stakeholders.

Theoretical Background

Circularity advocates minimizing waste and continually using resources through strategies such as recycling, reusing, reducing, and revamping. Thus, circular transitions involve integrating circular principles into industrial processes (Geissdoerfer, Pieroni, Pigosso & Soufani, 2020). However, this endeavor requires technology (Ceschin & Gaziulusoy, 2016) and collective effort towards circularity including manufacturers, customers, partners, regulatory bodies, and technology networks, as no single company can achieve this alone (Sjödin & Parida, 2021). This emphasizes collaboration, co-creation, and shared responsibility in achieving circular objectives.

Companies often prioritize their internal interests over a holistic view of the business ecosystem (Reim, Parida & Sjödin, 2019), potentially resulting in reduced value creation and diminished circularity. Multi-actor business models, emphasizing collaboration and value co-creation among stakeholders, provide a framework for addressing the challenges associated with circularity transitions (Verleye, de Keyser, Raassens, Alblas, Lit & Huijben, 2023). For industrial firms, this challenge requires multidisciplinary efforts (Glikson & Woolley, 2020) and the adaptation of well-designed and economically viable business models (Frishammar & Parida, 2019). Therefore, adopting a comprehensive and collaborative approach is deemed essential for achieving effective and sustainable circular transitions.

Digital servitization, which refers to the integration of digital technologies into products to create value through additional services, is a key enabler of these transitions (Sjödin et al., 2023). It involves transforming processes, capabilities, and offerings within industrial firms using frontier technologies (Parida & Wincent, 2019). These advancements facilitate the development of smart connected services, enabling remote control, monitoring, and optimization, which are vital for circular practices.

Consequently, this study draws on the literature on circular economy, multi-actor business models, and digital servitization in the B2B context to develop an understanding of how industrial processes can be facilitated to support the transition towards circularity.

Methods

The study adopts a qualitative, exploratory multiple-case study approach (Yin, 2009) to investigate the role of multi-actor business models in facilitating the transition towards circularity. Data collection involves conducting 14 semi-structured interviews with employees of two European industrial service providers in the industrial automation and motion control industry. Data collection also includes interviews with industrial customers, company presentations, follow-up interviews, and project reports (Eisenhardt, 1989; Eisenhardt & Graebner, 2007). Purposive sampling selects participants with relevant experience and insights into connected energy services, circular economy practices, and multi-actor business models (Etikan, Musa & Alkassim, 2016). The thematic analysis identifies common themes and insights across the interviews (Gioia, Corley & Hamilton, 2013).

Expected Findings

The findings so far emphasize the importance of multi-actor solutions in overcoming barriers and facilitating the transition towards circularity. Particularly, (1) connected energy services co-created with end-user insights and customer data, (2) a vision of an ideal ecosystem for circularity through connected energy services, emphasizing multi-actor solutions, (3) aligning data platforms on energy use for optimizing energy management and practices supported by multi-actor interactions, (4) understanding how quality-related features impact efforts towards circularity, and (5) evaluation of training programs aimed at promoting sustainable energy use and circular principles.

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Investigating Industrial Firms Implement Circular Business Models: An Organizational Practice Perspective

Debadrita Panda, Vinit Parida, Johan Frishammar

Entrepreneurship and Innovation, Luleå University of Technology

Abstract

This research examines into the implementation of circular business models (CBMs) by Swedish industrial firms, examining how they navigate the transformation from linear to circular thinking. Employing the strategy as practice (s-as-p) lens, it reveals the practical activities undertaken by these firms. Through qualitative content analysis of 169 articles, the study identifies three sequential stages in CBM implementation: designing, developing, and scaling CBMs. It uncovers various practices within each phase, shedding light on how industrial firms embrace circularity at the organizational level with ecosystem support. This study contributes to circular economy (CE) literature, predominantly focused with barrier, driver and enablers by bridging the gap between theoretical concepts and practical implementation, offering insights into the actions necessary for CBM adoption. Moreover, this study also assists to comprehend how these diverse practices unfold. Additionally, it provides a practitioner-oriented guidelines applicable beyond Sweden, facilitating CBM implementation in diverse industrial contexts.

Keywords: Circular economy, Circular business model, Strategy as practice, Sweden, Industrial firms.

Introduction and context

The manufacturing sector significantly contributes to a nation's industrial progress highlighting the need to comprehend industry's interrelation with the environment (Rajesh & Rajendran, 2020). In response, CE emerges as a nascent concept, attracting substantial interest across business, institutional, and academic spheres (Bag, Yadavk Wood, Dhamija & Joshi, 2020). While Pearce and Turner are often credited with the origins of the CE concept in the 1990s, its foundations trace back to earlier discussions, such as Boulding's discourse in 1966 (Lekan, Jonas & Deutz, 2021). CE aim to minimize waste by emulating nature's cyclical processes. Bloomsma and Brennan (2017) delineate three developmental periods of the CE, from its inception to the current focus on waste as a valuable resource, inspiring discussions on environmental impacts and business model (BM) innovation.

A BM elucidates how a company generates value by converting resources into benefits, serving as a nexus between strategy and operations (Ranta, Aarikka-Stenroos, Ritala & Mäkinen, 2018). Embracing CE principles necessitates transforming the BM, known as a circular business model (CBM), vital for promoting circularity (Bocken, De Pauw, Bakker & van Der Grinten, 2016). Both academics and practitioners advocate for BM innovation to facilitate the transition to a CE (Brennan, Tennant & Blomsma, 2015). However, transitioning to CBMs poses challenges as it requires a fundamental shift in how firms generate, deliver, and capture value (Teece, 2010), particularly in heavy industries entrenched in linear thinking (Urbinati et al., 2020). Addressing these challenges and seizing opportunities associated with CBM alignment with CE principles requires understanding practical implementation and associated activities (Khan & Haleem, 2021).

This study aims to bridge gap by offering significant contributions to the existing literature. Gaining insight into the practical measures undertaken by industrial firms to implement CBM is essential for a comprehensive understanding (Khan & Haleem, 2021). While existing literature predominantly focuses on barriers, drivers, and enablers, practical implementation remains underexplored (Frishammar & Parida, 2021). To explore this, this study adopts a strategy-as-practice lens (s-as-p), investigating industrial firms' practices and actions during CBM implementation (Whittington, 2014).

To this background, the purpose of this study is to advance understanding of how industrial firms engage in diverse practices for CBM implementation.

This study builds on academic and grey literature, analyzing materials from Swedish industrial firms from 2013 to 2023, employing qualitative content analysis (Mayring, 2004). The findings reveal three consecutive stages that industrial firms follow for CBM implementation.

Methods

Our study utilized qualitative content analysis (Mayring, 2004) to investigate the implementation of CBMs in Swedish industrial firms from 2012 to 2024. We retrieved relevant literature by querying the Scopus database and cross-referencing, resulting in a final set of 169 articles. Data analysis involved two phases of inductive category development, identifying underlying activities and grouping them into CBM practices. The study focused on top Swedish industrial firms (SNI/SIC-codes 07-32) and applied rigorous reliability checks to ensure the credibility of findings (Mayring, 2004). This approach is effective in understanding CBM implementation within specific country contexts (Niskanen, Anshelm & McLaren, 2020).

Result and discussions

This section outlines the process through which traditional industrial firms adopt CBMs by undertaking various business practices across three consecutive phases. First-order codes denote the specific activities undertaken by these firms to accomplish the various practices identified through second-order coding. Activities entail particular tasks carried out within a business, often involving a series of steps to achieve a specific objective, such as enhancing circularity. Conversely, business practices encompass a collection of similar activities employed within their overall operations. Finally, second-order codes coalesce into an aggregate dimension, representing a more comprehensive conceptualization by combining specific practices—designing, developing, and scaling. Here, the aggregate dimension signifies the consecutive phases. Following the hierarchical structure of aggregate dimensions, the research findings along with discussions are presented below.

Designing CBM

This aggregate dimension involves the initial conceptualization and planning of CBM, including the ideation of logics, processes, and capabilities aligned with circular principles. Industrial firms explore and align circular logics with resource flow strategies, enhance digital analytical skills, and assess and expand partnerships. The outcome is a conceptualized CBM agreed upon by partners ready for further development and testing.

Under the practice of **experimenting with diverse circular value logics**, Swedish industrial firms explore various ways to evaluate circular value logics and make informed choices, considering the unique capabilities of different industries. They engage in activities such as incorporating value proposition logics, aligning them with resource flow strategies, and involving lead customers for validation

(Bocken et al., 2016). For instance, SKF strategically pursued the "Asset Efficiency Optimization" service, collaborating with key industrial clients to optimize machinery performance, while Scania offers circular solutions aligned with CO_2 emission regulations, delivering high-quality vehicles and services utilizing vehicle data from connected vehicles to maximize operational uptime.

Next, the successful design of CBMs necessitates a comprehensive transformation of a firm's competency profile, particularly focusing on **enhancing digital and analytical skills** (Bertassini, Ometto, Severengiz & Gerolamo, 2021). Swedish industrial firms initiate this transformation by providing training to employees to upgrade their digital and analytical skills. Collaborations with entities like Nordic Innovation and private partners facilitate CBM training, with startups specializing in data analytics and machine learning contributing to competency development in data handling. This includes expertise in material analysis, product-use cycles, recovery processes, sustainable design using tools like AutoCAD and Solidworks, and environmental engineering related to maintenance, reverse re-manufacturing, and repair (Janssens, Kuppens & van Schoubroeck, 2021). For instance, Atlas Copco collaborates with CoachHub to provide upskilling programs for employees to analyze equipment performance data, predict maintenance needs, and optimize resource usage (Atlas Copco, 2022). Another crucial activity involves industrial firms promoting the usage of advanced data analytics to drive circularity. They enhance technical expertise, automate processes, track stock movements, and issue maintenance notifications for surplus materials using emerging technologies like blockchain, sensor-based RFID, and IoT systems, along with techniques like predictive and prescriptive analytics (Blackburn, Ritala & Keränen, 2023). By integrating internal platforms with these systems, firms create a unified environment empowering all divisions and employees, fostering data-driven decision-making and accountability (Thomson, Sjödin & Parida, 2023). For example, SCA utilizes computerized tomography and artificial intelligence to optimize log processing at Bollsta sawmill, ensuring product value optimization and regulatory compliance (SCA, 2022).

As a third practice, Swedish industrial firms undertake **ecosystem reconfiguration** by assembling various stakeholders and external partners to promote sustainability, ensure compliance with environmental regulations, and navigate supply chain disruptions (Sjödin, Parida & Visnjic, 2022). The first activity involves assessing partners' willingness to engage in circular opportunities, emphasizing the importance of partners' adaptability and preparedness for transitioning from a product-centric to a service-centric approach (Parida, Burström, Visnjic & Wincent, 2019). External trend assessments are conducted to evaluate partners' compatibility for circularity, and strategic meetings are held with partner representatives to agree on necessary changes. Additionally, firms explore policy and regulatory alterations to gauge partners' willingness (Rattalino, 2018).

Next, industrial firms expand circular opportunities by engaging new partners and reconfiguring existing ones, seeking collaborators with capabilities in digital platforms, technological support, modular plant design, and standardization (Sjödin et al., 2022). Collaboration extends to original equipment manufacturers, competitors, and startups through initiatives like hackathons. Existing partnerships are reconfigured to support CBM development, emphasizing dialogue, knowledge sharing, and incentives to encourage the adoption of circular practices (Antikainen & Valkokari, 2016). As a third activity, firms address capability gaps through joint value creation, seeking partners whose strengths complement their weaknesses to create a synergy that benefits both parties. For example, ABB collaborates with startups from various sectors through initiatives like SynerLeap and ABB Technology Ventures, providing mentorship, technical support, investment opportunities, and pilot projects (ABB Group, 2023).

Developing CBM

In this second phase, the finalized design principles are put to the test and implemented, with a focus on revising vision and strategy for sustainability, transforming organizational processes, and introducing new revenue streams. The outcome is a thoroughly tested revised business model with extended circular revenue models ready for market launch.

To align organizational processes with circular principles, industrial firms **transform organizational processes** to reshape their mindset, structure, and processes, fostering an environment conducive to CBM implementation. They revise vision and strategy to prioritize sustainability, demonstrating commitment through concrete actions such as integrating circular practices and documenting sustainability efforts in annual reports and on webpages. These firms adapt their teams and business operations to reduce silo initiatives and introduce new roles and units, embracing flexibility and agility in response to sustainability challenges.

For instance, Volvo Group promotes cross-functional collaboration, with departments working closely to develop sustainable vehicle components and transitioning to more agile, team-based approaches (Volvo Group, 2023). Additionally, firms launch programs for gradual improvements to existing BMs, implementing change management initiatives focused on efficiency, waste reduction, and environmental awareness. They adjust compensation and reward structures to incentivize sustainable practices and conduct regular employee education sessions on circular principles. For example, Scania's "Sustainability in Every Drop" program recognizes and incentivizes sustainability-driven behaviors among its employees through compensation and reward structures (Scania, 2022).

Following ecosystem reconfiguration, industrial firms **actively orchestrate and align partner interactions** and optimize resources to achieve specific outcomes. They prioritize aligning stakeholders and partners toward common goals, fostering shared understanding and direction, ensuring cohesive and efficient ecosystem operation. This orchestration involves enforcing rules, promoting transparency, managing partner interests, and steering the ecosystem toward collective objectives (Parida et al., 2019). Initially, firms focus on revising governance structures to improve operational processes, roles, and activities. They establish internal service level agreements with ecosystem partners, defining functions, information sharing, and service standards for clear role allocation (Chen, Hung & Ma, 2020). A centralized monitoring mechanism is implemented to oversee service processes across ecosystem actors, and discussions are held to define industry standards. Additionally, orchestrators incur initial investment costs to incentivize partner transformation, aiding partners in addressing market, regulatory, and environmental uncertainties through process development, digitalization, competency enhancement, and financial support (Chen et al., 2020). Partners' willingness to share crucial knowledge and intellectual property for effective CBM implementation is emphasized, along with negotiating joint agreements on revenue sharing. Through revenue-sharing mechanisms, firms motivate partners in CBM initiatives, aligning their interests with long-term sustainability goals and fostering cooperation, mutual growth, and collective advancement of circularity principles. This comprehensive approach forms the basis for evaluating roles and responsibilities crucial for CBM success (Parida et al., 2019). For instance, Ericsson D-15, a hub for innovation devoted to circular principles, collaborates within a dynamic ecosystem to push the boundaries of innovation, particularly in the context of Industry 4.0, through an ultra-low latency 5G powered platform (Ericsson, n.d).

In the subsequent business practice, Swedish industrial firms **expand circular revenue models**, prioritizing product longevity, resource efficiency, and sustainability. This transition empowers firms to move from one-time product sales to fostering long-term customer relationships and responsible resource management. Initially, firms introduce new revenue streams, such as subscription models, which promote resource efficiency, extend product life cycles, and encourage reuse (Junnila, Ottelin & Leinikka, 2018). These models align with CE principles, where products are designed for durability and multiple life cycles. To capitalize on these models, firms emphasize advanced service contracts, adopting user-oriented or results-oriented revenue structures. Under the user-oriented model, products are offered through rental or lease agreements while ownership is retained, incentivizing firms to maintain and repair products to prolong usability and reduce replacements. Conversely, the results-oriented model entails firms taking full responsibility for delivering predefined results in exchange for payment (Junnila et al., 2018). For instance, Husqvarna Group offers the "Husqvarna Battery Box" service to professional users via a subscription model, promoting durability, longer product life, optimal equipment condition, and circular principles (Husqvarna Group, 2017). As these revenue models necessitate collective access to assets such as specialized equipment, research facilities, materials, and skilled labor, firms are realigning them with ecosystem partners. Co-creating revenue models with partners emphasizes value creation, resource optimization, and sustainability (Dahan, Doh, Oetzel & Yaziji, 2010). Agreed-upon revenue models among partners reduce costs, optimize resource utilization, minimize waste, foster collaborative innovation, and promote CE principles. For example, Alfa Laval offers a sharing business model for its PureBallast ballast water treatment system, allowing multiple shipping companies to collectively utilize and maintain the same equipment, reducing costs and optimizing resource utilization (Alfa Laval, 2023).

Scaling CBM

Following development, industrial firms transition to scaling their CBMs by expanding their implementation to reach a wider scope. Swedish firms aim to extend their CBMs to new customer segments or markets through scalable operations and digital solutions.

To expand to **new customer segments or markets**, industrial firms employ various scaling approaches, focusing on vertical or horizontal expansion of their CBMs. They engage in three key activities. Firstly, they optimize internal scaling by coordinating all organizational departments to access broader markets (Sandberg & Hultberg, 2021). For instance, ABB emphasizes the importance of engaging dedicated personnel from each department to drive circularity (ABB, 2024a, 2024b). Secondly, firms extend circular offerings to new customer segments by enhancing frameworks and service offerings. For example, ABB's PLC lifecycle management model ensures benefits like equipment optimization and efficient maintenance (ABB, n.d). Lastly, firms integrate circularity into their organizational values and culture, extending beyond surface practices when entering new markets. For instance, Scania follows a "new circular system" approach to integrate circularity into its operations, including battery reuse and recycling for grid balancing (Scania, n.d).

After establishing digital capabilities in design phase, firms **leverage digitalization to amplify the effectiveness** of their CBMs. Firstly, they streamline operations among partners, reducing costs and enhancing transparency by integrating digital platforms with legacy systems (Pauli, Fielt & Matzner, 2021). For instance, ABB emphasizes the adoption of IIoT technology to improve productivity and sustainability in power distribution (ABB, 2024b). Secondly, firms expand their marketplace connections through data-driven solutions, optimizing supply chains and facilitating circular sourcing (Abideen, Pyeman, Sundram, Tseng & Sorooshian, 2021). For example, Ericsson's Connected Recycling system tracks returns of used products throughout the reverse supply chain, supporting sustainability efforts with KPI reporting (Ericsson, n,d).

Implications and conclusion

The Swedish industrial sector is at a critical juncture in adopting CBMs, driven by a strong commitment to environmental sustainability. The transition to CBMs has profound internal impacts on industrial firms, with a recognition that there is no one-size-fits-all approach. Many firms progress incrementally along the circular continuum, often operating multiple business models concurrently by integrating old and new approaches.

Our study is relevant and significant as it unveils the practical actions taken by these firms across different CBM implementation stages, from design to development and scaling. Understanding these actions is crucial for other firms seeking circularity, offering concrete insights into required activities. Successful implementation demands a holistic approach encompassing technological advancements, organizational restructuring, ecosystem reconfiguration, and a mindset shift, highlighting the multifaceted nature of transitioning to circularity. Moreover, our study bridges theoretical concepts with practical insights, complementing existing research focused on circularity barriers, drivers, and enablers. By analyzing actual practices, the study provides valuable lessons for academics, policymakers, and practitioners alike.

In conclusion, our findings hold significant implications for industrial firms navigating CBM implementation, particularly those in the early experimental phase or facing slow scaling process. By addressing organizational and technological challenges, fostering collaboration, and embracing digitalization, firms can effectively transition to circularity and contribute to a sustainable future.

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Synergizing the Digitalization, Servitization, and Green Practices for Circular Economy: A Configurational Approach

Milad Kolagar, Victor Scholten

Faculty of Technology, Policy and Management, TU Delft, Netherlands

Abstract

The transition to a circular economy is increasingly recognized as being vital for the sustainable development of industries. Indeed, the emergence of new green and digital technologies, such as Internet of Things, artificial intelligence, precision agriculture and renewable energy solutions, drives businesses to undergo multiple transformations. With the adaption of their business models and the enhancement of customer orientation, these technologies facilitate the creation of new business solutions and services that promote business circularity. Several factors have been identified in the emerging literature on the circular economy that could potentially impact the operationalization of the circular economy. It is, however, still unclear how these factors interact to result in the implementation of circularity. Hence, the purpose of this study is to explore the various configurations of enabling conditions that lead to successful circular economy operationalization. By using a fuzzy set qualitative comparative analysis (fsQCA), we examine the impact of different configurations of "digitalization", "servitization", "business model innovation", "green practices", and "customer participation" conditions on achieving circular economy. Based on survey data obtained from Dutch AgriTech companies, multiple paths to successful circular economy adoption are observed. The findings underscore the complexity of achieving circular economy, demonstrating that no single strategy is sufficient. Instead, a combination of several factors must synergize in order to ensure sustained circularity. Therefore, this study contributes to both the literature on digital servitization and circular economy, while providing insight to practitioners and policy makers seeking to promote circularity.

Keywords: Circular economy, servitization, digitalization, green practices.

Introduction

In recent years, the importance of transitioning different industries toward sustainable business practices has gained attention in response to environmental challenges, resource depletion, and climate change (Bocken, Boons & Baldassarre, 2019; Kolagar, 2024). Additionally, industrial firms are facing unprecedented challenges from change and disruption, in the face of the rapid development of enabling technologies, that can put their future viability at risk. This has led the very logic of businesses to transform towards a regenerative economic system aiming at protecting the environment by closing the material loop, reusing resources, and ensuring resource efficiency (Blackburn, Ritala & Keränen, 2023).

Indeed, the circular economy has emerged as a vital paradigm, aiming to decouple economic growth from resource consumption (Bocken & Ritala, 2022) through the different so-called R-principles (e.g. recover, recycle, repurpose, remanufacture, refurbish, repair, reuse, reduce, rethink, and refuse). This has been especially true in the agricultural technology (AgriTech) sector, as there are a number of innovations and advancements that are supporting and transforming traditional agricultural practices. In a harmonious blend of innovation and tradition, technologies such as artificial intelligence (AI), machine learning (ML) algorithms, the industrial internet of things (IIoT), and renewable energy solutions are converging with agriculture. The use of green and digital technologies is enabling businesses to undergo a number of transformational processes (Opazo-Basáez, Vendrell-Herrero & Bustinza, 2018). Indeed, digitalization facilitates real-time monitoring and optimization of agricultural operations, while artificial intelligence greatly enhances decision-making and predictive capabilities (Kolagar, 2024; Sjödin, Parida & Kohtamäki, 2023). Through precision agriculture, crop yields and resource usage can be improved, and renewable energy solutions can be used to reduce the carbon footprint of operations. Together, these technologies facilitate servitization, which in turn promotes circularity by transforming processes, capabilities, and offerings within industrial firms and their ecosystems (Kolagar, Parida & Sjödin, 2022) to create, deliver, and capture increased service value (Sjödin, Parida & Kohtamäki, 2020). By offering continuous maintenance, monitoring, and optimization, companies can extend the lifecycle of products, reduce waste, and enhance customer engagement. Servitization, in fact, is closely aligned with circular economy as it promotes efficient resource utilization and continual improvement of performance.

Despite this potential, the operationalization of circular economy is a complex and multifaceted challenge. While several conditions —such as digitalization, servitization, business model innovation, green practices, and customer participation— have been identified as critical enablers, there is still much uncertainty around the interaction between these factors and it remains poorly understood how these conditions synergize to create effective pathways to operationalize circular economy. This study aims to address this gap by exploring the different configurations of enabling conditions that lead to successful circular economy implementation. By analyzing survey data from the Dutch AgriTech companies, we seek to uncover multiple strategies that companies adopt towards reaching circularity and provide a nuanced understanding of how digitalization, servitization, and green practices can be effectively integrated. The findings of this study will contribute to the literature on digital servitization and circular economy, offering valuable insights for practitioners and policymakers. By highlighting the necessity of a holistic and integrated approach, we aim to provide actionable recommendations that can facilitate the transition towards circularity.

Methodology

To explore the distinct configurations that enable circular economy operationalization in the AgriTech sector, we employed a fuzzy set qualitative comparative analysis (fsQCA) approach (Sjödin, Parida & Kohtamäki, 2019). As a result of this method, complex causality can be examined and several pathways to a desired outcome can be identifies. Data was collected from a diverse sample of Dutch AgriTech companies of varying sizes. The survey included items measuring digitalization, servitization, business model innovation, green practices, customer participation, as well as the circular economy operationalization.

Preliminary Findings

As a result of our preliminary analysis, we have identified multiple distinct strategies for achieving operationalization of the circular economy. Key configurations indicate that high levels of digitalization and servitization, when combined with robust green practices, significantly enhance circular economy operationalization. Furthermore, business model innovation and active customer participation emerged as critical complementary factors in several successful configurations. These findings highlight the complexity and interdependence of various strategic transitions, underscoring that no single factor is sufficient on its own. Instead, a holistic approach that synergizes digital, servitization, and green initiatives is essential for fostering circularity. It is through this nuanced understanding that practitioners and policymakers will be able to gain actionable insights that will promote circuler economies.

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Leveraging Blockchain Technology in The Battery Value Chain to Enhance Circularity

Moshkan Ebrahimi, Koteshwar Chirumalla, Anas Fattouh

School of Innovation, Design and Engineering

Mälardalen University, Eskilstuna, Sweden

Abstract

Driven by concerns over environmental pollution, resource scarcity, and increased consumption and waste, industries are undergoing a fundamental transition towards a sustainable, low-carbon future. The increasing demand for batteries, particularly for electric vehicles (EVs), has raised these concerns, especially for the management of the enormous number of batteries reaching their end-of-life (EOL). Addressing the challenges related to EOL and achieving efficient EOL battery management necessitates a transition from the traditional linear model to a circular economy (CE). This transition involves offering comprehensive battery-related services, including installation, operation, maintenance, and EOL recycling, a concept known as servitization. Efficiently managing battery leasing, usage tracking, and maintenance requires robust digital platforms. These platforms leverage data analytics, predictive models, and decision support systems (DSS) to streamline EOL processes.

Collaboration among battery manufacturers, users, recyclers, and service providers is crucial for developing integrated solutions for battery lifecycle management. Blockchain technology (BC) has emerged as a key enabler in this transformation. BC offers features such as traceability, decentralized governance, smart contracts, and consensus mechanisms, which address challenges related to security, trust, and privacy. By enhancing data management and enabling seamless integration, BC facilitates the transition to a CE, ultimately improving collaboration and communication across the battery

value chain. This work explores how BC can drive the circularity of EV batteries, promoting sustainability and efficiency throughout their lifecycle.

Keywords: Blockchain technology, Blockchain features, Circular economy, Servitization, Battery value chain.

Research Objective, Methodology and Related Work

This study develops a conceptual framework to investigate the role of BC in the battery value chain to promote CE through a comprehensive literature review.

While batteries present a feasible solution for addressing environmental concerns, their relatively short lifecycle, until their capacity drops to 80% of the original capacity, poses significant EOL management challenges (da Silva, Lohmer, Rohla, & Angelis, 2023). Transitioning to a CE, offers an opportunity to utilize the remaining capacity to extend their useful life or recover valuable material.

The European Union (EU) has issued regulations for batteries, integrating various CE strategies. These regulations also mandate the calculation of the carbon footprint of batteries, considering their entire lifecycle (Commission, 2020). Various strategies for the servitization of CE can be categorized into short loops (Refuse, Reduce, Resell/ Reuse, Repair), medium loops (Refurbish, Remanufacture, Repurpose), and long loops (Recycle, Recover, Re-mine) (Reike, Vermeulen, & Witjes, 2022).

Implementing these strategies requires tracking battery characteristics and operational status along the value chain to obtain precise information such as state of health (SoH), state of charge (SoC), and effective data communication among stakeholders (Júnior, Sanseverino, Gallo, Koch, Schweiger & Zanin, 2022). Moreover, it is essential to determine battery ownership and assign responsibility for CE strategies and service offerings. The lack of unified standards for battery characteristics currently prevents the identification of producers and those responsible for servitization (Zhang, Feng, Jiang, Gong & Wang, 2023).

Digitalization plays a crucial role in converting information and processes from analog to digital formats, thereby enhancing data management and access to information generated by various parties (Mahut, Daaboul, Bricogne, & Eynard, 2017). BC has emerged as a viable solution to address challenges related to data. BC, as a decentralized digital ledger, offers features such as traceability, auditability, smart contracts, and consensus mechanisms bringing transparency, security, privacy, and trust (Cheng, Hao, Tao, & Zhou, 2021). These features, combined with its capabilities, position BC as a powerful tool for implementing CE servitization strategies (Rejeb, Zailani, Rejeb, Treiblmaier, & Keogh, 2022).

BC can effectively track battery functionality across the entire value chain from production, first and second life applications, to recycling. Nevertheless, effective battery tracking requires different stakeholders to provide and share information about the battery with other parties. Currently, battery traceability and data communication are hindered by privacy and security concerns about exposing sensitive information among stakeholders (da Silva et al., 2023; Zhang et al., 2023).

Furthermore, BC operates without a central controlling authority that ensures data accuracy and security through smart contracts and consensus mechanisms, preventing counterfeiting and unauthorized alterations, and building trust in the value chain.

Decentralized smart contracts securely record and update data in a ledger, automatically verify terms of service agreements, and execute transactions, ultimately reducing costs. The consensus function validates transactions, ensuring immutability where data resist alterations (Yadav, Singh, Amin, Almutairi, Alsenani & Ahmadian, 2023).

Results

The structure developed from the literature review highlights the critical stages and interactions within the battery CE, emphasizing the integration of BC and the concept of servitization, as depicted in Figure 1. The battery value chain involves key stakeholders including suppliers, battery manufacturers, vehicle manufacturers/ OEMs culminating in the initial life cycle of the battery. BC plays a pivotal role in this framework, offering a decentralized platform that enables effective collaboration and communication through real-time data monitoring, thereby enhancing transparency. BC traceability ensures timely service and maintenance, prolongs the batteries' first life and supports their transition to second life applications. The availability and communication of data need to meet security and privacy requirements, as participants may be reluctant to share all information. Smart contracts and consensus mechanisms can address these concerns.

In addition to BC integration, the model incorporates servitization, where companies shift from selling products to offering battery-related services. The battery and material recovery stage involves circular integrators and recycling entities that facilitate CE strategies for batteries, categorized into short, medium, and long loops based on battery characteristics and operation data registered on BC by participants. By combining BC and servitization promote resource optimization and extended lifecycle management for batteries.

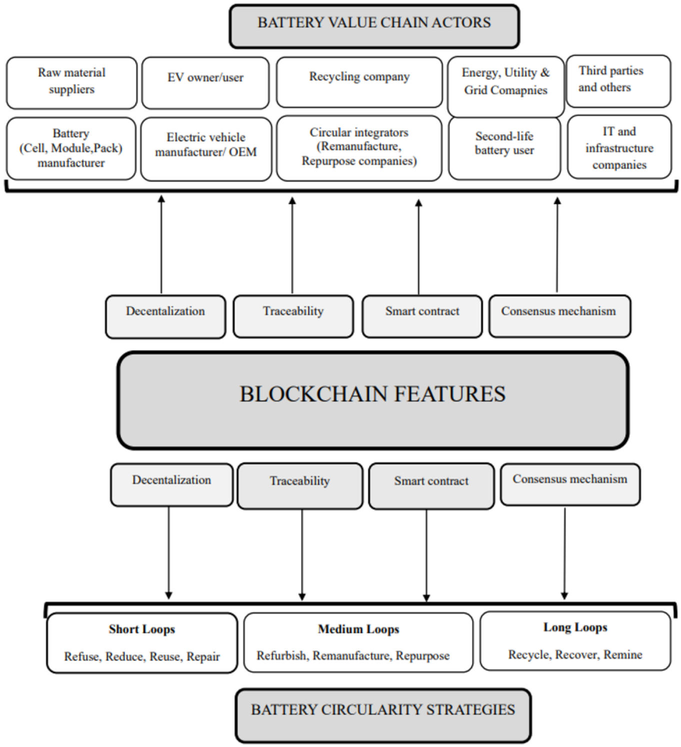

Figure 1. Mapping battery CE strategies with stakeholders through BC.

Conclusion

This research contributed theoretically to the literature by examining various features and capabilities of BC along value chain such as traceability, smart contracts, data communication. We addressed the research gap concerning the potential role of BC to circular initiatives by motivating data accessibility and traceability for batteries in a way that protects the interests of both upstream and downstream stakeholders, while generating value for them.

The research aids industry stakeholders and policy makers in adopting BC to achieve greater operational efficiency, improved resource management, supporting regulatory compliance and enhanced circularity in the battery value chain.

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Overcoming Barriers to Circular Servitization in Manufacturing Using AI: A Sustainable Transition Theory Approach

Anand R. Moorthy
University of Pisa
Mario Rapaccini
University of Florence

Abstract

This research explores the potential of servitization powered by artificial intelligence as a catalyst for the transition towards a circular economy in the manufacturing sector. Using the Sustainability Transition Theory, the study examines the interplay between technology, organization and society (Geels, 2002), in shaping the transition towards a circular economy through AI enabled servitization. The research identifies key barriers that hinder the widespread adoption of circular servitization. Further it explores the transformative role of AI in overcoming these challenges, to move towards a more circular economy. The methodology involves review of relevant literature, combined with analysis of selected case studies. This approach allows for a detailed examination of barriers in this context. The early findings reveal the immense potential of AI powered services in optimizing resource utilization, in extending product lifecycles and facilitating closed-loop practices. These practices are fundamental to the circular economy, as they promote the reuse and recycling of resources and therefore reducing waste and environmental impact. This research contributes to the understanding of the complex dynamics involved in transition towards a circular economy. It also provides insights for policymakers, practitioners and researchers, offering guidance for decision making in this field.

Keywords: Circular economy, servitization, AI, manufacturing, sustainability transition theory.

Introduction

The need for sustainable manufacturing has propelled the exploration of innovative business models, such as servitization (Kolagar, Parida & Sjödin, 2024; Sjödin, Parida & Kohtamäki, 2023). Servitization, which shifts focus from selling products to providing integrated product-service solutions (Minaya, Avella & Trespalacios, 2024), can align closely with circular economy principles (Atif, 2023) by potentially extending product life cycles, optimising resource use and reducing waste. This alignment creates a powerful synergy: circular servitization. While AI holds immense potential to drive this transition towards a more circular and service oriented manufacturing sector, its practical implementation is fraught with challenges (Sjödin, Kamalaldin, Parida & Islam, 2023). This research looks into the intricate interplay between AI, servitization and the broader socio-technical system to understand the barriers hindering the adoption of circular servitization in manufacturing and explore the role of AI in overcoming them.

Theoretical Framework

Sustainability Transition Theory (STT) (Smith, Voß & Grin, 2010; Markard, Raven & Truffer, 2012) provides a robust lens for analyzing the multi level dynamics of the transition towards a circular economy. By focusing on the interplay between niches (emerging AI-enabled servitization practices), regimes (dominant manufacturing practices and business models) and landscapes (broader socio-technical context), this research aims to identify the key barriers hindering the widespread adoption(Geels, 2002) of circular servitization and explore the role of AI in overcoming these challenges.

Research Objectives

This study aims to:

- Identify key barriers hindering the implementation of AI-powered servitization for circular economy practices in manufacturing.
- Explore the role of AI in overcoming these barriers.
- Develop an understanding of the transition pathways towards circular servitization in the manufacturing sector

Methodology

In this study a mixed-methods approach will be used with emphasis on secondary research, combining:

1. Literature → Review → To → synthesise existing knowledge on circular economy, servitization, AI and sustainability transitions.
2. Case Studies: To explore the experiences of manufacturers implementing AI-powered servitization strategies.
3. Expert Interviews: Depending on availability and feasibility, insights may be gathered from industry practitioners, academics and other experts.

(Preliminary) Findings

1. Barriers to Circular Servitization: Technological limitations, organisational inertia, lack of consumer awareness and regulatory hurdles are significant barriers.
2. AI as an Enabler: AI can address these barriers through advanced analytics, automation and decision support. For eg. AI-powered predictive maintenance can extend product lifecycles, while AI-

driven supply chain optimization can reduce waste and improve resource efficiency.

3. Transition Pathways: Successful implementation of AI-powered servitization requires a combination of technological advancements, organisational change and supportive policies.

Implications and Contributions

This research contributes to the field by:

1. Identifying key barriers and enablers for circular servitization in manufacturing.
2. Demonstrating the potential of AI to overcome these barriers and drive the transition towards a circular economy.
3. Providing insights for policymakers, practitioners and researchers to develop effective strategies for promoting circular servitization.

By understanding the complex interplay between technology, organisation and society, this research aims to inform the development of policies, business models and technological solutions that accelerate the transition to a circular economy.

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Parallel Session 6

Service Innovation in Diverse Industries

Co-Chairs: Ferran Vendrell-Herrero & David Lehman

Service Innovation in the hospitality – time to infuse service thinking

Prof Dr Shaun West

Lucerne University of Applied Sciences and Arts, Lucerne, Switzerland

Prof Dr Nicole Hinrichs

EHL Hospitality Business School, Lausanne, Switzerland

Abstract

This study investigates the importance of shifting from a service-oriented mindset to a hospitality-infused approach in the hospitality industry. Using a snowball approach, we explore service infusion, service-dominant logic, and service design as frameworks to enhance customer experiences. Service infusion integrates comprehensive services into core offerings, significantly boosting customer satisfaction and operational efficiency. Service-dominant logic emphasises value co-creation with customers, fostering personalised experiences over standardised services. Service design aligns closely with service-dominant logic by incorporating human-centred, iterative improvements that enhance overall service quality and sustainability. This approach ensures hospitality providers can offer satisfying experiences, thus maintaining a competitive edge in a rapidly evolving market.

Keywords: Service Innovation, Customer Experience, Service-Dominant Logic, Service Design, Hospitality Industry.

Introduction

Our motivation for this study was the observation that today, much of the hospitality industry operates under the misconception that it primarily offers a "range of services" rather than a comprehensive "service experience". This fragmented mindset often results in poorly executed attempts to engage with customers throughout their journey, leading to forced and superficial relationships. A shift towards an experience infusion and a holistic mindset is essential for fostering genuine customer engagement and driving service innovation within the industry. To understand the aspects of experience infusion within the context of hospitality, we have used a snowball approach to gain insights into the problems that have been observed, first considering experience infusion and then searching for examples of service innovation; we then move to Service-Dominant logic as a way of understanding value co-creation and finally evaluate the use of Service Design as an improvement and innovation tool to support the infusion of service thinking.

Service infusion with hospitality

Experience infusion, which integrates comprehensive services into the core offerings of hospitality businesses, is crucial for innovation and customer satisfaction. Bilgihan and Nejad (2015) emphasise that innovation in hospitality generally involves technological advancements and incorporating services that enhance the overall guest experience. Similarly, Chen, Kerr, Chou and Ang (2017) highlight the importance of business co-creation for service innovation, suggesting that engaging customers in the design and delivery of services leads to more personalised and satisfying experiences. This approach aligns with Can, Kiliçalp and Akyürek (2024) findings, which underscore the role of service innovation and employee engagement in fostering creativity and continuous improvement in service delivery. While assessing prior studies, Tajeddini, Gamage, Tajdini, Hameed and Tajeddini (2024) explore service design, emphasising the need for a balanced approach to innovation that leverages exploration and exploitation activities.

Kandampully, Bilgihan, van Riel and Sharma (2023) argue for a holistic, experience-oriented approach to service innovation, where value is co-created with customers and society. This perspective is supported by Hoang, Luu, Nguyen, Tang and Pham (2024), who discuss how entrepreneurial leadership and market-sensing capabilities can drive service innovation in hospitality firms. Yang, Luu and Qian (2021) emphasise the importance of dual-focused transformational leadership in fostering service innovation, highlighting the need for leaders who can balance customer- and employee-oriented initiatives.

Victorino, Verma, Plaschka and Dev (2005) highlight that service innovation directly influences customer choices, underlining the importance of continuous improvement and adaptation in service offerings to meet customer expectations. Kim and So (2023) note that understanding the evolution of service failure (i.e. failure to meet customer expectations) and recovery is integral to maintaining customer trust and satisfaction. Knowledge-sharing, often supported by technicality, can facilitate a human-centred approach to service innovation and support achieving outcomes (Kumar, Mamgain, Pasumarti and Singh, 2024; Molina-Castillo , Meroño-Cerdán, Lopez-Nicolas and Fernandez-Espinar (2023).

Impact of Service Innovation

Service innovation in the hospitality industry refers to developing and implementing new or improved services, processes, and experiences that enhance customer satisfaction, operational efficiency, and competitive advantage. Table 1 provides (examples from the literature) on service innovation within the hospitality industry. Many technological innovations do not directly impact the customer experience and may, in fact, negatively impact the experience aspects. Some support 'back office' automation tasks and contribute to service experience rather than driving operational efficiency alone. Nevertheless, the examples suggest we require a different lens when considering hospitability, where service infusion can be increased with the expected outcome of improved customer experience.

Aspect	Example	Description	References
Technology integration	Mobile check-in/check-out	Many hotels now offer mobile apps that allow guests to check in and check out using their smartphones, bypassing the front desk.	Hung et al., 2021
	Smart room technology	Integration of IoT devices that control lighting, temperature, and entertainment systems through voice commands or mobile apps.	Prayag & Ozanne, 2018
	Chatbots and AI	AI-powered chatbots provide instant customer service, answer queries, and assist with bookings.	Tussyadiah & Park, 2018
Personali-zation	Customized experiences	Using data analytics to offer personalized recommendations for dining, activities, and amenities based on guest preferences and past behaviors.	Berezina et al., 2019
	Loyalty programs	Advanced loyalty programs that offer personalized rewards and recognition to frequent guests.	Xie & Chen, 2019
Sustainability initiatives	Eco-friendly practices	Implementation of green practices such as energy-efficient lighting, water-saving fixtures, and waste reduction programs.	Kang et al., 2018
	Sustainable sourcing	Using locally sourced, organic, and sustainable products in hotel restaurants and amenities.	Font et al., 2021
Enhanced guest experience	Unique amenities	Offering unique and memorable amenities such as themed rooms, virtual reality experiences, or wellness programs.	Ali et al., 2017
	Experience design	Creating immersive and interactive experiences for guests, such as cooking classes, cultural tours, or adventure activities.	Tanford et al., 2020

Aspect	Example	Description	References
Operational efficiency	Automated services	Automation of routine tasks like housekeeping scheduling, inventory management, and maintenance requests.	Kim & Qu, 2017
	Robotics	Use of robots for tasks such as room service delivery, luggage handling, and cleaning.	Murphy et al., 2017
Safety and health innovations	Enhanced cleaning protocols	Adoption of advanced cleaning technologies and protocols to ensure guest safety and hygiene.	Jiang & Wen, 2020
	Contactless services	Increased use of contactless payment systems and services to reduce physical interactions.	Kim et al., 2021
Collabora-tions and partnerships	Local partnerships	Collaborating with local businesses to offer exclusive experiences and services to guests.	Sigala, 2019
	Cross-industry innovations	Partnering with tech companies, transportation services, and other industries to enhance the overall guest experience.	Gössling et al., 2019

Table 1. Examples of service innovation in hospitality.

Service-Dominant Logic in Hospitality as a framing for service innovation

Service-dominant logic emphasises co-creating value through provider-consumer interactions, yet hospitality often needs help due to standardised services and technology. Font, English, Gkritzali and Tian (2021) argue that engaging customers in service design better meets their needs, but technology can hinder this process, limiting meaningful interactions (Shin & Perdue, 2022). Ahn, Back, Barišić and Lee (2020) show that SDL in resorts leads to higher satisfaction. However, many prioritise uniform services over personalised experiences, stifling creativity and reducing guest participation (Bhat & Sharma, 2021; Gallarza, Gil-Saura and Arteaga-Moreno, 2023).

This reliance on technology-driven standardisation underscores the challenge of balancing efficiency with personalised, co-created experiences (Scarlett, Reksoprawiro, Amelia & Wibowo, 2022).

Service Design to support innovation within the hospitality

Service design supports the design and continued improvement of the services, helping to provide an engaging experience for all the actors in the process and aligning closely with the theory of Service-Dominant Logic (Vink, Edvardsson, Wetter-Edman & Tronvoll, 2019). Service design also emphasises a human-centred approach, incorporating iterative testing and feedback (Stickdorn, Hormess, Lawrence & Schneider, 2018). Chen and Chen (2022) highlight how sustainable practices address environmental concerns with environmentally conscious guests, aligning services with their values. This alignment enhances the overall guest experience, fostering loyalty and positive word-of-mouth.

Tai, Wang and Luo (2021) explore how technology-driven innovations, such as AI-powered chatbots and automation, improve efficiency, while human-related innovations focus on personalised service and emotional connections. Considering affordances in tourism service design enables hospitality providers to intuitively meet customer needs, leading to higher satisfaction, delight, and loyalty (Tomej & Xiang, 2020).

Closing

Applying service-dominant logic in hospitality reveals a critical tension between the benefits of technology-driven efficiency and the need for personalised, co-created experiences. While technological innovation streamlines operations, it often hinders meaningful guest interactions, limiting value co-creation. Hospitality providers must balance integrating technological innovations and maintaining personalised service and guest engagement, which is essential for unique and satisfying experiences. Integrating a service mindset into operations is necessary for sustainable value co-creation and effective response to service failures.

Shifting from a service-oriented mindset to an experience-infused approach fosters genuine customer engagement and drives innovation. Service infusion, which integrates comprehensive services into core offerings, enhances customer satisfaction and operational efficiency. Service Design offers an approach to both service innovation and employee engagement in continuous improvement, leading to more personalised and satisfying experiences. The experience-oriented approach to service innovation aligns closely with Service-Dominant Logic. Understanding service failure and recovery and integrating automated support and knowledge-sharing behaviours are crucial for customer trust and satisfaction.

Leaders can infuse service thinking in hospitality firms by applying service design and helping to build upon the theoretical frame provided by service-dominant logic, underpinned by service innovation grounded in service design.

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Exploring Digital Servitization Through a Practice-Approach: Insights from Two Automotive Leaders

Camila Favoretto, Guilherme Sales Smania, Glauco Henrique de Sousa Mendes

Federal University of São Carlos, São

Abstract

This study examines digital servitization (DS) using the practice approach. As organizational change materializes in practices; this approach (mainly, strategy-as-practice) provides an interesting lens for examining the DS strategy, their practices, and outcomes. To achieve this, the study draws on data from two world-leading automotive companies that have embarked on successful and distinct digital servitization strategies. The study examines the management practices adopted by each case company to perform, realize, and evolve the DS as it happens. The findings underscore motivations driving the DS and the practices shaping it across three levels (strategies and offerings, organizational, and network). The study advances the literature by uncovering the practices that shapes the DS strategy, demonstrating how management practices allow for different nuances in both DS strategies. For practitioners, this study enhances awareness of the DS journey by elucidating organizational practices that can influence this journey.

Keywords: Digital servitization, Transformational process, Strategy-as-practice, Product company.

Introduction

Digital servitization (DS) is understood as the convergence of servitization and digitalization, resulting in the provision of product-service-software systems supported by digital capabilities, digitalized processes, and digital assets (Frank, Mendes, Ayala & Ghezzi, 2019; Favoretto, Mendes, Oliveira, Cauchick-Miguel & Coreynen, 2022). Despite its widespread use, many product companies still struggle to implement DS. For example, DS creates tensions and paradoxes (Smania, Osiro, Ayala, Coreynen & Mendes, 2024). Secondly, DS requires product companies to integrate new external resources and capabilities (Sjödin, Liljeborg & Mutter, 2024). Lastly, although DS is portrayed as straightforward, it emerges as an iterative, emergent process supported by various combinations of practices (Palo, Åkesson & Löfberg, 2019; Kohtamäki, Rabetino, Einola, Parida & Patel, 2021). In this context, servitization scholars have embraced the practice turn by exploring different types of practices shaping DS strategy (e.g., Palo et al., 2019; Kohtamäki et al., 2021). Indeed, the strategy-as-practice (SAP) provides an interesting lens for examining DS strategy, its practices, and outcomes (Jarzabkowski & Spee, 2009; Kohtamäki et al., 2021), since DS strategy does not follow a linear design and implementation process but rather emerges incrementally through ever-changing practices. While studies have identified different types of DS strategies to create value (e.g., Coreynen, Matthyssens & van Bockhaven, 2017; Kohtamäki, Parida, Oghazi, Gebauer & Baines, 2019), the practices shaping DS strategies have received limited attention so far (Favoretto et al., 2022).

In light of this scenario, this article aims to delve into the realm of DS strategy by analyzing its practices. While SAP studies zoom in on the accomplishment of strategy, Nicolini (2009) also suggests zooming out in analysis to capture essential points rather than finer details of a phenomenon. Thus, we focus on the management practices carried out by organizational actors that realize and evolve the DS strategy. Specifically, we concentrate on practices that support product companies in their transition toward DS. Inspired by the practice approach, we argue that DS can be understood as bundles of practices (sequences of actions) that shape organizational life and culminate in different types of strategies. Although SAP addresses micro-practices and spotlights practitioners' work, we choose to look at the macro picture of DS strategy, akin to other practice-oriented studies (e.g., Mason & Spring, 2011; Palo et al., 2019).

Research methodology

We conducted in-depth qualitative case studies in two globally leading companies in the automotive industry that have implemented distinct types of DS strategies and management practices. Data were gathered through semi-structured interviews with key represents from different organizational levels from both companies. In addition, secondary data were collected through documents provided by informants and publicly available materials.

Content analysis techniques were employed to analyze the data using the NVivo Plus 11 software. First, a within-case analysis was performed to configure their DS strategies and practices. Second, a cross-case analysis was carried out to uncover patterns and differences related to their practices.

Findings

The study examines two companies implementing distinct DS strategies. While Company A focuses on delivering business intelligence through product-service software systems, Company B emphasizes delivering enhanced customer experiences via new business models like mobility services, data-driven services, and platforms. Both companies face challenges in implementing DS strategies, influenced by management practices shaping these strategies and supporting organizational change. The findings highlight that intentional narratives play a crucial role in legitimizing both DS strategies with stakeholders and guiding practitioners during the DS transition. Organizational practices such as restructuring, fostering a digital mindset, and legitimizing transformation are critical to DS strategy success. Furthermore, companies implemented management practices to align their digital capabilities with strategic narratives to support the DS transformation effectively. Furthermore, changes in sales, delivery processes, and network structures are crucial for DS, enabling adaptation to complexities and facilitating management of relationships with internal and external actors.

In summary, the study underscores the dynamic and multifaceted nature of DS strategies, emphasizing the importance of management practices in shaping DS strategies.

Theoretical and practical contributions

The contribution of the present study to the servitization literature is threefold. Firstly, it answers the calls to study DS as practice and in practice (Palo et al., 2019; Favoretto et al., 2022). Secondly, it shows that the transition towards DS can follow distinct strategies to create customer value. Specifically, it delves into how management practices instantiate or lead to through the DS strategies that were put in place for the both companies. Lastly, we built upon Palo et al.'s (2019) work and demonstrate how servitized companies can integrate digitalization into their practices to advance toward the complex product-service-software systems, highlighting the nuances of DS strategies (Favoretto et al., 2022; Tronvoll, Sklyar, Sörhammar & Kowalkowski, 2020). For managers, this study outlines the DS strategies and identifies relevant practices that shape them.

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Coopetitive Tensions in the Aerospace Industry

Zsófia Tóth

University of Durham, UK

Carlos Diaz Ruiz

Hanken School of Economics, Finland

Oliver Wirth

Alpine Leadership Centre, Switzerland

Abstract

The study explores coopetitive tensions in aerospace industry servitization with a focus on the perspective of Maintenance, Repair, and Overhaul (MRO) firms. Different forms of coopetitive tensions are identified that manifest through the alliances between MROs and manufacturers. Some of these coopetitive tensions are disruptive, while others are well-managed and support the sharing of technological resources and expertise. A root of coopetitive tensions is that both MROs and manufacturers aim at reaching the same customer base. Drawing on in-depth qualitative interviews with senior managers, the study highlights complex interdependencies that emerge from coopetition. Both benefits (e.g. further improved service offerings) and hinderances (e.g., relational imbalances) are explored in this study. Theoretical contributions are proposed to literature on servitization and tensions. Managerial implications relate to the identification and proactive management of tensions in business relationships with special regards to servitization settings but also in other business-to-business contexts.

Keywords: Servitization, coopetition, tensions, repair.

Introduction

Coopetition, the strategic collaboration between competitors, has influenced approaches to servitization and further business model innovation in the aerospace sector, particularly within Maintenance, Repair, and Overhaul (MRO) service firms and Original Equipment Manufacturers (OEMs). If managed properly, this hybrid strategy allows aerospace firms to balance competition and cooperation to enhance innovation, reduce costs, and maintain market presence. Literature provides more information about coopetition as experienced by manufacturers. However, servitization takes place in networks, and thus, the experiences and navigation approaches of service firms are equally relevant. In the context of aerospace MRO, coopetition typically manifests through alliances between Original Equipment Manufacturers (OEMs) and the suppliers of MROs. These alliances enable the sharing of technological resources, such as repair manuals and spare parts, while they foster operational synergies that can improve service engineering capabilities and streamline maintenance processes.

The cooperative aspects of these relationships are characterized by resource sharing, which includes the sharing of material and immaterial resources, wherein OEMs provide access to intellectual property. In return, MROs offer their overhaul capacities and repair expertise. The competitive dimension, however, arises as both parties vie (at least in part) for the same customer base, each striving to deliver superior service solutions. This dual dynamic leads to complex interdependencies that incite tensions (Raja, Neufang & Frandsen, 2022).

Tensions influence the development of business relationships and overall business performance. Some may arise from conflicting objectives, misalignment of priorities, competing demands, and uncertainties around innovation, including servitization efforts (Burton, Story, Zolkiewski, Raddats, Baines & Medway, 2016).

Certain priorities/goals make sense separately but can also be conflicting when they occur at the same time (Dmitrijeva, Schroeder, Bigdeli & Baines, 2022), for instance, investing into innovative efforts as well as cost-cutting at the same time. The ability to navigate tensions is essential for fostering collaborations, especially in industries like aerospace where long-term business relationships are the norm. Managing tensions may involve either dissolving them at the level of their root causes or embracing them in a proactive manner (Bigdeli, Kapoor, Schroeder & Omidvar, 2021). This applies to coopetitive tensions as well, where companies need to deal with two seemingly conflicting aims: collaboration and competition at the same time.

Besides the challenges, the aerospace industry benefits from coopetitive arrangements in several ways. First, MRO providers gain access to OEM customer bases, expanding their market reach and enabling the cross-selling of services. Second, OEMs can enhance their service offerings through the technical expertise of MROs, that contribute valuable operational insights to product development and service engineering. These partnerships are not without tension, however, as OEMs retain significant control over critical resources, creating an imbalance that may favor the manufacturer. Additionally, coopetition requires the development of specialized capabilities to manage the multifaceted relationships between MROs and OEMs.

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Servitization of Complex Products and Systems (CoPS): Value Creation Wheel and the Role of Late Adopters in Sustainable Fishing and Aquaculture

Sara Jahanmir

Neoma Business School, France

Luis Filipe Lages, Leid Zejnilovic

Nova School of Business and Economics, Portugal

Abstract

Complex products and systems, like satellite systems or telecommunications networks, are critical for shaping industrial dynamics. Due to their interdisciplinarity and complexity, their development and adoption patterns are very different from those of commodity goods. Services that rely upon complex products and systems depend on a network of diverse stakeholders, and aligning their interests and capabilities is a challenging task. Using action case research, we designed, conducted, and then studied the outcomes of the interventions within NextOcean, an initiative focused on advancing ocean monitoring and management through innovative technologies and interdisciplinary research. We propose that innovation meta-frameworks, like the Value Creation Wheel (VCW) and the integration of late adopters can improve the servitization of complex products and systems and contribute to advanced capabilities becoming more sustainable, accessible, flexible, and cost-effective. We also demonstrate how late adopters can contribute to transforming such technologies into service-oriented offerings by providing solutions for removing technical, organizational, and perceptual barriers and thus accelerating the adoption of such services. Our findings contribute to the theory

and practice of innovation, value creation, and servitization of complex products and systems.

Keywords: Complex products and systems, Value Creation Wheel, Late Adopters, Earth Observation, Sustainability.

Introduction

The extant literature recognizes complex products and systems (CoPS) as a unique analytical category characterized by innovation processes that differ from those commonly found in mass-produced goods (Hobday, Rush, & Tidd, 2000), distinct from mass-produced goods (Hobday, 1998). Of particular interest for this study is that CoPS are characterized by long life cycles, lengthy maturation processes, and interdependences of heterogeneous stakeholders that are critical for developing the underlying technologies and the CoPS value appropriation (França, Lakemond & Holmberg, 2023).

In fact, many mass-produced goods would not be possible without CoPS (Mazzucato, 2013). However, to reach the mass adoption stage and unlock positive reinforcement of CoPS development, many heterogeneous stakeholders, including the champions of CoPS use cases, must agree upon shared objectives and reach a stage of internally aligned interests and capabilities for materializing CoPS use cases. As these stakeholders are at different levels of maturity, often substantially lagging behind the market (e.g., government agencies), the adoption of CoPS is a journey over a thorny path.

In this article, we propose that innovation meta-frameworks like Value Creation Wheel (VCW), and the systematic inclusion of late adopters can substantially improve CoPS adoption and their value appropriation. We apply the case action research (Vidgen & Braa, 1997) in the context of Next Ocean, an initiative focused on advancing ocean monitoring and management through innovative technologies and interdisciplinary research. Drawing upon the theoretical lenses of VCW, late adopters, and CoPS, we show that the application of VCW and the inclusion of late adopters enables a better match of CoPS and business value. We argue that the value of this study is not only in demonstrating a specific and important mechanism that enhances the diffusion and value appropriation of CoPS (theory) but also in showing how the approach can be replicated at scale and, at the same time, be technology-agnostic. In practice, this is particularly important for critical infrastructure that is important for society but cannot secure sufficient support from governmental sources to ensure reaching the necessary technological maturity for large-scale commercialization.

NextOcean: Earth Observation Services for Sustainable Aquaculture

The European Union's fishing industry is the fourth largest in the world (Eurostat, 2022). Given its considerable size and economic importance, developing and protecting a sustainable exploitation of aquatic resources should be a priority at a European level. To achieve this goal, the EU has funded NextOcean with over 3 million Euros, a project that uses earth observation (EO) data to address critical issues related to marine environments, including climate change, biodiversity loss, and sustainable resource use. NextOcean tests whether fishing authorities can use earth observation data to better monitor marine resources and whether fishing companies would benefit from this data to prove their sustainability compliance. This data can also be used by aquaculture regulators to assess the impact of fish farms. Finally, NextOcean organizes workshops to include the broader community and inform about earth observation data and related commercial services (European Commission, 2021).

Value Creation Wheel and NextOcean's Servitization

Despite the above-mentioned workshops and events to inform and involve end users, NextOcean's servitization and, thus, commercialization were not promising. Prior research presents various motivations for businesses to servitize, such as new service business model (Spring & Araujo, 2009), product differentiation, new revenue streams (Mathieu, 2001), cost saving, improved service quality (Araujo & Spring, 2006) or high financial performance (Heirati, Leischnig & Henneberg, 2024). Raddats, Baines, Burton, Story and Zolkiewski (2016) conclude that economic motivation and demand-based issues, such as helping customers reduce costs or manage risks are the primary motivations of manufacturers of complex products to servitize. Other studies examine the relationship between servitization and firm's performance (Martín-Peña, Sánchez-López, Kamp & Giménez-Fernández, 2023). Parida and Jovanovic (2022) propose a framework to manage value co-creation when servitizing advanced services in global markets. However, to our knowledge, no study proposes a framework to facilitate successful servitization of complex technologies in global markets.

To fill this gap and to systematically design NextOcean's servitization, this study applies the Value Creation Wheel (VCW) (Lages, 2016), a meta-framework for innovation and problem-solving, to identify the most suited target market for NextOcean services. NextOcean services address four user scenarios: monitoring fishing activities and impact, minimization of bycatch and eco-labeling, monitoring aquaculture impacts and new fish farms. We start the VCW journey by gathering data through 1) ten co-creation workshops of 3 (total of 8 teams, 35 participants from different backgrounds and nationalities); 2) a survey of NextOcean partners to understand the expectations of NextOcean's lead users (von Hippel, 1986); 3) an in-depth qualitative analysis of 153 sites in the field of Earth Observation; and 4) a qualitative competitor analysis of NextOcean. The application of VCW aims to identify critical aquaculture and fishing target markets across the globe to launch NextOcean services. We conducted two business cases per user scenario, resulting in eight business cases, four in aquaculture and four in fishing. To identify the best geographical market for NextOcean services, we apply Multi-Criteria Decision Analysis (MCDA) and the Value Creation Funnel (VCF), crossing the 193 potential target markets with the ranked criteria, leading to the final targets with the highest potential for NextOcean services, namely monitoring fishing activities and impact (France and Japan); minimization of bycatch and ecolabeling (France and Portugal); monitoring aquaculture impacts (Norway and Scotland) and new fish farms (Norway and Spain).

The Unexpected Role of Late Adopters

Developing a servitization strategy for NextOcean provided new insights about the attitude of different adopter categories toward using EO data. Like any innovative service, NextOcean faces resistance from late adopters. Late adopters are the last group of users to adopt an innovation. They are skeptical and resistant to change (Jahanmir & Lages, 2016). Although the project highly benefited from the insights provided by lead users and early adopters, we realize that an adequate servitization of a complex service such as NextOcean requires a clear understanding of late adopters. Despite their slow adoption, late adopters contributed to refinement and optimization of NextOcean as well as identifying opportunities for market expansion. Given their risk-averse nature (Rogers, 2003), late adopters provided insights for risk mitigation resulting in more stable and sustainable service adoption. While lead users provide us with their needs and expectations, late adopters and resistant users were necessary to understand how and in which aspects such services could be adjusted and improved to find higher acceptance in the marketplace and diffuse faster.

Implications and Conclusion

From a complex technology to a market-oriented service, NextOcean provides a single access point to innovate online commercial services for sustainable fisheries and aquaculture. Our study contributes to the theory of servitization of complex services by providing new insights into how the Value Creation Wheel can be applied to better understand the potential of a complex service and thus identify adequate target markets. We also demonstrate the importance of late adopters in servitization and commercialization of such complex services. Our study also contributes to the practice of innovation, servitization, and commercialization by providing managers, business owners, and policymakers with a meta-framework for problem-solving while involving all stakeholders, including late adopters.

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Value Creation in the New Space: Exploring the Potential of Servitization and Platformization Strategies for Satellite Manufacturers

Victoria Krivova, Valentina Zancan, Paolo Trucco

School of Management, Politecnico di Milano

Abstract

The shift from product-centric to platform- and service-centric business models holds transformative potential for the satellite manufacturers. Despite the traditional product-centricity, the New Space context, where most revenue is derived from the downstream market, necessitates satellite manufacturers to explore these paradigms. This study aims to investigate how satellite manufacturers can leverage platformization and servitization strategies to enhance the value created by satellite systems and how the adoption of modularization and standardization practices in satellite design and development processes support the successful implementation of these strategies. Our epistemological approach is based on the review of scientific literature, interviews with space experts, and analysis of secondary data. Empirically, we focus on the European space ecosystem, because of its distinct peculiarities (e.g., regulatory landscape, market dynamics) and access to a rich set of primary and secondary data. This study expands the knowledge on platformization and servitization in complex product systems and transfers it to the satellite industry. Moreover, it contributes to the literature on modularity by connecting it to platformization and servitization, highlighting its role in facilitating these transformative business models. The results are translated into a set of actionable recommendations.

Keywords: Platformization, servitization, complex product systems, satellite systems.

Introduction

The concepts of platformization and servitization have emerged as key strategies for manufacturers to transition from purely product-centric to platform- and service-centric business models (Kanninen, Penttinen, Tinnilä & Kaario, 2017; Lerch, Horvat & Jasny, 2024). This transition is characterised by the progressive shift from selling a standalone product to providing a platform with a set of integrated services that extend beyond traditional after-sale support (e.g., repair and maintenance) to encompass advanced, value-added offerings involving long-term contractual agreements, commitment to cost-reduction, and multi-actor collaborative efforts (Fischer, Gebauer, Gregory, Ren & Fleisch, 2010; Baines & Lightfoot, 2013; Kapoor, Bigdeli, Schroeder & Baines, 2022).

Several companies across different terrestrial sectors have prominently shifted from product-based (e.g., selling cars or jet engines) to platform- and service-based strategies (e.g., providing mobility solutions or engine-hour rentals), thereby adapting to dynamic market demands and competitive pressures (Hein & Rosete, 2022). In contrast, satellite manufacturers, facing a peculiar business landscape (e.g., the inherent inaccessibility of satellites during the operational lifecycle stage, the ongoing transition from B2G to B2B engagements, the industry's traditional mindset rooted in its institutional past) still demonstrate a strong product-centricity despite potential financial, strategic, and marketing benefits of service-oriented frameworks (Raddats, Baines, Burton, Story & Zolkiewsko, 2016; Ulaga & Kowalkovski, 2022). In the New Space context (i.e., commercially-oriented space business paradigm), where up to 90% of revenues are generated in the downstream market

(Euroconsult, 2023; Space Economy Observatory 2023), platformization and servitization paradigms hold a transformative potential for the satellite manufacturers to accommodate heterogeneous demand and evolving needs, aligning with the requirements of the New Space. However, the mere integration of services with existing products is insufficient (Moro, Cauchick-Miguel, de Sousa Mendes & Sousa-Zomer, 2023). To achieve optimal outcomes, it is crucial to integrate a value-centric perspective that considers the value proposition not only for manufacturers but also for the entire network of stakeholders. This necessitates the adoption of a value-driven approach, which forms the foundation for RQ1:

RQ1: How can satellite manufacturers leverage platformization and servitization strategies to enhance the value created by satellite systems?

Furthermore, the current approaches to designing and developing complex mission-specific satellite systems pose a significant challenge for satellite manufacturers to adopt platform- and service-oriented strategies. This necessitates exploring and accommodating design and development practices that mirror the principles of platformization and servitization strategies.For instance, by emphasising flexibility, scalability, and emergence of standards. Modularity is a design concept that has already demonstrated its potential to enable more adaptable architectures and streamlined processes, prompting us to ask the RQ2:

RQ2: How do modularization and standardization practices in satellite system design and development support the implementation of platformization and servitization strategies?

Methodology

This study employs an exploratory qualitative research design, utilizing data collected from primary and secondary sources. For primary data collection, we adopted a multiple case study method. Multiple case studies enable in-depth investigations within real-life contexts, fostering understanding of empirical domains where existing research is scarce and under development (Yin, 1984; Eisenhardt, 1989). The multiple case study employs an organizational level of analysis, while the unit of analysis centres on the value mechanisms of servitization and platformization strategies adopted by satellite manufacturing organizations. We employed semi-structured interviews as the primary method for data collection. This approach was complemented by publicly available documents to enrich the data sample and for data triangulation purposes (Jick, 1979; Eisenhardt, 1989). The selection of cases employed a purposive sampling strategy to maximise learning opportunities (Stake, 1995). Informants were strategically chosen based on their relevant expertise in the thematic areas of interest (Denzin & Lincoln, 2011) and through a snowball sampling technique (Lincoln & Guba, 1985). Interviews were recorded and verbatim transcribed, and inductively coded following Gioia, Thomas, Clark and Chittipeddi (1994). Moving back-and-forth between primary and secondary data (Eisenhardt, 1989), we performed a thematic analysis of the resulting data sample, to identify recurrent themes within the cases (e.g., primary data) and academic records (e.g., secondary data) (Braun & Clarke, 2006).

Findings

The preliminary findings for RQ1 indicate that New Space companies exhibit value streams not observed in traditional satellite business, particularly when compared to the satellite infrastructures procured by institutions in the B2G business. Satellite manufacturers competing in the New Space embrace open architectures within their platform-based and service-oriented solutions. This openness allows for a broad range of stakeholders to contribute knowledge and inputs towards the development of novel satellite systems. However, for a traditional satellite manufacturer, this shift necessitates the exploration of unconventional activities, practices, and processes (Zancan & Trucco, 2023) to effectively transition from monolithic satellite systems to platform-based and service-oriented ones.

The preliminary findings for RQ2 show that the further adoption of modularization and standardization practices in satellite system design and development is needed for the successful implementation of platformization and servitization strategies. Krivova, Trucco and Locatelli (2023) shows that current competence levels among satellite manufacturers in leveraging modularity typically range up to

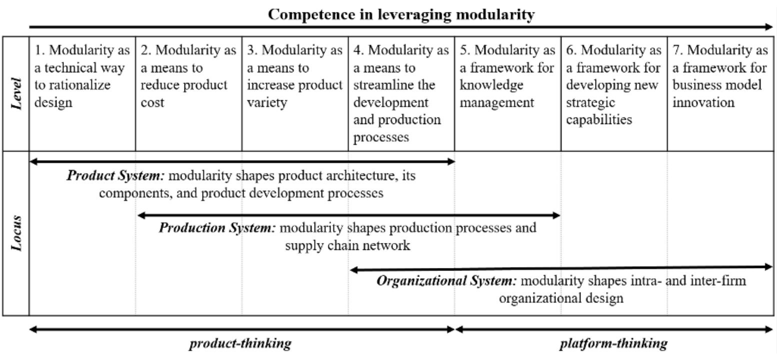

Figure 1. Space Modularity Maturity Model (S3M). The S3M delineates seven levels of maturity in manufacturers' understanding and adoption of modularization and standardization practices, expanding the scope of modularity influence from product to production to organizational systems and business model.

level 4 (Figure 1). However, to fully accommodate platform- and service-oriented paradigms, modularity shall be conceptualized as a foundational framework in the satellite system design and development processes rather than merely a technical solution.

Conclusion

As a result of this study, we conclude that satellite manufacturers must envision the services that will be supported by the respective satellite platforms during the design and development phases. The consideration of modularization and standardization practices becomes paramount, ensuring both the customization required to address the heterogeneous needs of commercial and institutional user bases, and the efficiency of satellite systems development operations. This forward-thinking approach necessitates novel value streams to support the transition towards platformization and servitization strategies.

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Parallel Session 7

Sustainability in Servitization and Digitalization

Co-Chairs: Marco Opazo & Josip Marić

Environmental Sustainability in Product-Service Systems: Analysing the Critical Role of Pricing and Revenue Mechanisms

Nicola Saccani, Laura Scalvini, Federico Adrodegari

University of Brescia

Abstract

The need for sustainable business models is growing as a result of global warming and diminishing natural resources, especially in the manufacturing sector. A possible solution is the Product Service System (PSS), which increases energy efficiency and promotes a circular economy. Nevertheless, there is no assurance that all PSS types will be sustainable, and it is important to additionally consider the possibility of rebound effects. Furthermore, it is frequently challenging for companies to integrate environmental benefits with economic success. Consequently, research on the connection between PSS and environmental sustainability is necessary, particularly from a revenue perspective. In this study, we offer a theoretical framework to examine how PSS's revenue creation strategies mesh with its environmental sustainability benefits. The suggested framework lays out four critical features —PSS categories, revenue structures, pricing mechanisms, and environmental value drivers— and offers configuration choices to realize the alignment between environmental sustainability and PSS offerings. Nevertheless, the findings reveal that environmental drivers, revenue, and price requirements are seldom in sync, which hinders PSS adoption from reaching its full environmental sustainability potential. Moreover, in order to accomplish the alignment, this study investigates novel “pay-per-emission” income models and “emission-based” pricing mechanisms. Finally, it raises managers'

awareness of the need to encourage customers' conscious behavior to get PSS truly sustainable.

Keywords: PSS, environmental sustainability, pricing, pay-per-emission.

Introduction

In recent times, there has been an increasing need for business models that are more environmentally sustainable, driven by worries regarding climate change and the diminishing availability of resources primarily. Many people view Product Service Systems (PSS) as a potential answer, particularly in manufacturing (Yang & Evans, 2019). The effect on sustainability is contingent upon the attributes of the PSS, but existing research on PSS and servitization has frequently seen this connection as implicit and occasionally unintentional (Tukker, 2015). It is important to note that not all PSS types are sustainable, and it is crucial to consider the potential rebound effects as well. Furthermore, research examining the advantageous ecological impacts of PSS focuses on their potential rather than the actualized results (Ries, Beckmann & Wehnert, 2023), and, from a corporate viewpoint, it is frequently challenging to integrate environmental advantages with financial profitability. Hence, this research aims to examine the correlation between PSS (Product-Service Systems) and environmental sustainability, particularly from a pricing perspective, and to comprehend how the methods of value creation, delivery, and capture inherent in a PSS offering can be integrated with factors of environmental sustainability (Roman, Thiry, Muylaert, Ruwet & Maréchal, 2023).

The conceptual framework

Using the integrative review methodology (Torraco, 2005), the authors developed a conceptual framework. The review examines the PSS archetypes, analyses the factors that influence environmental value in servitization and PSS, and explores the revenue and pricing strategies employed in PSS. The obtained conceptual framework enables the analysis of the correlation between PSSs, revenue models, pricing mechanisms, and environmental value drivers. It also facilitates the examination of the relationship between revenue generation methods and environmental value drivers, as well as their consequences for environmental sustainability. The framework, represented by a morphological box (Zwicky, 1967; Ries et al., 2023), categorizes the topic of interest into four main characteristics: PSS types, revenue models, pricing mechanisms, and environmental value drivers. This tool can serve two purposes: as an assessment tool to evaluate the existing alignment of a PSS offering, and as a design tool to determine the most appropriate PSS offering and revenue model to achieve environmental advantages.

The pay-per-emission

This study introduces two more possibilities to the existing choices discussed in the literature: a pay-per-emission revenue model (which falls under the category of pay-per-performance) and an emission-based pricing mechanism, inspired by the principles of carbon pricing. Per-usage-unit pricing systems should incorporate an input or value-based logic to achieve a suitable equilibrium between the provider's costs and the benefits for the customer, while also adopting an emission-based approach in line with environmental value drivers. Pay-per-performance models, specifically, could involve a customer's projected cost being tied to a predetermined target for environmental effects. If there are deviations from this target, a premium or penalty mechanism could be applied. The "pay-per-emission" revenue model sets thus a price that is directly linked to the carbon intensity of the output, enabling the inclusion of environmental externalities, particularly greenhouse gas (GHG) emissions, in a manner similar to a carbon tax. In fact, the carbon tax has resulted in more effective than emission trading schemes (ETSs) in reducing the environmental impact (Green, 2021).

Conclusion

This study lays the groundwork for future research by providing a conceptual framework for understanding how PSS pricing mechanisms and revenue-generating methods relate to the environmental value drivers. The findings indicate that the revenue and pricing factors are seldom in line with the environmental factors, which hinders the full realization of the potential for environmental sustainability in the implementation of PSS. Moreover, this study is proposing the implementation of a novel revenue model and pricing mechanism that specifically and directly accounts for the environmental consequences caused by the PSS. Ultimately, it enhances managers' understanding of the imperative to promote environmentally conscious behaviour among customers for PSS to achieve real sustainability.

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Becoming a Sustainable Enterprise: Practices and Outcomes of Organizational Identity Work During a Strategic Change

Tuomo Lindholm, Tuomas Huikkola, Marko Kohtamäki, Rodrigo Rabetino

University of Vaasa, Finland

Abstract

This paper explores how product manufacturers' transformation is shifting towards a sustainable product-service system, a transformation process previously coined as sustainable servitization. The study examines a single case to understand the strategic evolution of a product manufacturer from products to services and further toward becoming a sustainable enterprise. The study focuses on the organizational identity work conducted by the manufacturer. This study will contribute to servitization literature by providing a detailed understanding based on a longitudinal study involving planned and emergent elements. The study may assist managers in developing routines for managing the organizational identity work in product manufacturing companies.

Keywords: Oganizational identity work, sustainable servitization, sustainable enterprise, sustainable product-service system.

Introduction

Sustainability is becoming a focal issue in developing manufacturing firms' current and future business strategies. Servitization is one of the central business models that may enable manufacturing companies to achieve their sustainability goals by generating more sustainable, smart product-service systems. These systems aim to reduce the environmental impact while realizing the business potential of sustainability initiatives (Kohtamäki, Bhandari, Rabetino & Ranta, 2024).

Servitization is a comprehensive strategic transformation that influences members' current perceptions of organizational identity (Huikkola, Kohtamäki & Ylimäki, 2022; Palo, Åkesson & Löfberg, 2019; Tóth, Sklyar, Kowalkowski, Sörhammar, Tronvoll & Wirths, 2022). Threats to organizational identity initiate organizational identity work in which the organization's members actively change and negotiate their perceptions of organizational identity (Kreiner & Murphy, 2016). A call exists for studies to understand the identity of a sustainable product manufacturer.

The present study addresses the following research question: "*How does organizational identity work shape the content of organizational identity during sustainable servitization and how can organizational identity work be used to support the manufacturing firm's transition toward a sustainable enterprise?*" To address this question, we conducted a single qualitative case study (Gioia, Patvardhan, Hamilton & Corley, 2013) of a product manufacturer undergoing sustainable servitization. The study makes two main contributions to the servitization literature: 1) the study analyzes organizational identity work practices, and 2) describes how organizational identity work may be used to manage sustainable servitization.

Theoretical background

Sustainable Servitization

Servitization is a broad field of research with sub-streams such as servitization business models, digital servitization as well as sustainable servitization (Rabetino, Kohtamäki, Parida & Vendrell-Herrero, 2024). The study examines how manufacturing firms are shifting to sustainable product-service systems, a concept known as sustainable servitization. This term emphasizes the importance of sustainability for manufacturers and the expected transition involving strategy, structures, and organizational identity. Therefore, sustainable servitization refers to the transition process, while sustainable product-service systems refer to the company's related offerings. Servitization can be seen as a central means to achieve the company's sustainability goals, and some early findings to support the interaction between sustainability and servitization for company performance have been proposed (Kohtamäki et al., 2024).

Organizational identity work

Organizational identity describes how members perceive the organization's central, distinctive, and lasting characteristics (Albert & Whetten, 1985; Gioia et al., 2013). It provides a cognitive frame for an organization's activities and guides how they are performed (Nag, Corley & Gioia, 2007), thereby influencing how members interpret and act on issues (Dutton & Dukerich, 1991). For instance, organizational identity affects whether environmental issues are seen as threats or opportunities (Sharma, Pablo & Verdenburg, 1999) and how members collectively construct meanings of their environmental management and protection activities (Chen, 2011).

Organizational identity work is "*activities engaged in by organization members to form, repair, maintain, strengthen, disrupt or otherwise influence understandings of the central, distinctive and enduring characteristics of an organization.*" (Fachin & Langley, 2023, p. 3). Organizational identity work comprises discursive, cognitive, and behavioral processes aimed at interpreting and modifying the identity content (Kreiner, Hollensbe, Sheep, Smith & Kataria, 2015, p. 982; Kreiner & Murphy, 2016, p. 279).

In sustainable servitization, organizational identity work may facilitate balancing different identities and integrating sustainability aspects into the content of organizational identity and the company's offerings.

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Smart Manufacturing, Digital Service Innovation and Company's Sustainability Orientation

Jean Pierre Seclen-Luna

Pontifical Catholic University of Peru

Marta Fernández-Olmos

University of Zaragoza

Abstract

The necessity of sustainable development presents a vital challenge for manufacturing companies that could require a perspective on adopting smart manufacturing and digital service innovation. This study delves into this approach by investigating the effect of smart manufacturing/digital service innovation on environmental expenditures. Using a dataset from the Spanish Survey on Enterprise Strategy in 2018, the Logic method was applied to 813 manufacturing companies. The results show that companies that adopt industrial robots and digital service innovation have positive associations with environmental expenditures. However, when companies implement both strategies in a separate way, they are not associated significantly with environmental expenditures. Thus, this research adds nuances to those relationships.

Theoretical Framework

With the rapid development of digitalization and industrial robots, as the main manifestation of smart manufacturing, are being installed and used on a large scale in major economies around the world. According to the "2023 World Robotics Report" released by the International Federation of Robots (IFR, 2023), the stock and installation number of industrial robots in Spain has experienced a notable growth being one of the 15 largest markets in 2023.

Industrial robots are a crucial technology used in the new generation of the information revolution and the main manifestation of smart manufacturing at this stage. The intelligent and automated features of industrial robots help manufacturers avoid energy use and improve energy efficiency, thus reducing energy consumption (Martinelli, Mina & Moggi, 2021). Furthermore, industrial robots bring many economic benefits to enterprises, such as making modular and personalized products, saving operational costs, optimizing management procedures, reducing production safety accidents, and increasing TFP (Dalenogare, Benitez, Ayala & Frank, 2018), even they are oriented to eco-efficiency (Seclen-Luna, Galera-Zarco & Moya-Fernández, 2024).

These days, scholars and managers have agreed that manufacturing companies should implement sustainability orientation to achieve competitive advantage and long-term viability (Porter & Kramer, 2011). More recently, experts also stated that companies should adopt digital strategies since today's digital era revolves around using new technologies that create value for companies (Parida, Sjödin & Reim, 2019).

Manufacturing companies are increasingly attaching considerable importance to services in the value creation process (Kohtamäki, Baines, Rabetino, Bigdeli, Kowalkowski, Oliva & Parida, 2021). In that sense, manufacturing industries are offering a hybrid offer that contains both products and services (Vendrell-Herrero & Bustinza, 2020) or even digital service innovation (Opazo-Basáez, Vendrell-Herrero, Bustinza & Raddats, 2024). However, companies may struggle to implement technologies independently to address the complex challenges associated with the development of sustainability advantages. Thus, this study focuses on the influence of industrial robots and digital service innovation on a company's environmental orientation (Figure 1).

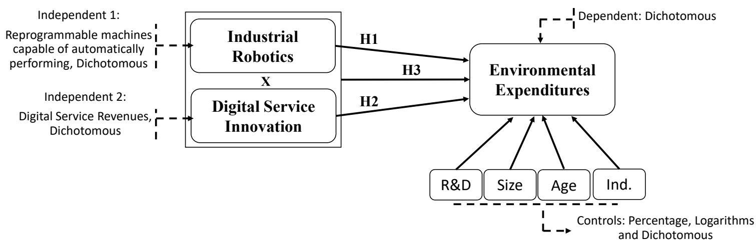

Figure 1. Theoretical Model.

Method

We have used the Spanish Survey on Enterprise Strategy (2018), which has provided all the data at company level. Sustainability orientation is a dichotomous dependent variable that captures the manufacturing company's decision to spend on environmental issues. To advance research on the implementation of smart manufacturing, this study examines industrial robotics, which are reprogrammable machines capable of automatically performing a complex set of actions. Digital service is the second independent variable, here we have used the percentage of digital service revenues divided by the total company revenue in a year. Control variables are the innovative capability that is measured by R&D intensity. Also, size, age, and industry are included in the model. Data selection and depuration has been achieved following a five steps process: 1) Selection of years and industries; 2) Assignment of a unique industry code along the years for each company; 3) Removal of observations without information about robotization; 4) With this process we have obtained a sample of 813 companies in 20 different industries during a two-year period (2017-2018).

Due to the nature of the dependent variable, we have used Logic models to contrast our research hypothesis.

Preliminary Results

	Model 1		Model 2		Model 3	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
High RBI	-0.134	0.499				
Medium RBI			-0.087	0.381		
Low RBI					0.259	0.338
DSI	-0.049	0.171	-0.159	0.176	-0.084	
High RBI*DSI	1.709**	0.817				
Medium RBI*DSI			2.192***	0.663		
Low RBI*DSI					0.854*	0.483
Age	0.159	0.175	0.155	0.176	0.148	0.175
Small Size	-1.437***	0.181	-1.364**	0.185	-1.336***	0.185
Large Size	0.821**	0.377	0.804**	0.382	0.716*	0.382
R&D	0.062*	0.036	0.063*	0.036	0.060*	0.036
Sector activity	YES		YES		YES	
Constant	0.358	0.717	0.357	0.724	0.309	0.722
Number of observations	813		813		813	
LR Chi^2	207.29***		221.95***		210.24***	
Pseudo R2	0.186		0.199		0.189	

Note: RBI: Industrial Robotics, DS: Digital Services.

Table 1. Logit models.

Our results are similar in all models. Our analysis yielded a not significant direct effect for the relationship between smart manufacturing (and digital service innovation) on a company's sustainability orientation, which there is no evidence for our first and second hypothesis. This is in line with previous literature that has suggested that smart manufacturing without sustainability orientation fails to gain performance (Liu, Liu & He, 2023). However, the results support our interaction effect that companies with smart manufacturing and digital services (both together) facilitate making decisions towards sustainability orientation, confirming our third hypothesis. This study offers a contribution to smart manufacturing and sustainability theory. This confirms the necessity to apply the sustainability approach to research on relationships between smart manufacturing and digital service innovation.

On the other hand, R&D, and large companies are significantly associated with the relationships between smart manufacturing, digital service innovation and sustainability orientation, however, age and small companies, it does not.

Concluding Remarks

The present research provides a nuanced understanding of the impact of industrial robots (and digital service innovation) on a company's environmental expenditures. Specifically, when companies implement smart manufacturing and DSI (jointly), they are associated positively with the decision to environmental expenditures. In short, the role of industrial robots seems to be oriented to production processes and not directly associated with sustainability in manufacturing industries (Wang, Wang, Wu & Liu, 2023; Yao, Liu, Fujii & Li, 2024).

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Exploring Digital and Organisational Drivers to Achieve Sustainability through Digital Service innovation: A Comparative Study in Servitized Manufacturers

Carlos Galera Zarco

University College London

Eduardo Sisti, Jose Antonio Campos-Granados

Deusto University

Abstract

The transition towards a more sustainable economy presents significant challenges for manufacturers, which are under increasing pressure to reduce their environmental impact while remaining competitive. Embracing service-oriented business models enabled by new digital technologies offers a promising approach to align business practices with sustainability goals. However, the role of digital service innovation (DSI) in enhancing environmental performance within these organisations remains not sufficiently understood. Moreover, the interplay between digital technologies, organisational practices, and institutional factors in the context of sustainability through DSI has not been thoroughly explored. This study investigates how digital and organisational drivers enable sustainability through DSI in servitized manufacturers. We address two research questions: 1) How do digital technologies, organisational practices, and institutional factors interact to facilitate sustainability via DSI in servitized manufacturing firms? 2) What are the key socio-technical and institutional elements that influence the successful design and implementation of sustainable digital services in these firms?

Through a comparative analysis of two leading manufacturers, we examine how these companies integrate advanced digital

technologies with organisational strategies to improve environmental-economic performance. The study aims to develop a comprehensive framework outlining critical factors for effective DSI deployment with a positive impact on sustainable practices, offering insights for practitioners and academics interested in how DSI can bring environmental-economic benefits in manufacturing.

Keywords: Digital Service Innovation, Servitization, Sustainability, Socio-Technical factors.

Introduction

The imperative to decarbonise the economy by mid-century has led many industrial sectors to pursue growth strategies that minimise resource consumption and, consequently, environmental degradation (e.g., EU Green Deal). Servitization, understood as the shift from product-centric to service-oriented business model, has emerged as a strategic response among manufacturers aiming to align with these sustainability goals (Doni, Corvino, Bianchi Martini & Mazzoni, 2019). DSI is becoming central to this transformation, as it leverages new technological developments to create new or improved services that can enhance environmental performance (Opazo Basáez, Vendrell-Herrero, Bustinza & Raddats, 2024). Indeed, DSI enables manufacturers to offer solutions that reduce resource consumption and optimise processes. Nonetheless, the specific ways in which DSI contributes to enhanced environmental performance in servitized manufacturers remain still unclear.

In this context, advanced digital technologies such as artificial intelligence (AI), the Internet of Things (IoT), Blockchain, or Big Data Analytics provide unprecedented opportunities for manufacturers to develop innovative services with the potential drive both economic and environmental benefits (Yoo, Hendridsson & Lyytinen, 2010; Wamba, Akter, Edwards, Chopin & Gnanzou, 2017). These technologies can enable real-time monitoring, predictive maintenance, and a more efficient resource management, all of which with a potential contribution to service innovation and reduction to the environmental impact of business activities (Lusch & Nambisan, 2015). By integrating these technologies into their service offerings, manufacturers can achieve operational efficiency and create new value-added services with an impact on sustainability (Opazo-Basáez, Monroy-Osorio & Marić, 2024). Therefore, it is widely accepted that these technologies enable innovative services that can benefit both the environment and the business (Lusch & Nambisan, 2015; Opazo-Basáez, Monroy-Osorio et al., 2024).

However, there is a gap in understanding how digital and organisational factors together contribute to sustainability through DSI in manufacturing firms.

An institutional perspective offers a valuable lens to study DSI and transformational phenomena involved, emphasizing how novel digital arrangements and applications gain legitimacy within organizations and industries (Hinings, Gegenhuber, & Greenwood, 2018). Any digital transformation involves not only technological change but also the emergence of new actors, structures, practices, values, and beliefs that interact with existing institutional arrangements (Vial, 2019), and it can be particularly challenging when a digital transformation involve sustainable objectives (Seidel, Recker, & vom Brocke, 2013).

Therefore understanding this interplay is critical in assessing how DSI can facilitate sustainability in servitized manufacturers.

This ongoing research study aims to address these identified gaps by exploring the digital, organisational, and institutional drivers that facilitate sustainability through DSI in servitized manufacturers. First, our study focuses on exploring the dynamic interplay between digital technologies, organisational strategies, and institutional contexts in achieving sustainability through DSI in manufacturing firms that are servitizing. Secondly, we identify the critical socio-technical and institutional factors that are essential for the successful design and implementation of digital services with implications in sustainable practices within these companies.

Methodology

A qualitative approach is identified as the most appropriate to achieve the proposed objectives. Qualitative methods are well-suited for exploring phenomena in depth and capturing the richness of contextual influences (Creswell, 2013). Given our focus on understanding processes and interactions within real-world settings, a comparative case study design is particularly appropriate (Yin, 2018). Therefore, we are conducting a comparative case study of two manufacturers engaged in servitization: company A (machinery manufacturing) and company B (aerospace sector). This comparative case study will enable us to examine the detailed ways these firms integrate advanced digital technologies with innovation under specific organisational strategies that aim to increase their environmental performance. This comparative analysis of cases is valuable for studying a contemporary event within different real-life contexts, especially when, like in our case, the boundaries between the phenomenon and context are not clearly defined (Yin, 2018).

Data collection includes semi-structured interviews with key personnel involved in DSI initiatives and organisational design, analysis of internal documents, and observations of firms' digital platforms and processes.

For data analysis, we are going to employ thematic coding to systematically identify patterns and themes related to digital technologies, organisational practices, and sustainability outcomes (Braun & Clarke, 2006). We will use NVivo software to facilitate the organisation and analysis of qualitative data. A socio-technical perspective will guide our analysis, recognising that technological innovations are deeply intertwined with social and organisational elements (Bostrom & Heinen, 1977). We expect that this approach will enable us to understand how technical and social factors interact to facilitate sustainability through DSI.

Expected outcomes

Although the study is still in progress, we anticipate that our research will reveal significant insights into how the application of digital technologies under the correct organisational settings and institutional contexts collectively contribute to sustainability in servitized manufacturing through DSI. We also expect to identify different socio-technical factors; such as organisational culture, specific capabilities, collaborative processes, and data management practices with the potential to underpin the successful design and deployment of "green" digital services. Additionally, we aim to understand how institutional elements like industry norms, regulations, and stakeholder expectations influence innovation in digital services.

Finally, by integrating these findings, we plan to develop a comprehensive framework that highlights the key factors necessary for effective deployment of digital service innovations aimed at enhancing environmental-economic performance. This framework is expected to provide valuable guidance for practitioners seeking to leverage advanced digital technologies and organisational strategies to achieve benefits while contributing to sustainability goals. Moreover, academically, we expect to enrich the understanding of the complex interplay between DSI, organisational dynamics, and institutional influences in the context of sustainable manufacturing.

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Parallel Session 8

Collaboration, Trust, and Technological Transformation in Servitization Ecosystems

Co-Chairs: Paavo Ritala & Håkon Osland Sandvik

The Glue that Holds Together the Most Complex of Networks: Exploring the Role of Trust in Industrial Service Ecosystems

Timon Urs Knapp, Roman Adamovskyy, Jens Poeppelbuss
Ruhr-Universität Bochum

Abstract

Facing dynamic and diverse market environments, industrial companies build and network of strategic partnerships to enable optimized value creation for their solution offerings. The resulting industrial service ecosystems are complex, multi-actor constructs that are prone to a multitude of tensions. Trust as the key social cohesive power in business relationships remains an underexplored phenomenon in the context of industrial service ecosystems. This paper reacts to several calls for empirical research on the trust dynamics in such contexts by elaborating its underlying mechanisms and the overall effect. Using a qualitative-empirical approach, we conducted an interview study with 20 business representatives from the German mechanical engineering industry and adjacent ecosystem partners. While the process of data analysis is still ongoing, we found a strong perceived influence of trust on relationships within industrial service ecosystems, especially due to the innovativeness of value propositions and the necessity of value co-creation. We identified trust as both an interorganizational and interpersonal issue that spans multiple organizational levels. Based on our findings, we were able to conceptualize trust in industrial service ecosystems as a continuous cycle of trust-building, trust-maintenance and trust-regaining that requires constant adaptation and commitment by all actors.

Keywords: Industrial Service Ecosystems, Servitization, Trust, Networks.

Introduction and Background

In current dynamic market environments, it has become nearly impossible for industrial companies to operate or innovate relying solely on their own resources and competencies (Sklyar, Kowalkowski, Tronvoll & Sörhammar, 2019). In efforts to evolve towards a solution provider, many companies seek to build a network of strategic partnerships that enables the integration of core competencies between different actors for an optimized value creation (Akaka, Vargo & Lusch, 2012). Such industrial networks have long departed from the linear concept of value chains, as they consist of complex interrelations in multi-actor constructs and opaque hierarchies. Therefore, they are commonly referred to as ecosystems, a term derived from natural sciences, and in particular *service ecosystems*. This concept was introduced by Vargo and Lusch to describe "a relatively self- contained, self-adjusting system of resource-integrating actors connected by shared institutional arrangements and mutual value creation through service exchange" (Vargo & Lusch, 2016). Ecosystem actors are connected through various interdependencies, where alignment is essential to increase the ecosystems value creation (Stål, Riumkin & Bengtsson, 2023). The concept remains nascent and most of existing service ecosystems are young and quite brittle (Nuutinen, Valkokari, Halttunen & Palomäki, 2024), especially those containing actors undergoing servitization who experience changes across most of their functions and structures (Moric Milanovic, Bubas & Cvjetkovic, 2022; Peillon, 2021). Most industrial service ecosystems also contain international actors and require complex cross-border collaboration, adding yet another layer of complexity (Kaartemo, Akaka & Vargo, 2017; Akaka, Vargo & Lusch, 2013) and making them prone to a multitude of tensions (McColl-Kennedy, Cheung & Coote, 2020).

Such ever evolving and dynamic industrial service ecosystems rely on social cohesive powers going beyond the formal institutional arrangements identified by Vargo and Lusch. The importance of trust is commonly agreed upon for any lasting and mutually beneficial collaboration (Chai, Li, Tangpong & Clauss, 2020; Gounaris, 2005), yet its influence on multi-actor industrial service ecosystems remains underexplored. Several models conceptualize the antecedents and effects of trust in business relationships or service provision (e.g. Morgan & Hunt, 1994; Mayer, Davis & Schoorman, 1995; Doney & Cannon, 1997). However, a buyer-seller dyad is the predominant perspective on trust (e.g. Srinivasan, Srivastava & Iyer, 2020), which fails to encapsule the complexities of multi-actor industrial relationships. Gansser, Boßow-Thies and Krol (2021) propose the first theoretical model of trust in B2B services yet underline the importance of adopting a multi-actor and cross- cultural perspective as well as understanding the dynamics of trust in future research. The uptake of digital technologies additionally increases the requirements and opportunities for effective trust management (Kowalkowski, Wirtz & Ehret, 2023). Responding to such calls for further research on trust dynamics of industrial service ecosystems (Nuutinen et al., 2024), we ask the research question:

How does trust affect industrial service ecosystems and which mechanisms within the multi-actor collaboration constitute its influence?

We seek not only to elaborate the overall role of trust for industrial service ecosystems but also aim to analyze the mechanisms of how trust in industrial service ecosystems is (re-) established and maintained.

Research Method

In this ongoing research project, we apply an abductive theorizing approach with the use of qualitative interview data. So far, 20 interviews have been conducted with experts from companies that constitute multi-actor networks in the German mechanical engineering sector. This includes selling and purchasing OEMs as well as providers of digital and physical services. The interview-data is coded using the three-step Gioia procedure (Gioia, Corley & Hamilton, 2013). During this process of data analysis, explanations are continuously created and evaluated by contrasting the empirical data with existing models of trust in business relationships, characterizing our research as abductive. Our findings are preliminary but already show a very clear relationship between trust and the success and stability of industrial service ecosystems, while pointing towards a high degree of complexity of trusted partnerships in multi-actor constellations.

Findings and Discussion

In industrial service ecosystems, the proposed value can be co-created only as long as the ecosystem persists (Berthod, Helfen & Sydow, 2018). For it to remain alive, participating actors must follow institutionalized rules (Koskela-Huotari, Edvardsson, Jonas, Sörhammar & Witell, 2016) while also showing flexibility and openness, towards new actors and existing partners. With our study, we were able to identify trust serving simultaneously as the ”glue” and “fuel” for such permanent relationships, necessary for overcoming challenges in the ecosystem and effective as a selling point towards customers. The study by Hurni and Huber (2014) on trust and power in platform ecosystems supports these findings by identifying inter-organizational trust as a pre-condition for the acceptance of interdependent partnerships. While most interviewees identified their relationships as trustful, we found the trust building as complex and both an organizational and individual task, on inter- and intra-organizational levels. The relevance of trust within the company, across functional and hierarchical borders was deemed a key prerequisite for any trustful external relationship as trust is in part an interpersonal issue that is built and maintained by employees in interface positions. The organizational stake in trustful relationships rather includes setting the frameworks for tracking and evaluating of quantifiable requirements, e.g. performance history, market conditions, payment history. Several interviewees considered this particularly important, but the majority recognized a lack of standardized measures for trust in their companies, reducing the assessment of trust often to a very subjective, employee-individual level. There was a broad consensus, however, that service quality is a necessary condition for any type of trust, with poor quality obliterating all prior trust building efforts, underscoring the importance of perceived expertise for trust (Hurni & Huber, 2014). Especially for novel value propositions –as normally the case in servitization– this leaves many ecosystems very brittle and insecure, until the concept and each partner's contribution has "proven" reliable.

Furthermore, our research identified different types of regarding breaches of trust, such as opportunistic behavior of partners –for example in pricing–, misleading information provision, or unreliable operations. These breaches increase mistrust, leading to more strict performance monitoring routines, the deliberate disbandment of the ecosystem or replacement of partners. However, such consequences significantly affect the ecosystem's performance, defining a state of trustful collaboration as the desirable equilibrium in an industrial service ecosystem.

In summary, our preliminary findings suggest a continuous cycle of trust-building, trust- maintenance and trust-regaining that requires constant adaptation and commitment by all actors in a value co-creating industrial service ecosystems. We continue this project by elaborating the trust mechanisms at different interfaces within an exemplary ecosystem and integrating a cross-cultural perspective.

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Servitization-Based Concentric Alliances: R&D Reduces High M&A Integration Costs

Ferran Vendrell-Herrero

University of Edinburgh, UK

Yueling Zhou

Vrije Universiteit Amsterdam, Netherlands

Emanuel Gomes

Nova School of Business and Economics, Portugal

Abstract

This paper examines the intersection of servitization, strategic alliances, and mergers and acquisitions (M&As), with a particular emphasis on how different types of alliances —concentric and horizontal— facilitate the transition from alliances to M&As. The existing servitization literature highlights the importance for manufacturing companies to enhance their service functions through alliances with knowledge-intensive business service (KIBS) firms. However, it remains largely silent on the extent to which these concentric alliances, characteristic of servitization, can be integrated within the company over time. We argue that the costs of internalization will be higher in concentric alliances than in horizontal alliances between manufacturing companies, our reference group, due to the greater costs associated with cross-sector integration. Furthermore, we examine the content of these alliances, focusing exclusively on innovation-based alliances, particularly those centered on R&D or technology transfer. We propose that within concentric alliances, those focused on R&D are more likely to transition into M&As due to their higher level of co-absorptive capacity. These hypotheses are supported by combining alliance and M&A data from SDC Platinum, covering the period

from 2005 to 2021. Our findings have significant scholarly and managerial implications.

Keywords: Concentric alliances, Horizontal alliances, Mergers and Acquisitions, Servitization, R&D.

Introduction

Firms are increasingly adopting servitization —enhancing manufacturing with value-added services— to gain competitive advantages, a trend highlighted by significant growth in recent decades (Cusumano, Kahl & Suarez, 2015; Vendrell-Herrero, Gomes, Bustinza & Mellahi, 2018). While research has explored the benefits of servitization at both firm and industry levels (Suarez, Cusumano & Kahl, 2013), the role of strategic collaborations, such as alliances and mergers and acquisitions (M&As), in amplifying organizational growth through servitization remains underexplored. Previous studies have demonstrated that servitization offers sustainable competitive advantages by reducing procurement costs, minimizing information asymmetries (Lafuente, Vaillant & Vendrell-Herrero, 2017; Visnjic & Van Looy, 2013), and enhancing firms' capabilities to provide tailored product-service solutions (Cusumano et al., 2015). However, the integration of servitization within strategic alliances and M&As has received comparatively less attention (Bustinza, Gomes, Vendrell-Herrero & Baines, 2019; Xing, Liu, Tarba & Cooper, 2017).

Although researchers such as Paiola, Saccani, Perona and Gebauer (2013) and Bustinza et al. (2019) have examined strategic alliances, and others like Xing et al. (2017) and Öberg (2024) have focused on M&As, a comprehensive analysis of the interrelationships between servitization, alliances, and M&As remains lacking. This paper addresses this gap by investigating how servitization influences the transition from strategic alliances to M&As, with a particular focus on comparing concentric alliances —partnerships between manufacturing firms and knowledge-intensive business service (KIBS) companies— and horizontal alliances, which involve collaborations between manufacturing firms. The distinction between concentric and horizontal alliances is important, as previous studies comparing alliances with M&A, did not capture the nuances and specificities of different types of alliance. Additionally, the paper highlights the role of R&D alliances in enhancing co-absorptive capacity (Seo, Edler & Massini, 2022) and reducing internalization costs. This study aims to provide a thorough analysis of how servitization shapes these collaborative growth strategies and facilitates the transition from partners to acquisition targets.

Literature Review and Hypotheses

Concentric vs. Horizontal Alliances and Their Role in Strategic Alliances and M&As

Concentric alliances involve partnerships between manufacturing firms and Knowledge-Intensive Business Service (KIBS) firms, whereas horizontal alliances are strategic partnerships between two manufacturing firms. Concentric alliances are typically more diverse than horizontal alliances, as the partnering firms in concentric arrangements offer different products or services but share similar input or output factors (Bustinza et al., 2019). KIBS firms, by facilitating knowledge transfer, innovation, and growth (e.g., Junni, Sarala, Tarba & Weber, 2015; Amara, Landry & Doloreux, 2009; Muller & Zenker, 2001), enable concentric alliances to potentially add more value and integrate innovative product-service solutions more effectively than horizontal alliances.

Strategic alliances and M&As are critical business decisions, often considered as alternative strategies (Yang, Lin & Peng, 2011). Companies generally choose between forming an alliance or pursuing an acquisition, with limited consideration of the potential interplay between the two. However, recent studies indicate that prior alliances with acquisition targets can significantly benefit the subsequent M&A process and enhance post-acquisition performance (e.g., Al-Laham, Schweizer & Amburgey, 2010; Meschi, Metais & Shimizu, 2018; Porrini, 2004). The improvement in post-acquisition outcomes is attributed to the familiarity, resource exchange, and trust built during the alliance period (e.g., Anand & Khanna, 2000; Kale & Singh, 2009; Puranam, Singh & Chaudhuri, 2009; Rousseau, 1990; Tsang, 1999). Thus, the diverse nature and value-adding potential of concentric alliances, particularly those involving KIBS firms, may play a crucial role in facilitating smoother transitions from alliances to M&As, enhancing overall strategic success.

Servitization and Partner-to-Target Transition

Aligning these findings with the servitization literature, it becomes clear that alliances can effectively transition into M&As and bolster servitization efforts. Servitization involves enhancing a company's capabilities to offer integrated products and services (Vendrell-Herrero, Bustinza, Parry & Georgantzis, 2017). The familiarity and resource exchange established through prior alliances can facilitate this transition, allowing acquirers to more readily assimilate the target’s knowledge and integrate innovative product-service solutions (McCarthy & Aalbers, 2022; Bustinza et al., 2019). Consequently, combining the strengths of both alliances and M&As provides firms with a strategic pathway to sustainable growth, improved competitiveness, and innovation within the servitization process (Xing et al., 2017).

However, the dynamics of different alliance types —such as concentric versus horizontal alliances— can influence the internalization process and the likelihood of transitioning from partners to acquisition targets. Companies often choose acquisitions over alliances when internalizing costs are lower than those associated with intermediate collaborative arrangements (Buckley & Casson, 1976). Concentric alliances, which involve partnerships between manufacturing firms and Knowledge-Intensive Business Service (KIBS) firms, tend to incur higher internalization costs compared to horizontal alliances due to their greater diversity and the complexities of integrating different activities. This increased diversity leads to greater uncertainties and rapid changes in knowledge-intensive industries (Ragozzino & Moscheiri, 2014). For example, emerging technology start-ups may be more inclined to sell at a reasonable price if additional resources are needed for growth (Graebner & Eisenhardt, 2004). Conversely, if a manufacturing company partners with KIBS instead of acquiring them, the KIBS' valuation may rise significantly over time. As a result, concentric alliances are less likely to transition into M&As later on. Based on this analysis, our first hypothesis is as follows:

H1: The likelihood of partner-to-target transition is lower in concentric alliances than in horizontal alliances.

The role of R&D in concentric alliances

In concentric knowledge-based alliances, manufacturing companies that invest heavily in R&D attain a more balanced position in knowledge exchange with their KIBS partners (Bustinza et al., 2019). By continuously developing new, complex products and related services, these companies reduce customer uncertainty and enhance their resilience (Ariu, 2016). R&D activities not only facilitate effective knowledge transfer but also bolster co-absorptive capabilities between the partnering firms (Seo et al., 2022), thereby reducing internalization costs. Specifically, the collaborative nature of R&D activities enables firms to share and integrate advanced knowledge more seamlessly, improving the overall efficiency of the alliance. In contrast, alliances focused solely on technology transfer often face imbalances in knowledge exchange, where one partner may dominate the transfer process, leading to higher costs and reduced integration potential. As a result, R&D-oriented alliances are more likely to evolve into successful integrations compared to those centred solely on technology transfer. Thus, we posit:

H2: Concentric alliances engaged in R&D activities are more likely to acquire their alliance partners due to the reduced integration costs from enhanced co-absorptive capabilities.

Database and preliminary results

Data on strategic alliances and M&A were exported from the SDC Platinum data, covering the period from 2005 to 2021. Using OECD criteria, we selected R&D, and technology transfer alliances, identifying manufacturing and knowledge-intensive companies based on NAICS industry codes. In total, there are 4,646 alliances cases, with 140 transitioning to M&As, resulting in an average transition rate of 3.01%.

We classified alliances into concentric and horizontal types: concentric alliances involve a partnership between a manufacturer and a KIBS firm, while horizontal alliances consist of two manufacturing firms. We further categorized these alliances into relational alliances, which focus primarily on R&D activities, and transactional alliances, which focus on other functions. We then analysed the total number of cases and the partner-to-target transition rates for each type of alliance. Our findings indicate that concentric alliances generally exhibit a lower partner-to-target transition rate compared to horizontal alliances, primarily due to higher internalization costs. However, within concentric alliances, robust R&D activities significantly reduce these internalization costs

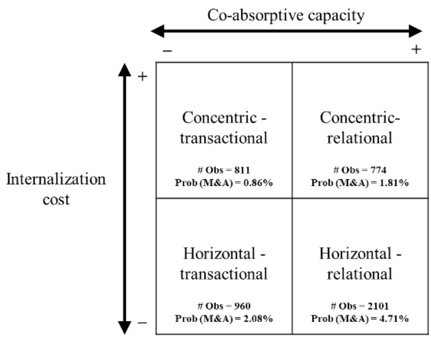

Figure 1. Types of alliances and partner-to-target transition rate.

and enhance the likelihood of transitioning to M&As. This supports our hypotheses, as depicted in Figure 1, which illustrates the types of alliances and their corresponding partner-to-target transition rates.

Conclusion

This study explores the dynamics of concentric versus horizontal alliances in the context of servitization, with a focus on their potential transition to M&As. The results demonstrate that concentric alliances, involving partnerships between manufacturing firms and KIBS, face higher internalization costs, making them less likely to evolve into M&As compared to horizontal alliances between manufacturing firms. Nevertheless, strong R&D activities within concentric alliances can mitigate these costs, thereby increasing the probability of transitioning to M&As.

These insights highlight those strategic alliances featuring R&D are essential for facilitating integration through M&As and for advancing complex product-service solutions that confer competitive advantages. This research contributes to the literature by clarifying the conditions under which alliances transition to M&As and emphasizes the strategic importance of alliance formation. Future studies should investigate the long-term post-acquisition performance outcomes of these transitions to further elucidate the strategic value of different alliance types in the context of servitization.

Acknowledgment

This work was funded by Fundação para a Ciência e a Tecnologia (UIDB/00124/2020, UIDP/00124/2020 and Social Sciences DataLab - PINFRA/22209/2016), POR Lisboa and POR Norte (Social Sciences DataLab, PINFRA/22209/2016)

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R&D Investments and External Collaborations for Smarter Product Development

Esteban Lafuente

School of Business, Costa Rica Institute of Technology (ITCR), Cartago, Costa Rica. E-mail: elafuente@itcr.ac.cr

Yancy Vaillant

Department of Strategy, Entrepreneurship and Innovation, TBS Education, France. Email: y.vaillant@tbs-education.fr

Abstract

In response to the increasing demand for digitally-enhanced connected products, manufacturers are making substantial investments in research and development (R&D) aimed at incorporating smart capabilities, such as remote monitoring, control, optimization, and autonomization. However, the assumption that greater R&D investment directly correlates with smarter product development is challenged by this study. The research explores how smart products function within complex systems of systems, where value creation is interdependent, and unilateral innovation is often ineffective. Findings indicate that for R&D investments to yield significant advancements in smart product development, collaborations with external partners within the value system are essential. Specifically, R&D collaborations focused on research stages, rather than development stages, are shown to be most effective in creating products with enhanced optimization and autonomization capabilities. The study underscores the importance of a coordinated, collaborative approach, especially with research-based partners, to unlock the full potential of smarter products in interconnected ecosystems.

Keywords: Smart Products, R&D Collaborations, Value Systems, Autonomization.

Technology-led Transformation of After-Sales Work Practices – Past, Present and Future Perspectives

Marleen Mühlberger

Glasgow Caledonian University, Glasgow, Scotland

Benjamin Biesinger

University of Hohenheim, Stuttgart, Germany

Shaun West

Lucerne University of Applied Sciences and Arts, Lucerne, Switzerland

Abstract

Technology-led transformation of after-sales work practices has become crucial for enhancing operational efficiency and customer satisfaction in the industrial sector. This study explores the reciprocal and synergistic effects of emerging technologies, such as artificial intelligence (AI) and virtual reality (VR), and new after-sales working practices. Through interviews with industry experts, the study provides insight into the past, present, and future of efficiency enhancement, data-driven decision-making, human-machine collaboration, human-centric interaction design, and predictive after-sales support. The research highlights the gradual integration of AI over the past five years, handling routine tasks and using customer data for predictive maintenance. Today, AI increasingly supports technicians with real-time diagnostics, seamless communication, and customised services through more sophisticated data interfaces. The role of AI is expected to expand, with predictive after-sales assistance becoming standard and AI handling complex tasks, freeing human managers and technicians to focus on more strategic aspects of the aftermarket. The study contributes to the academic discourse on technology integration in aftersales. It provides practical insights for industry professionals to enhance their after-sales strategies and manage the technology-led transformation of after-sales work practices.

Keywords: After-sales, Field services, Artificial intelligence, Human-machine interaction, New working practices.

Introduction

The transformation of working practices in industrial after-sales through emerging technologies, such as artificial intelligence (AI), has become a significant area of research in recent years (Brown & Davis, 2019). According to Fombella, West, Muehlberger, Sautter, Zepf and Harrison (2022), changes in working practices took a significant leap forward during the COVID-19 lockdowns, mainly due to the challenges of working at a customer site and the acceptance of remote working. This topic is gaining traction as organisations strive to improve operational efficiency and customer satisfaction while remaining competitive in a rapidly changing technological landscape (e.g., the launch of ChatGPT in 2023).

While existing literature has provided valuable insights into after-sales management, more needs to be understood about the specific implications and potential synergies between new working practices and emerging technologies in this context. Current literature focuses on either new working practices or technologies such as AI individually rather than exploring their combined effects in industrial after-sales (Wilson & Lee, 2018).

This study aims to address the gap in the literature by examining the nexus of new working practices and emerging technologies in industrial aftersales. It will use a mixed-method approach involving surveys and interviews with organisations operating in the after-sales sector. By doing so, we will explore how integrating new working practices and emerging technologies can enhance after-sales processes, customer experience, and organisational performance.

The findings of this study will contribute to existing knowledge by providing a comprehensive understanding of the reciprocal and synergistic effects of new working practices and emerging technologies in industrial aftersales. The study will shed light on the benefits and challenges of this integration, offering practical insights for organisations to enhance their after-sales management strategies and improve customer satisfaction. Doing so will answer the research question: *what are the impacts of emerging technologies on working practices experienced over the past five years, and what could happen in the next five years?*

Methodology

The methodology employed in this preliminary study to answer the research question was a qualitative approach, explicitly utilising in-depth interviews with industry experts from different sectors, such as automotive, electronics, and consumer goods. Qualitative research allows for a deeper understanding of the subject matter by exploring specific insights and themes through open-ended questions (Miles, Huberman & Saldana, 2014). The interviews were conducted using a semi-structured format, which provided flexibility to explore different aspects of after-sales services. This approach ensured that participants' expertise and experience in the field were effectively captured, providing a diverse and comprehensive perspective on the issue (Denzin & Lincoln, 2011). Participants were selected based on their relevance and knowledge of after-sales services; by including experts from different sectors, the research aimed to gain insights from different perspectives, thereby increasing the validity and reliability of the findings (Patton, 2015). The data collected from the interviews was subjected to thematic analysis (Braun & Clarke, 2006). The thematic analysis involves the systematic identification and organisation of patterns and trends within the data, which helps extract meaningful themes and categories. This analysis facilitated the identification of key patterns and trends in after-sales services and the working practices driven by emerging technologies across different industries.

Preliminary findings from the thematic analysis

Over the past five years, AI has been gradually integrated into after-sales processes to improve efficiency and accuracy (Table 1). Automation tools have been implemented to handle routine tasks such as customer inquiries, troubleshooting, and basic repairs (Smith, 2019a; Smith, 2019b). This period also saw the initial steps towards data-driven decision-making, as companies began to use customer data to predict service needs and improve product reliability.

Currently, the collaboration between humans and AI is more pronounced. AI systems now support technicians by providing real-time diagnostics and repair instructions, significantly reducing the time required for complex repairs. This synergy has reduced manufacturing and service costs and enhanced the accuracy and speed of complaint resolution. Human-machine interfaces have become more sophisticated, enabling seamless communication between customers and service providers. These interfaces allow for proactive maintenance and personalised service experiences, increasing customer satisfaction and loyalty (Miller, Smith & Thompson, 2023).

Theme	Past	Present	Future
Integration and efficiency enhancement (i.e., new ways of working)	Remote work tools (e.g., Teams, Zoom)	AI route planning for service technicians	Paperless working
	Significant increase in mobile working and online meetings. Employees experienced more flexibility in working hours but struggled with the lack of personal interaction.	The system took away a task that the technicians liked to do and affected their 'freedom'. The system was in use for less than a month.	There is a positive outlook on the move towards complete paperless work. However, it requires training to ensure acceptance and effective usage.
Data-driven decision making (i.e., digital twins, automated forecasting)	Automated planning tools	Digital recording and billing	AI in root-cause analysis
	Enhanced transparency and lean processes. Employees appreciated faster, more streamlined processes and resource savings but struggled to build dashboards.	Increased efficiency through digital recording/billing. However, finding the right systems for different business models was problematic.	AI is expected to significantly support and enhance the root-cause analysis, making it more efficient and accurate.
Human-machine collaboration (i.e., proactive prompting, co-working)	Real-time diagnostics (e.g., AI-assisted repair SOPs)	VR glasses for customer communication	Enhanced chatbots to support collaboration
	Technicians benefited from reduced repair times and increased accuracy. However, there were concerns about over-reliance on machines and the impact on traditional problem-solving skills.	VR glasses have helped in communicating with customers and discussing drawings, improving process efficiency.	Improvement in manufacturing costs and reduction in complaints. This will require training and clear guidelines.
Human-centric design of interactions (i.e., chatbots, phone interfaces, HMIs)	Communication interfaces (e.g., electronic data interfaces)	Self-service portals (1)	Self-service portals (2)
	Improved communication and personalised services, increasing customer satisfaction and loyalty. Nonetheless, there were mixed feelings about the reduction in face-to-face interactions and potential isolation.	The move to self-service portals was seen positively, enhancing efficiency and personalisation. However, challenges included resistance from some employee groups.	Collaboration between humans and machines is expected to improve manufacturing costs and reduce complaints. New chatbot assisted interactions across platforms will become more human-centric.

Theme	Past	Present	Future
Predictive after-sales support (i.e., maintenance, planning, tools etc.)	ERP systems for order management	GenAI support for sales functions	AI in purchasing and supplier screening
	ERP systems aided in order intake and maintaining business figures. While this improved efficiency and time to market, it was recognised that further improvements were needed to fully utilise these systems.	GenAI is supporting drafting of routine paperwork for sales documents. Tests are ongoing to reuse exsting unstructured documents. This is seen as positive as it removes 'tedious' tasks.	Essential for effective decision-making and planning. Requires robust systems and skilled personnel. Positive response with an understanding of the need for preparation.

Table 1. Themes identified from the literature and the impact of specific technologies identified from the interviews.

Looking ahead, the role of AI in after-sales services is expected to expand further. AI-driven predictive maintenance will become standard practice, minimising downtime and extending the lifespan of products. Collaboration between humans and AI will evolve, with AI taking on more complex tasks and decision-making, freeing human technicians to focus on more strategic and creative aspects of their work. Electronic data interfaces will become even more integrated, facilitating a fully connected ecosystem where products, service providers, and customers interact continuously (Davis & White, 2024).

Theoretical and Practical Contributions

The findings from the 14 interviews confirm that companies are integrating new working practices and emerging technologies into after-sales services and are now reshaping the industry. Over the past five years, significant changes have been made in automation and data use. The collaboration between humans and AI is currently enhancing efficiency and customer satisfaction. This trend will continue in the future, with AI playing an increasingly central role in predictive maintenance and decision-making and new forms of human-machine interactions providing a more connected and proactive service experience.

The advent of new working practices and emerging technologies creates a paradigm shift in how we approach work, innovate, and interact within organisational structures. Technological change permeates all aspects of tasks, processes, and decision-making, automating and optimising previously human-only tasks managed through hierarchical models to ensure performance and stability. New working practices, characterised by flexibility, collaboration, and digitalisation, depart from traditional hierarchical models towards more agile and adaptable frameworks.

This contribution to the academic discussion is essential for understanding how emerging technologies, particularly AI, reshape traditional after-sales management practices in the industrial sector. Building on existing research and introducing new perspectives, this study aims to enhance the academic discourse on after-sales management. The study will provide theoretical insights and practical recommendations for industry professionals seeking to transform work practices effectively in the era of AI.

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Parallel Session 9

Policy, Governance, and Servitization

Co-Chairs: Paul Matthyssens & Federico Adrodegari

Beyond adaptation: How Governments Shape the Future through Strategic Innovation under Uncertainty

Marin Jovanovic

Copenhagen Business School

Leonardo Santiago

Copenhagen Business School

Vinit Parida

Luleå University of Technology

Nina Steenhard, Anne-Marie Vangsted

Statens Serum Institut

Abstract

Digital transformation compels organizations to continuously reinvent themselves, moving beyond adaptation to proactively shape markets through strategic innovation. While private firms have leveraged strategic innovations to influence market trajectories, governments have traditionally been more risk-averse, favoring incremental changes. However, the COVID-19 pandemic demonstrated that governments can engage in shaping-oriented strategic innovations even under high uncertainty and resource scarcity. This study examines Denmark's proactive response to the COVID-19 pandemic as an in-depth case study of the government-led strategic innovation implementation process. The novel PCR testing solution shaped Denmark's response, rapidly scaling its PCR testing capacity from approximately 3,000 daily tests in March 2020 to over 200,000 by March 2021, while securing supply chain inflow. This study proposes a process-based framework identifying four key phases of this strategic innovation implementation process:

1) Radical Variation—generating novel ideas that challenge existing testing methodologies, mobilizing the steering committee, and synthesizing an alternate model; 2) Idealized Selection—mobilizing stakeholder commitment, developing scalable solutions and associated infrastructure, and synthesizing new capabilities; 3) Replication—scaling infrastructure, coordinating plan execution, and implementing quality assurance processes; and 4) Adaptation—identifying problems, branching out from the original process into an adjusted one, and coordinating adaptation. Our study contributes to the literature by extending the concept of shaping-oriented strategic innovation to the public sector, demonstrating how governments—traditionally seen as reactive and constrained by bureaucracy—can proactively engage in strategic innovation to shape their environments. Second, we provide an evolutionary process perspective that encompasses the stages of radical variation, idealized selection, replication, and adaptation. Third, we highlight the role of external and internal actors in the sensemaking process. Fourth, we offer evidence of how ongoing strategic actions are coordinated using flexible structures like board-like steering committees, as well as the role of digital resources in both scaling services and assisting coordination. We contribute to the existing literature on strategic innovation and offer practical implications for governments seeking to proactively shape future environments.

Keywords: Strategic Innovation, Shaping-Oriented Strategies, Government Innovation, COVID-19, Denmarkntiation, emergent strategies, complementary perspective.

Introduction

Digital transformation requires organizations to reinvent themselves continuously (Johnson, Christensen & Kagermann 2008; Nambisan, Lyytinen, Majchrzak & Song, 2017; Hanelt, Bohnsack, Marz & Antunes Marante, 2021), and they are increasingly recognizing the imperative not only to adapt to existing markets but also to shape them proactively (Patvardhan & Ramachandran, 2020; Rindova & Martins, 2021). While many innovation efforts focus on incremental improvements and reactive strategies within established market boundaries, strategic innovation (Markides, 1997; Tidd & Bessant, 2014) offers guidance and direction on achieving a superior competitive position that often includes shaping the market (Rindova & Martins, 2021).

There are several shaping characteristics of strategic innovations. First, strategic innovation is characterized by *forward-looking agency*, where organizations envision and enact futures that represent significant departures from the past, challenging existing paradigms and altering the status quo (Gavetti & Menon, 2016; Patvardhan & Ramachandran, 2020; Rindova & Courtney, 2020). Second, strategic innovation adopts a *holistic* approach. For instance, by implementing an "innovation basket" portfolio framework, firms could integrate diverse innovation projects aligning each business unit's strategic objectives with the overall firm's strategy (Si, Loch & Kavadias, 2023). Third, it involves *market driving*, where organizations actively shape the market trajectory rather than merely adapting to it, influencing consumer preferences and industry norms (Jaworski, Kohli & Sahay, 2000). Finally, *digital innovation* increasingly plays a pivotal role in strategic innovation, serving as a catalyst that amplifies the scale, speed, and impact of strategic initiatives (Appio, Frattini, Petruzzelli & Neirotti, 2021). The integration of digital technologies enables organizations to create new scalable (platform) business models and platform ecosystems (Ritala & Jovanovic, 2024) that also address the societal challenges (Ritala, 2024), enhance customer experiences (Parise, Guinan &Kafka, 2016), and streamline operations through cyber-physical integration and digital platforms (Jovanovic, Sjödin & Parida, 2022; Moschko, Blazevic & Piller, 2023).

There are various types of strategic innovations through which private firms have shaped markets—including product-driven innovations like smart products (Raff, Wentzel & Obwegeser, 2020), technology-driven innovations exemplified by platform-based models (Gawer & Cusumano, 2014), design-driven innovations (Verganti, 2008; Verganti, Vendraminelli & Iansiti, 2020), process-driven innovations (Piening & Salge, 2015), and business model innovations (Sjödin, Parida, Jovanovic & Visnjic, 2020). However, governments differ significantly from private sector organizations in ways that affect their capacity for strategic innovation, such as higher risk aversion and a tendency toward incremental changes and adaptation rather than market shaping (Christensen & Lægreid, 2007; Gao, Hsu & Li, 2018).

In the context of the unprecedented challenges of the COVID-19 pandemic and high uncertainty (Moon, 2020), governments may respond by either adapting, learning incrementally and managing risks, or shaping, making bold commitments to influence future outcomes, with each approach rooted in different epistemological frameworks (Rindova & Courtney, 2020). Interestingly, governments demonstrated the capacity to engage in shaping-oriented strategic innovations under conditions of high uncertainty and resource scarcity (Phillips, Roehrich & Kapletia, 2023). For instance, this context nudged governments to proactively reshape public health infrastructures by scaling testing capacity through new technologies (Kummitha, 2020), reconfiguring supply chains, collaborating with the private sector to secure scarce resources (Ivanov & Dolgui, 2020; Rowan & Laffey, 2020; Ivanov, 2022), and implementing novel digital systems for data management and coordination (Pan, Cui &Qian, 2020).

These strategic innovations show that governments can leverage effect-driven shaping (Patvardhan & Ramachandran, 2020) to shape public health environments and generate particular effects. However, current literature offers limited insights about means-driven shaping, taking an evolutionary process view of shaping-oriented strategic innovations (Nelson & Winter, 1982). Specifically, the integrated view of the strategy implementation process is less explored, including recognizing the continuous interplay between sensemaking of conceptualizing strategic innovations (often from a top-down, formal perspective) and enacting them (from a bottom-up, adaptive perspective), organizing diverse actors to engage in a sensemaking process, and coordinating ongoing strategic actions (Weiser, Jarzabkowski & Laamanen, 2020). Understanding these practices is crucial for comprehending how governments can shape the environment and markets in their favor to accommodate services for its citizens, specifically under conditions of high uncertainty and resource scarcity (Patvardhan & Ramachandran, 2020; Rindova & Martins, 2021). Against this background, we pose the following research question:

How do governments develop and implement shaping-oriented strategic innovations under high uncertainty and resource scarcity?

This paper addresses this gap by examining Denmark's proactive response to the COVID-19 pandemic as an in-depth case study of government-led strategic innovation implementation. Drawing on 21 interviews with the key stakeholders involved in the government-led steering and crisis committees, 2 workshops with the government leadership, and crisis committees and 163 pages of steering committee meeting minutes, the study analyzed the internal processes and strategic decisions that enabled Denmark to develop strategic innovation in form of novel PCR testing solution and rapidly scale its testing capacity from approximately 3,000 daily PCR tests in March 2020 to over 200,000 daily tests by March 2021, while securing supply chain inflow. The study proposes a process-based framework identifying four key phases of this strategic innovation implementation process: 1) Radical Variation—generating novel ideas that challenge existing testing methodologies, mobilizing steering committee, and synthesizing an alternate model;

2) Idealized Selection—mobilizing stakeholder commitment, developing a scalable solution and associated infrastructure, and synthesizing new capabilities; 3) Replication—scaling the physical and digital infrastructure, coordinating plan execution, and implementing quality assurance process; and 4) Adaptation—identifying problems, branching out from the original process into an adjusted one, and coordinating adaptation.

Our study offers insights into the internal strategy-making processes of governments, highlighting how they can develop and implement shaping-oriented strategic innovations under conditions of high uncertainty. First, we extend the concept of shaping-oriented strategic innovation to the public sector, demonstrating how governments —traditionally seen as reactive and constrained by bureaucracy— can proactively engage in strategic innovation to shape their environments. Second, we provide an evolutionary process perspective that includes the stages of radical variation, idealized selection, replication, and adaptation. Third, we present the role of external and internal actors in the sensemaking process. Fourth, we offer evidence of how ongoing strategic actions are coordinated using flexible structures like board-like steering committees, as well as the role of digital resources in both scaling services and assisting coordination.

The remainder of the paper is structured as follows. In Section 2, we review the relevant literature on shaping-oriented strategic innovations in the digital age, government-led strategic innovation under high uncertainty, and the process view on strategic innovation implementation. Section 3 outlines our research methodology. In Section 4, we present our findings on Denmark's process of scaling novel testing solutions during COVID-19. Section 5 discusses the implications of our findings for theory and practice.

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Knowledge Sharing Dynamics and Expectations: Unravelling the Social Impact of Firms

Gonçalo Cordeiro de Sousa, Emanuel Gomes
Nova School of Business and Economics
Ferran Vendrell-Herrero
University of Edinburgh Business School

Abstract

In today's business environment, firms are increasingly driven to address global challenges and improve environmental sustainability. This study delves into how firms can enhance their sustainability performance through external collaboration and radical innovation, with a focus on Portuguese manufacturing SMEs. By applying principles from management and innovation literature and the circular economy, the research explores how extending these principles to intangible assets like knowledge can impact sustainability.

The study utilized a longitudinal approach and a two-stage least squares methodology to analyse data from 1,081 Portuguese SMEs. It found that external collaboration, particularly with customers and users, significantly boosts firms' environmental sustainability performance when paired with radical innovation. Building on the concept of 'democratizing innovation' developed by Von Hippel (2006), this research introduces the concept of the "circularity of ideas," which underscores the dual benefits of innovation: driving business success and supporting environmental stability.

The analysis suggests that less restrictive appropriability regimes —strategies and mechanisms used to protect intellectual property— enhance access to external knowledge and facilitate radical innovation. Such regimes allow firms to draw more effectively from

external knowledge sources and return these innovations to society through sustainable practices.

Integrating theories from open innovation (e.g., Laursen & Salter, 2014) and hybrid organizations (e.g., Liu, Xing, Vendrell-Herrero & Bustinza, 2024), the study highlights how firms can leverage external knowledge for private innovation and then use this innovation to achieve societal outcomes. The model presented includes boundary conditions to clarify how collaborations succeed: one stream relies on signalling conditions, while the other uses self-selection conditions. These conditions mirror the dynamics of circular economy systems, where knowledge and resources are continuously cycled and shared.

The research emphasizes that firms with less restrictive appropriability regimes are more open to sharing knowledge and resources, fostering greater innovation (Wang, Wang & Mardani, 2023). In hybrid organizations that balance internal performance with sustainability, firms that achieve higher productivity through radical innovation are better positioned to embrace sustainability practices.

The study's contributions are threefold. First, it addresses gaps in research on firm-level factors influencing sustainable engagement and links open innovation with hybrid organization literature through the concept of circularity of ideas. Second, it responds to calls for exploring the relationship between appropriability regimes and openness, suggesting that less restrictive regimes benefit firms by facilitating access to external knowledge. Third, it proposes that firms showing heightened productivity from radical innovation are more likely to adopt sustainability practices (Adams, Jeanrenaud, Bessant, Denyer & Overy, 2016).

The longitudinal analysis tracks the effects of co-creation, appropriability regimes, and radical innovation on sustainability performance across three periods. This method enables a detailed examination of how these factors interact over time.

Addressing the United Nations' Sustainable Development Goals, the study underscores the importance of integrating environmental and societal considerations into business strategies. It extends the circular economy analogy developed by Stahel (2016) to intangible knowledge generation, asserting that collaborative arrangements between private companies and public or third-sector entities drive ground-breaking innovations. The perception of openness and mutual sharing is crucial for fostering innovation and sustainable practices.

Restrictive appropriability regimes, on the other hand, hinder the sharing of resources and knowledge, limiting innovation. Firms that are less inclined to protect their intellectual property aggressively are better positioned to capitalize on collaborative opportunities and pursue new innovations.

The study highlights that a sustainable society requires alignment between businesses' internal operations and broader societal goals. Innovations resulting from interorganizational collaborations not only enhance firm-level competitiveness but also benefit the entire economic ecosystem and society. Firms that achieve higher productivity through radical innovation are more likely to engage in sustainability practices, suggesting that focusing on internal productivity can support broader societal benefits.

In conclusion, the study advocates for embracing the principles of the circular economy, where knowledge and resources acquired through external collaborations contribute to innovation and are returned to society through sustainable practices. This approach optimizes resource utilization, enhances firm performance, and fosters interconnectedness among businesses, stakeholders, and society. Firms are encouraged to maintain openness to external knowledge, signal this openness through less restrictive appropriability regimes, and view innovation outcomes from a broad perspective. By leveraging radical innovation, companies can enhance their reputation and contribute to a more sustainable and interconnected business ecosystem.

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Digital Governance Framework for UK Cross-Border Trade

Mike Brookbanks, Glenn Parry, Carla Bonina

Surrey Business School, University of Surrey, Guildford, UK

Abstract

The 2025 UK Border Strategy sets out a vision for the UK border to be the most effective in the world. Border management presents a multi-organisational governance challenge. Governance refers to the design and/or implementation of rules, processes, and structures to govern not only data and novel technology but also the relationships between a diversity of actors and institutions. This research addresses the question, "how will governance of UK cross-border trade unfold and adapt in the context of recent developments in UK border digital platforms?" A qualitative case study drew on interviewees working in border trade from industry and government, industry/government workshops, meetings and reports. Findings show that recent government policies, international standards, and multistakeholder programmes have established the basis of a framework for change in cross-border operations. The framework underscores the relevance of data standards and interoperability within the digital trade ecosystem. However, we found limited motivation within the current cross-border operations to adopt new technology (DLT/Blockchain and IoT) and change the *status quo*. Current government and industry programmes have limited financial momentum, and historical policy and regulations constrain the perceived value and impact of the current initiatives. The research suggests that the governance of digital cross-border trade may be driven by a collaboration of government and industry if it aligns with cross-border operational resilience and efficiency strategies. In a broader context, trade finance must quantify the current inefficiency of trade operations interactions to affect/drive change within the UKG customs border operations. This work establishes the required coupling of a multi-level governance framework for digital technologies in the context of cross-border trade, operational efficiency and resilience.

Keywords: Governance, Blockchain, Supply Chain, digital transformation.

Exploring the Role of Regional Policy in Territorial Servitization

Timon Urs Knapp, Martin Ebel

Ruhr-Universität Bochum

Bart Kamp

Orkestra – Basque Institute for Competitiveness, Deusto University

Jens Poeppelbuss

Ruhr-Universität Bochum

Lorea Narvaiza, Ciara O'Higgins

Department of Management, Deusto University

Abstract

We aim to understand how regional policy action can affect KIBS-industry relationships and stimulate territorial servitization processes. As empirical evidence on territorial servitization remains scarce and the policy dimension has not been addressed yet, we employ a qualitative-empirical design by comparing two post-industrial regions in Europe, the Basque Country in Spain and the Ruhr Valley in Germany. Our data comprise semi-structured interviews, focus group discussions and analysis of policy documents. We found two types of policy support, which differ in the extent of policy interventions, the target sectors of policy action, and the geographical scope of policy attitudes. Our research aims to shed light on the role of regional policy and intermediaries in territorial servitization processes, proposing a multi-actor view on the transformation. Similarly, we conclude that existing definitions of territorial servitization might be too narrow to explain different outcomes of the transformation.

Keywords: Territorial Servitization, Regional Policy, KIBS, Servitization, Case Study.

Introduction and Background

Economies in post-industrial regions must find new competitive advantages beyond manufacturing, such as Territorial Servitization (TS) (Lafuente, Vaillant & Vendrell-Herrero, 2019). TS can be viewed as a collective or multisectoral concept for the regional development of post-industrial economies. It is defined as the process of involves linking manufacturers and providers of knowledge-intensive business services (KIBS) to create strong regional ecosystems by pooling their complementary core competencies (Lafuente, Vaillant & Vendrell-Herrero, 2017; Vendrell-Herrero, Lafuente & Vaillant, 2020).

Being still a comparatively novel concept in the servitization literature, TS has been studied mainly through aggregate data (Lafuente et al., 2017; Kamp & Ruiz de Apodaca, 2017; Vaillant, Lafuente Korváth & Vendrell-Herrero, 2021). Individual-level studies on the relationships between firms and KIBS providers are limited (Opazo-Basáez, Narvaiza-Cantín & Campos, 2020), and a policy perspective is lacking despite its recognized importance in regional economic transitions (Myro, 2019). Existing studies show synergies between KIBS and industrial companies but do not explain how to foster these relationships or address potential barriers causing their failure. To explain these, we deem it useful to draw from literature on network failures (Mani, 2002; Oxera, 2005). Network failures can occur due to misalignment in logics or revenue models, and these can be exacerbated by barriers or costs (Simon, 1957; Williamson, 1979), especially with intangible goods like KIBS (Kamp, Zabala & Zubiaurre, 2023).

When failures occur systematically between KIBS and industrial companies within limited spatial settings, it hampers TS processes, justifying policy intervention (Gustafsson & Autio, 2006; Block, Keller & Negoita, 2020). Liu, Lattermann, Xing and Dorawa (2019) find that territorial policy support measures are essential to developing cooperation by stimulating interaction (Boix & Vaillant, 2011), e.g., through intermediary organizations (Kenney & Mowery, 2014). While local-for-local or cross-regional policy approaches can be adopted (Kamp & Tözün, 2010), the mechanisms for cooperation remain underexplored (Amancio, de Sousa Mendes, Moralles, Fischer & Sisti, 2022). These mechanisms represent the interplay between the political attitude towards TS (derived from the strategic vision of a regional economic structure), its communication and coordination of implementation through relevant stakeholders. The role of intermediaries, such as associations or local agencies, has also been overlooked in TS literature.

We therefore view regional policy as a planning and orchestrating power in TS and aim to shed light on its role in stimulating TS processes. We identify and compare the implications of two different political attitudes towards TS. Our research question is:

How can regional policy action affect KIBS-industry relationships and stimulate territorial servitization processes?

Research Method

Our study employs a case study approach to examine a complex, multifaceted phenomenon involving multiple actors. We selected European regions experiencing industrial decline and seeking to regain competitive advantage through KIBS growth. The Basque Country and the Ruhr Valley were chosen as our two cases due to their comparable status as postindustrial regions developing KIBS, while they differ concerning policies, processes, and outcomes (Ridder, 2017; Eisenhardt, 2021).

We used secondary data from publicly available policy documents and primary data from interviews with policy actors, KIBS, industrial companies, and business associations, along with focus group discussions on regional economic transformation in each region. This helped us understand stakeholder engagement and policy efficacy.

Our ongoing data analysis follows an abductive approach, comparing empirical data with existing TS theory. Cross-case comparison tables identified similarities and differences between cases (Cloutier & Ravasi, 2020), culminating in a comparative table showcasing the different policies and their features.

Preliminary findings

We observed similar TS settings in both regions but with differing political visions. Local linkages between industry and KIBS providers are weak, e.g., due to industrial self-sufficiency and cultural distance in the Basque Country, and non-territorial partnerships in the Ruhr Valley. Despite these similar settings, the regions have different policy attitudes. Both acknowledge the need for change and the key role of KIBS, but their visions for the economic ecosystem diverge. Thus, we identified two archetypes of policy attitudes toward TS.

The phenomenon we observed in the Basque Country has been defined as *Embedded Territorial Servitization*, which involves political efforts to attract KIBS providers to urban areas and facilitate connections with local industrial actors, thereby internalizing knowledge resources to strengthen the region's industrial economic power. The vision contains a relocation and segregation of KIBS and industry in the region, aiming towards a self-sufficient, resilient local ecosystem. Policy actions are therefore directed towards both the KIBS sector that is intended to grow in the metropolis region as well as the industry that is intended to reestablish itself and potentially even grow in the hinterland. The corresponding politically desired purpose for intermediary actors is also twofold: Create an attractive environment for the settlement of KIBS providers in the metropolis and connect them with the local industrial players, help them tailor their offerings to the local needs, and establish lasting linkages to achieve a tightly woven regional ecosystem.

The policy attitude we found in the Ruhr Valley Valley is better described as *Extended Territorial Servitization*, implies that policy is investing heavily to promote the settlement of KIBS providers, yet not to support the local industrial base but rather to transform the whole region into a knowledge hub comprising several KIBS excellence clusters with a global reach. This does not imply the full disappearance of the industry from the Ruhr Valley, however, the policy action is not specifically directed toward it. It solely concentrates on the KIBS sector, with an explicit focus on innovative KIBS that are intended to form excellence clusters. The corresponding politically desired purpose for intermediary actors is therefore to support KIBS providers in their development and create spaces for partnerships and exchange between them as well as helping them with the global marketing of their services. This represents a different archetype of policy attitude towards TS with the same mission, i.e., creating a resilient economic base, and the same measures, i.e., promoting KIBS settlement, but with a different vision of the future regional economy. Figure 1 shows these differences in detail.

While the academic literature on TS envisions a "renaissance" of local manufacturing (Lombardi, Santini & Vecciolini, 2022), our results show that political visions can differ, influencing the

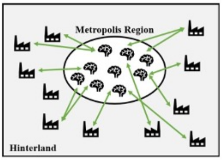
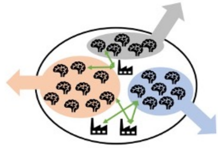
Denomination	Embedded Territorial Servitization	Extended Territorial Servitization
Vision of future economic structure		
Extent of policy intervention	Adjustment-oriented	Transformation-oriented
Sectors envisaging policy measures	KIBS & industry	KIBS only
Geographical scope of policy attitude	Region-bound	Cross-regional

Figure 1. Comparison of Policy Attitudes towards Territorial Servitization.

transformation's outcome. Political actors in both regions confirm the importance of KIBS for TS, aligning with the consensus that KIBS drive TS (Gomes, Bustinza, Tarba, Khan & Ahammad, 2019), but their interplay with local manufacturing is different in both regions. Hence, we suggest to adopt more open and holistic understanding of TS, incorporating policy perspectives and the role of intermediaries. Intermediaries play a vital role in implementing political visions into strategies. We observed various types of KIBS and intermediary organizations, suggesting the need for a differentiated investigation of TS processes.

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Born on a Different Cloud –Forced Coopetition in Cross-Sector Industrial IoT Development Projects

Philipp Majocco, Robert Obermaier
University of Passau

Abstract

The development of Industrial IoT solutions for the automotive industry to enable digital servitization requires that automakers, Internet-technology firms and industrial incumbents join forces and therefore the management of inter-organizational relationships that go beyond dyadic structures. As the automotive industry is en route to digital transformation, multi-sourcing strategies such as forced coopetition, originally from the digital sphere, are now being applied by automotive firms in a cross-sector setting. To better understand forced coopetitive development projects for Industrial IoT, born on a different cloud and raised at the intersection of the digital and industrial spheres, this study focuses on the unfolding tensions at the project level and dynamics that arise at the market level. To address this research need, the study applies exploratory multiple case study research by drawing on an evolving data set, where data was collected through 20 interviews to describe this phenomenon in-depth in its contextual conditions. An institutional logic perspective is applied to uncover where the tensions originate. The preliminary results show that tensions surface due to the divergent institutional logics and the delicate relationship created by forced collaboration. The tensions are then grouped into four categories - performing, belonging, organizing, and learning tensions - to examine how to mitigate the risks of dysfunctional collaboration. The learning tensions between the organizations forced to collaborate are of particular interest, as they could determine the subsequent dynamics at the market level.

Keywords: Digital Servitization, Forced Coopetition, Industrial IoT, Institutional Logics.

Motivation

Digital servitization, characterized as the provision of digital services embedded in physical products, has emerged as a field of interest at the intersection between the digital and industrial spheres (Kohtamäki, Parida, Patel & Gebauer, 2020; Obermaier, 2019; Rabetino, Kohtamäki & Gebauer, 2017; Vendrell-Herrero & Wilson, 2017). According to Ehret and Wirtz (2017) Industrial IoT is key to unlock the value of machines and to provide advanced digital services. To achieve this (future) Industrial IoT operators (Mosch, Majocco & Obermaier, 2023; Rymaszewska, Helo & Gunasekaran, 2017) need to form cross-sector development projects to facilitate digital servitization business models (Kohtamäki, Parida, Oghazi, Gebauer & Baines, 2019).

Leading automotive, Internet-technology and manufacturing firms agree that cross-sector collaborations are a necessity, due to the contextual complexities that "shape the gestalt of digital transformation of an organization" (Fabian, Weck, Hanelt, Firk, Oehmichen & Bhattacharya, 2022, p.3). Contextual complexity includes structural contingencies, which refer to the internal structure, size, and complexity that affect the execution of processes within an organization, and environmental contingencies, which refer to how external pressures affect an organization (Fabian et al., 2022). The automotive industry is particularly affected by external pressures as the environment becomes more competitive and conflicting demands intensify (Smith & Lewis, 2011). Cost pressures, shorter product lifecycles, new market entrants, and stricter emissions regulations are driving automakers into cooperation with direct competitors, a strategy known as coopetition (Brandenburger &

Nalebuff, 1998). Coopetition has established as a viable strategy in order to effectively leverage on complementary resources and to familiarize with new technologies (Bengtsson, Kock, Lundgren-Henriksson & Bäsholm, 2016; Fernandez, Chimbaretto, Chauvet & Engsig, 2021).

As the automotive industry is en route to digital transformation (Hildebrandt, Hanelt, Firk & Kolbe, 2015), automakers are also adopting multi-sourcing strategies from the digital sphere (Bapna, Barua, Mani & Mehra, 2010), such as forced coopetition. Forced coopetition is a construct in which a client organization forces multiple external suppliers to cooperate, even though the suppliers are competitors at the inter-organizational level (Wiener & Saunders, 2014). In this sense, the initiating automaker is "cherry picking" by forcibly coupling the cloud expertise of the Internet-technology firms with the shop-floor expertise of the industrial incumbents, although both offer their own Industrial IoT solutions. The reasons of the automakers to form such a complex construct are rooted in the aforementioned environmental contingencies and outcome uncertainties (Majocco, Mosch & Obermaier, 2024). The industrial incumbents and Internet-technology firms are initially compelled to participate by the lucrative contract sizes, e.g. Volkswagen announced to invest $131 billion in electrification and digital development until 2028 (Taylor, 2023) and may later be able to benefit from changing market dynamics (Mosch et al., 2023). The resulting cross-sector development projects blur previously established organizational boundaries, industries, and markets, and provide an opportunity to examine the following research questions through the lens of institutional logics:

1. *What are the potential tensions and pitfalls associated with forced coopetitive dynamics, and how can organizations mitigate the risks of dysfunctional collaboration?*

2. *What dynamics are evolving in the Industrial IoT market through the initiation of forced coopetition development projects?*

Institutional theory explains how the actions of organizations are shaped by what is perceived as proper, rational, and necessary (Tolbert, David & Sine, 2011). Institutional logics underpin the objectives and values of an organization and influence how the organization operates internally and presents itself externally (Thornton & Ocasio, 2008). When organizations share the same institutional logics, "a shared worldview ensures that actors can interpret resource integration opportunities coherently and come together quickly" (Lusch & Nambisan, 2015, p. 165). In contrast, a forced coopetition construct with divergent institutional logics within creates a situation of institutional complexity that can hinder the intended collaboration (Greenwood, Raynard, Kodeih, Micelotta & Loundsbury, 2011). An institutional logic perspective thus provides a possible means of understanding the conditions under which organizations contribute to a common goal as well as the tensions and dynamics that arise in the process.

Methodology

Exploratory case study research is particularly suitable for investigating organizational settings with heterogeneous actor structures. It has emerged as the preferred approach to understand and describe a contemporary phenomenon, such as forced coopetition development projects, in-depth in its contextual conditions (Yin, 2018). Moreover, multiple case study research offers the possibility of enhanced theory building and generalizability of findings compared to single case research (Eisenhardt & Graebner, 2007).

Preliminary findings

Cross-sector Industrial IoT development projects to enable digital servitization provide a dynamic context at the intersection of the digital and industrial spheres to examine how organizations reframe known approaches such as coopetition (Bengtsson et al., 2016; Gernsheimer, Kanbach & Gast, 2021), navigate the conflicting tensions at the project level (Raza-Ullah, 2020) and manage the dynamics at the market level.

The preliminary results show that tensions between the digital and industrial spheres arise due to incompatible prescriptions from divergent institutional logics (Greenwood et al., 2011). The industrial sphere is organized by a linear and sequential logic, based upon a modular architecture (Lusch & Nambisan, 2015), while the digital sphere is organized by a non-linear and reconfigurable logic, based on a layered architecture (Hildebrandt et al., 2015). According to Smith and Lewis (2011) tensions that arise between the contradictory poles can be divided into four categories: performing, belonging, organizing, and learning tensions. The future course of this study is to examine how the categorized tensions unfold in a forced cross-sector collaboration construct and how organizations can mitigate the risks of dysfunctional collaboration. In line with previous studies the data show forced cooperative development projects create a rupture in each organization, increasing the decoupling between the project's temporal and corporate horizons (d'Armagnac, Geraudel & Salvetat, 2019). In this context, the learning tensions are of particular interest, as the domain knowledge acquired can later be used to exploit power imbalances and gain market share, as neither of the two suppliers can currently provide seemingly sufficient Industrial IoT solutions for the automotive firms.

Therefore, the preliminary findings suggest that forced coopetition development projects foster innovation in the short term (project level), but have a potentially far-reaching impact on market dynamics, especially in the industrial sphere, due to the inherent competitive and destructive nature of coopetition.

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Parallel Session 10

Collaboration, Technology, and Strategic Pitfalls in Servitization

Co-Chairs: Zsófia Tóth & Chris Raddats

Pre-Digitalization as Foundation for Solution Delivery of AI in Servitization

Jasmin Singh

Doctorate Candidate, Fraunhofer IMW

Heiko Gebauer

Professor, Fraunhofer IMW, Linköping University and University of St.Gallen.

Abstract

Artificial Intelligence (AI) is a prominent topic in contemporary discourse, presenting novel opportunities for both - how we do things and what we do -, leading to the emergence of new ideas. In the current era, AI represents the culmination of the digital transformation journey. This journey can be delineated into three primary phases: digitization, digitalization, and digital transformation, with an intermediary phase termed pre-digitalization. These phases elucidate the progression and necessity of transitioning data from analog to digitized forms, ensuring its alignment and harmonization to facilitate analytics, and ultimately enabling AI. This paper develops a conceptual framework, which has been refined and applied through a single case study comprising four subcases. The paper demonstrates the relevance of these four phases in structuring the pathway for AI solution delivery.

Keywords: 3D's, 4D's, digitization, digitalization, digital transformation, pre-digitalization, AI, Customer Analytics.

Artificial intelligence (AI) as part of the modern digitalization journey is changing the way companies conduct business. It sparks new ideas and as a result has the potential to change operations and business models, even further it expands to new strategic opportunities and completely new business models. But the digitalization journey consists of more than AI, in fact AI can be considered the peak of it. As the name suggests, the digitalization journey can be viewed in phases, we call them the 3D's and rely on previous work about data analytic capabilities (Kokkinou, van Kollenburg, Mandemakers, Hopstaken & Elderen, 2023) and data conscious firms (Saarikko, Westergren & Blomquist, 2020).

The 3D's is a holistic view of the steps within our age of time in becoming a digital economy and society. Although digitization, giving the process of converting analog information into a digital format its name, is not relevant anymore in this day and age, it is a crucial initial step in getting to the next milestone of digitalization. We build on our previous work that the conversion of analog to digital information is not enough to start digitalization. Digitalization is described as the part in which digitized data is being made sense of. This is when data cleanliness starts to play an important role as unclean data can lead to inaccurate analyses, inefficient processes, and obstacles in transformation. In the paper we therefore argue the 3D's miss an important step we call pre-digitalization, which is the part were data is being made fit for purpose, not just digitized but clean, harmonized and organized enhancing the framework to 4D's. Only by completing this phase digitalization and digital transformation can be approached successfully. AI being a part of both digitalization and digital transformation requires the same approach. Especially with AI being considered a catalyst for change, enabling businesses to automate processes, enhance customer experiences, and create new business models. In the context of our case study in which we focus on customer data, specifically customer master data, it is relevant for customer analytics and AI.

Customer analytics and AI tools are relevant to enhance the customer experience. Tools shed light to customer satisfaction by assisting to comprehend customer behavior, inclinations and driving factors with the help of various analysis methods. Methods such as sentiment analysis, cluster analysis or churn analysis, just to name a few. These analysis methods and AI algorithms that might evolve out of the insights gained require data. The integrity of the data is paramount, as comprehensive data is essential for generating any meaningful insights. As suggested by Eisenhardt (1989) we focus on a single case study with four sub-cases for application and framework refinement.

The case company is currently seeking to implement AI driven tools. Simple tools such as call priority routing of high importance customers, but also more complex cases such as tailored marketing material on the company's landing page, automated e-mail support or customer-based sales forecasts. The first case requires customer records being properly segmented and tagged for importance and relevant phone numbers in the company's records for identification. The second case requires the customers purchasing history and marketing material tailored to the products and product combinations purchased, which again can be generated by AI by analyzing buying patterns across the entire customer base. The third case, probably the most known to the broader population, is a generative AI tool, that needs to be trained on historical customer service data. Lastly, customer-based sales forecasts will change the way the case company plans targets and budgets and is only a fruitful tool with fully aligned customer and product master data.

Applying the prerequisites to the 4D framework requires initial digitization of data. For the first case, this involves digital customer records segmented by importance. The second case involves digitized order and delivery history, the third includes emails (essentially digitized letters) and transcribed past phone calls, and the fourth comprises digitized customer master data, product master data, and purchasing data. The next phase is pre-digitalization, which involves comprehensive setup of customer data. For the first case, this means assigning a single customer ID per customer and segmenting them based on key performance indicators (KPIs) applicable across the entire company. For the second case, order and delivery history should be organized into customer record trees that include all addresses associated with each customer. The third case requires that transcribed phone calls, emails, and relevant documents from past customer service interactions trace back to the initial problem. Finally, similar to the first case, the fourth case requires comprehensively organized customer, product, and sales data. Only after completing these steps can digitalization (the third D) and digital transformation (the fourth D) begin. This involves implementing the AI cases, achieving digitalization, and subsequently adjusting the company's operating model to facilitate digital transformation.

These subcases are predicated on clean and comprehensive data that is not merely digitized (i.e., digitally available) but also organized, enriched, and aligned. Emphasizing master data in establishing the necessary foundation addresses most complexities in transactional data for the majority of companies. However, processes must be adapted, leading to a shift in parts of the business operating model from human to machine interaction. This paper seeks to contribute to the discourse on digital transformation from a data readiness perspective by presenting a framework termed the 4D's. This framework delineates the essential steps required to achieve digital transformation and integrate modern tools and technologies. By following the 4D's, a company can undergo digital transformation and excel through innovative practices. In the context of customer analytics and AI, this transformation results not only in primary benefits such as increased customer satisfaction and retention but also in secondary benefits such as cost savings, process optimization, and a redefined workforce focus. By freeing up time and creating space for new ideas, the workforce can engage in more innovative and strategic activities.

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Nokia's Failure of Becoming a Software Company: Identifying Strategic Traps Impeding Learning

Tuomas Huikkola, Marko Kohtamäki

University of Vaasa, Finland

Abstract

Nokia, formerly the world's leading smartphone manufacturer was forced to exercise a colossal business transformation by selling its mobile phones to Microsoft in 2013. This rich and longitudinal historical case study (1992-2013) of Nokia Mobile Phones' (later on just Nokia) rise and fall shows how Nokia was unable to exercise strategic transformation from products to software and services. The present study offers complementary explanation for a colossal business failure by adopting the perspective of the theory of the firm and analyzing the strategic learning against the identity, power, capability, and transaction-cost lenses. The study contributes to the strategic learning and dynamic capability literatures by unfolding the lack of learning capability to shape firm's identity, capabilities, power position, and efficiency logic. First, the study analyzes Nokia through the theory of the firm when everything went incredibly well (1992-2002), when markets stagnated (2002-2006) and when everything collapsed (2007-2013). Second, we present evidence and discuss the role of strategic learning in firm boundary theories and highlight the importance of strategic learning in adjusting the firm boundaries in changing market circumstances. Third, this study identifies three common traps that can impede strategic learning, namely 1) success trap, 2) pioneer and cognition trap, and 3) structural trap. For managers, this rich single case study provides practical suggestions on how to avoid falling into common business traps.

Keywords: Strategic learning; dynamic capabilities; success trap; strategic renewal.

Introduction

This study investigates Nokia from the theory of the firm perspective (identity, power, capability, efficiency) by analyzing Nokia's historical boundary changes between 1992 and 2013, and particularly those capabilities that were missing when Nokia failed to adapt to the technological changes in the smart phone era. Strategic learning capabilities, as suggested by previous studies, could generate dynamic capabilities that enable rapid adjustment of firm boundaries. The present study intends to investigate the interplay between firm boundary adjustments and strategic learning capabilities.

Previous research on Nokia's downfall in smartphone markets has provided various explanations. For instance, Vuori and Huy (2016) found out that Nokia was led by fear that hindered innovation and renewal. Laamanen, Lamberg and Vaara (2016) analyzed that both Nokia's early success and later failure could be traced to same factors, namely firm-endogenous factors (e.g., strategic leadership, capabilities, organizational design) and firm-exogenous factors (e.g., the environment such as government and public policies). Lamberg, Lubinaité, Ojala and Tikkanen (2019) found out that Nokia worsened its situation in new smartphone era by making several badly timed decisions regarding operating systems. Doz and Wilson (2017) pointed out that establishment of matrix structure in 2004 was a single most important decision for a firm's later downfall. Recently, Vuori and Huy (2022) studied strategic decision making at Nokia's board and found out that decision-making used to be authoritarian, confrontative and defensive when Jorma Ollila operated as Nokia's chair. Risto Siilasmaa considered that Nokia's top management in both board and executive levels lacked in-depth software understanding, leading to unrealistic management expectations and constant handset delays.

The present study focuses on Nokia's boundary changes when it started to create and dominate mobile phone markets (1992-1998), when competition especially from Asia stiffened in mobile phone markets after millenium (1998-2006), when new US-based software companies, namely Apple and Google disrupted the smartphone ecosystems remarkably (2006-2010), and when Nokia made its last maneuvers to change its course until eventually divesting its phone business to Microsoft (2010-2013).

This study has three major contributions to the strategic learning and dynamic capability research. First, the study analyzes Nokia's boundary changes in high-velocity sector when everything went incredibly well (1992-2002), when markets stagnated (2002-2006) and when everything collapsed (2007-2013). Nokia's boundary changes were based on firm's initial strengths, they were aligned, and decisions followed logical patterns that addressed exogenous changes. As the second contribution, we present evidence and discuss the role of strategic learning in firm boundary adjustments. The case demonstrates the importance of strategic learning in adjusting the firm boundaries to address constantly changing market conditions, suggesting the importance of strategic learning and dynamic capabilities for the theory of the firm. As the third contribution, this study identifies three common traps that can be hazardous for strategic learning, namely 1) success trap, 2) pioneer and cognition trap, and 3) structural trap.

Theoretical background

This paper contains two main literature streams: Firm boundaries and strategic learning. This paper contributes to the intersection of these literature streams and increasing our understanding of boundary changes required to transform from products to software & services.

Firm Boundaries and strategic learning

Firm boundaries refer to simultaneous use of synergetic, complementary, and interdependent lenses to study how managers make decisions to reposition in the markets (Santos & Eisenhardt, 2005; 2009). In addition to reconsideration of which activities are performed in-house (hierarchical structure), which ones to buy outside (market structure), and which activities to do in collaboration (collaborative structure), repositioning includes simultaneous alteration of identity (who are we and want to become?), position (where are we and where do we want to go?), and capabilities (what do we have and what do we want to have?) Managing repositioning successfully, firm needs to pay attention to their interplay (Huikkola, Rabetino, Kohtamäki & Gebauer, 2020). Firm boundary theories typically include four major theories: organizational identity theory, industrial organization (power) theory, transaction cost theory, and capability theory.

Strategic learning and dynamic capabilities are related to firm's ability to sense new market opportunities (e.g., scanning new technologies and interpreting environment), seize opportunities (e.g., ability to make decisions which opportunities to capture and reject), and realign capabilities to address external changes (e.g., creating new competences (Danneels, 2011).

Firm's failure to learn strategically

This study has four major contributions to the strategic learning/ dynamic capability and firm boundary literatures. First, the study contributes to the existing boundary literature by analyzing Nokia from different theoretical lenses when everything went incredibly well (1992-2002), when markets stagnated (2002-2006) and when everything collapsed (2007-2013). Nokia's boundary changes were aligned and followed logical patterns that addressed exogenous changes. The second major contribution is to extant strategic learning and dynamic capability research. The case demonstrates the relevance of strategic learning in regenerating the firm boundaries to address constantly changing market conditions. As a third contribution, this study identifies three common traps that can be troublesome for product manufacturers pursuing service strategies, namely 1) success trap (financial success in products may hinder success in services), 2) pioneer and cognition trap (being first in services in not always the winning strategy), and 3) structural trap (existing capabilities may become decayed as the markets evolve towards service-logic). Fourth, the study suggests that longitudinal historical case studies can advance strategy research and theory development, and is underutilized in the extant strategic learning research. Figure 1 illustrates key boundary changes at Nokia.

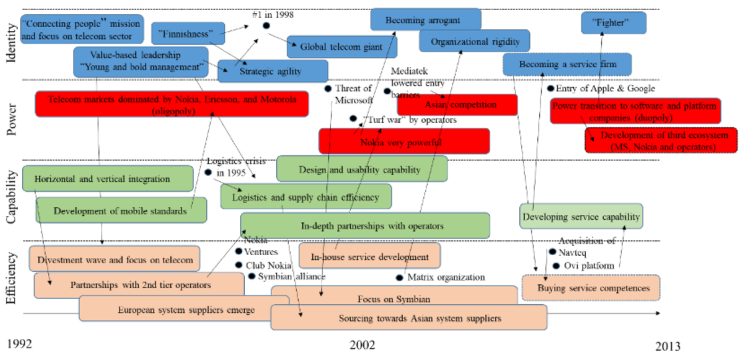

Figure 1. Overview of Nokia's boundary changes.

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Exploring Socio-Economic Networks Characteristics in the Virtual Sports Market: A Systematic Review

Francisco von Hafe

Value for Health CoLAB, Lisbon, Portugal

Comprehensive Health Research Center, Nova Medical School, Nova University of Lisbon, Lisbon, Portugal

Salomé Azevedo

Value for Health CoLAB, Lisbon, Portugal

Comprehensive Health Research Center, Nova Medical School, Nova University of Lisbon, Lisbon, Portugal

CEG-IST, Instituto Superior Técnico, University of Lisbon, Lisbon, Portugal

Liliana Freitas

Value for Health CoLAB, Lisbon, Portugal

CEG-IST, Instituto Superior Técnico, University of Lisbon, Lisbon, Portugal

Hélder Cação, Guilherme Viveiros

dotmoovs, Braga, Portugal

Ana Rita Londral

Value for Health CoLAB, Lisbon, Portugal

Comprehensive Health Research Center, Nova Medical School, Nova University of Lisbon, Lisbon, Portugal

Abstract

The advancements in wearable devices, blockchain, virtual, and augmented reality have given rise to the sports market's digital transformation leading to the emergence of the virtual sports market. Understanding the composition of this market, namely, its participants and their relationships, can provide insights into how the market might evolve and facilitate the effective development and implementation of virtual sports solutions. However, to the knowledge of the authors, a consolidated study of the participants and their relationships within the virtual sports market is lacking. This study

aims to systematically understand the socio-economic networks within the virtual sports market by identifying the participants and their roles, characterising their interactions, exploring the goals driving their participation, and assessing the benefits and costs associated with their participation. Preliminary findings from the analysis of these articles suggest that participation in virtual sports positively impacts socialisation, as users must cooperate or compete with others. Second, increased motivation was reported by users, including older adults, university students, and patients with spinal cord injuries. Finally, users experienced improvements in physical and mental health. Overall, these results enhance our understanding of socio-economic networks, providing insights for developers to design and implement more engaging and beneficial virtual sports solutions.

Keywords: Virtual Sports; Socio-economic networks; Market analysis; Systematic Review.

Introduction

The advancements in wearable devices, blockchain, virtual, and augmented reality have given rise to the sports market's digital transformation leading to the emergence of the virtual sports market (Lopez-Barreiro, Alvarez-Sabucedo, Garcia-Soidan & Santos-Gago, 2022; Migliore, 2021). Virtual sport combines physical activity with cutting-edge technology, offering innovative ways for individuals to engage in sports, improve health, and foster social connections (Davenport, 2014; Xiao, Hedman, Tan, Tan, Lim, Clemmensen et al., 2017).

Understanding the composition of this market, namely its participants and their relationships can provide insights into how the market might evolve and how participants might respond to changes (Nelson, 2013). Additionally, defining the interactions among market participants can help in understanding market dynamics and how participants' behaviours are influenced by others (Jackson, 2011). Economists commonly use socio-economic networks to study market composition (Rauch & Hamilton, 2001) as they allow the study and mapping of participant relationships (Hambrick, 2019). These networks have been used to study different markets, for example, to understand stakeholder dynamics, how innovations are diffused, how individuals get employed, or how products are distributed (Beaman, 2016; Fouad & Rego, 2024; Peng, Dickson, Scelles, Grix & Brannagan, 2020; Varela, Rotundo, Ausloos & Carrete, 2015).

In the context of the recent virtual sports market, a comprehensive understanding of these socio-economic networks can facilitate the effective development and implementation of virtual sports solutions. Despite the importance of this understanding, to the knowledge of the authors, a consolidated study of the participants and their relationships within the virtual sports market is lacking. So, this study aims to systematically understand the socio-economic networks within the virtual sports market by identifying the participants and their roles, characterising their interactions, exploring the goals driving their participation, and assessing the benefits and costs associated with their participation. Accordingly, four research questions that guided this systematic literature were defined (Table 1).

Research Question	Objective
Who are the participants that characterise the virtual sports market?	Identifying the participants that make up the socio-economic network structure of the virtual sports market
What type of interactions occur between participants within the virtual sports market?	Understanding the dynamics between participants of the virtual sports market, including the flow of information, resources, and influence
What incentives drive participation in the virtual sports market?	Understanding why participants choose to participate in the socio-economic network
What benefits and costs result from participating in the virtual sports market?	Understanding the benefits and costs of participation in the socio-economic network

Table 1. Research questions.

Methods

A systematic literature review was conducted entailing three stages: article identification and screening, data extraction and analysis, and quality assessment. For article identification and screening, the following key blocks of terms that lead to the selection of the keywords to be searched were defined: "Socio-economic networks" and "Virtual Sport". PubMed, IEEE Xplore, Web of Science, and Scopus were the chosen databases for article searching. A manual search was also conducted to supplement the initial search.

Then, for data extraction and analysis, the reason for implementing the virtual sports solution, its goal and description were collected based on the framework proposed by Hoffman (2020). Moreover, the following items were extracted from the articles: participants, their roles, interactions (classified following Thompson colleagues (1991)), goals, and the benefits and costs of participation.

Preliminary Results

Preliminary results include ten studies. Two focused on existing home solutions (Kaos, Rhodes, Hämäläinen & Graham, 2019; Westmattelmann, Grotenhermen, Sprenger, Rand & Schewe, 2021). Five introduced new solutions developed by the authors, including exergames to encourage social interaction between the elderly and their relatives through physical movement (Cornejo, Hernández, Favela, Tentori & Ochoa, 2012; Cornejo, Hernández, Tentori & Favela, 2014), one to support the rehabilitation of patients with spinal cord injury (Enciso, Vairya, Velasco, Sunthonlap, Pebdani, de Leon et al., 2020) and one to promote exercise in older adults (Shah, Karlsen, Solberg & Hameed, 2023). Three implemented existing virtual sports solutions, Wii FitU (Chao, Musanti, Zha & Katigbak, 2018), Nintendo Wii (Millington, 2015), and Kinect exergames (Xu, Li, Pham, Salmon & Theng, 2016), the first in a community centre and the other two in nursing homes.

So far the obtained results suggest: 1) participants and role: a diverse range of users, including older adults, university students, patients with spinal cord injuries, and professional and amateur cyclists but also the involvement of the developers and implementers of the solution and multiple experts from healthcare professionals to human-computer interaction experts in the development of the solution; 2) participants' ties: studies highlight the importance of competition and cooperation among users and between users and their family members to be able to play the game, and the role of the community centre and nursing home staff in facilitating virtual sports activities; 3) participants' goals: a study focusing on amateurs vs. professional cyclists shows that while amateurs' primary goal to participate was to obtain health-related benefits, professionals participate due to road safety enabled by the virtual sports' solution of cycling at home. In another study, we found that physiotherapists were motivated to participate in the design of a solution to help find innovative ways to maintain engagement in physical activities for elderly patients, while the nursing home staff's goal was to promote the elders' physical, social, emotional, and spiritual wellness; 4) participants' benefits and costs: for older adults, the benefits of virtual sports include enhanced enjoyment, improved social interactions, and better physical and mental health. However, potential costs, such as injuries and frustration due to low physical and media literacy, have been noted. For nursing home staff unfamiliar with new technologies, implementing virtual sports may increase their workload. For professional and amateur cyclists, virtual sports provide a safe and varied training environment. While professionals face challenges like the risk of cheating and psychological pressure from constant comparison, amateurs benefit from health improvement and social engagement opportunities.

Expected contribution

The obtained results from this systematic review are expected to deepen our understanding of the virtual sports market. Additionally, developers may find the obtained results useful to design and implement more engaging and beneficial virtual sports solutions.

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Learning Process of B2B CoPS Manufacturer's Orchestration Knowledge and Capabilities

Valeriia Skliarenko*, Giorgio Locatelli, Jacopo Manotti

School of Management, Politecnico di Milano

Abstract

Manufacturers are shifting from traditional supply chains to more flexible forms of organising such as platforms and ecosystems. Most of the literature about platforms and ecosystems is in the settings of business to consumers (B2C). Yet, there is a growing interest in studying platforms and ecosystems in business to businesses setting (B2B). In B2B setting the existing knowledge is mostly focused on digital platforms development in B2C settings and governance of already existing ecosystems. Focusing on complex product and systems (CoPS) manufacturers and drawing on the temporary organising and ecosystem lenses we aim at investigating how B2B CoPS manufacturers are developing their orchestration knowledge and capabilities. We conduct a single case study on incumbent B2B CoPS manufacturer (i.e. woodworking machines) with data collected via semi-structured interviews and interactive workshops. We provide a preliminarily conceptual framework of a manufacturer`s orchestration learning process starting from "servitisation" projects to gain competitive advantage to "ecosystemisation" projects to align collaborative network. We conclude with future research agenda.

Keywords: Servitisation, ecosystems, platforms, B2B CoPS.

Introduction

Manufacturers of complex product systems (CoPS) are looking for new flexible and scalable organising forms such as ecosystems (Kapoor, Bigdeli, Schroeder & Baines, 2022; Stonig, Schmid & Müller-Stewens, 2022). New ecosystem-based forms of organising are likely to be different from alliances or supply chains as they will include a larger set of interdependencies aimed at creating value for the customer (Jacobides, Cennamo & Gawer, 2018). However, in B2B setting (most common for CoPS) the existing knowledge is mostly focused on the leadership and governance of already existing ecosystems (Foss, Schmidt & Teece, 2023), digitalizing business models (Sjödin, Parida & Visnjic, 2022), and the process of digital platforms and platform ecosystems development (Lerch, Horvat & Jasny, 2024; Van Dyck, Lüttgens, Diener, Piller & Pollok, 2024). In the realm of supply chain to ecosystem transition, the change is subject to within-company and across-companies levels. Thus, potential orchestrators should implement dedicated projects to develop their organizational knowledge and capabilities at both these levels during their transition to ecosystem organising form. As these transformation projects change the organization (Winch, 2021), manufacturer should learn how to integrate and innovate the required knowledge and capabilities to the changing dynamic business environment. It is particularly interesting to see how such integration and innovation processes can bring manufacturer to the new "Epoch" (Berggren, Bergek, Bengtsson, Söderlund & Hobday, 2011). While (Söderlund, 2008) introduces different learning process that contributes to the competence dynamics operating in the project-based organizations, we aim at implementing same approach to investigate the ecosystem orchestrator`s learning process (i.e. to show the peculiarities of shifting, adapting, and leveraging organizational knowledge and capabilities). Thus, this paper tries to integrate project research stream to the platform and ecosystem body of knowledge and attempts to broaden our current conceptual frameworks of how manufacturers adapt to provide integrative solutions.

Theoretical background

The transition to an ecosystem organising can be seen through the temporary organizing lens i.e. the set of projects (acting as agents of change) which change the organisation (Winch, 2021). In our research, we follow the ontological school of the project with the "broader view" (Locatelli, Ika, Drouin, Müller, Huermann, Söderlund, Geradli et al., 2023) i.e. manufacturers do not know in advance how to perform a successful transition from a supply chain to an ecosystem organising. From an "ecosystem-as-structure" perspective (Adner, 2017) we observe how these projects change the existing activities, actors, positions and links at both "individual" i.e. within-company and "collective" i.e. across-companies levels (Söderlund & Borg, 2018).

Methodology

We draw on the longitudinal single case study on incumbent B2B CoPS manufacturer (woodworking machines). Manufacturer has its business presence worldwide, but specifically focusing on developing ecosystem first within Europe. Data were collected through one-to-one interviews as well as via monthly conducted interactive workshops (Table 1).

Secondly, this study is enriched with the secondary data (i.e. annual reports, presentations) to strengthen the triangulation of the primary data. Moreover, if interviewees referred to some specific documents during the interview, we incorporated them as supplementary secondary sources, where applicable.

	Job title	Number of interviews/ workshops	Total duration, minutes
One-to-one interviews with representatives	Head of Digital Transformation	2	180
	Digital platform manager	2	120
	Service & Parts Development Manager	3	120
	Human Resource Specialist	1	45
	Product Development Manager	1	60
	Head of Procurement	1	50
	Sales Manager	1	50
Interactive workshops	All managers involved in the platform ecosystem activities	5	300

Table 1. Profile of the interviews.

We further code (work in progress) the interviews following the Gioia method (Gioia, Corley & Hamilton, 2013). The preliminarily findings are presented in the dedicated section below.

Findings

We observe three distant stages of projects implemented by B2B CoPS manufacturer i.e. vanguard servitisation, "platformisation", and "ecosystemisation" projects. Figure 1 provides a more detailed view on our conceptual framework.

We call servitisation projects as vanguard projects (Brady & Davies, 2004), as they act as trial projects which can lead to an ecosystem development. These projects are mostly implemented at the "within-company" level and tackle new ways of approaching customer (e.g. digital portal, control room), and focal product reconsideration e.g. IoT machines, digital portals (Stonig et al., 2022; Van Dyck et al., 2024). The new set of actors, links, and activities

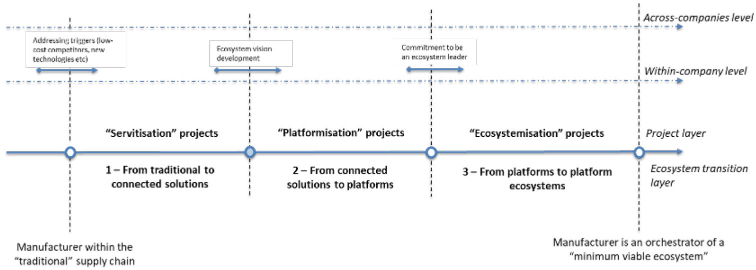

Figure 1. Conceptual framework (work in progress).

acts at this stage as a pre-condition for the ecosystem vision development. Such an ecosystem vision is opening a so-called new "Epoch" for the manufacturer (Berggren et al., 2011). "Platformisation" projects (e.g. development of digital platform, introduction of communication protocols) aim at gradually allowing other (specifically chosen) industrial partners to connect their solutions to the potential orchestrator`s platform (Lerch et al., 2024). Finally, "ecosystemisation" projects aim at network and capabilities alignment e.g. partners development functions, opening a platform to external solutions (Stonig et al., 2022). At this stage, manufacturer is acting as an orchestrator, and fully committed to design an ecosystem-like configuration. We intend to show (after accomplishing the inductive coding) how at each stage manufacturer shift, adapts, and leverages its orchestration knowledge and capabilities.

Acknowledgment

This study was carried out within the MICS (Made in Italy – Circular and Sustainable) Extended Partnership and received funding from the European Union Next-GeneraFonEU (PIANO NAZIONALE DI RIPRESA E RESILIENZA (PNRR) – MISSIONE 4 COMPONENTE 2, INVESTIMENTO 1.3 – D.D.

1551.11-10-2022, PE00000004). This manuscript reflects only the authors' views and opinions, neither the European Union nor the European Commission can be considered responsible for them.

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Collaborative Strategies for Green Servitization: The Role of Customer and Competitor Collaboration

Josep Rialp-Criado

Universitat Autònoma de Barcelona

Ferran Vendrell-Herrero

University of Edinburgh

Joan Freixanet

Universitat Autònoma de Barcelona

Marco Opazo-Basaez

Deusto University

Abstract

This study examines the strategic role of customer and competitor collaboration in driving green servitization in manufacturing industries. Green servitization emphasizes environmental stewardship through eco-friendly technologies and sustainable solutions. This research explores how collaborative partnerships enable firms increase their environmentally sustainable services aligned with market demands and regulations. Customer collaborations tailor green services, enhancing satisfaction and fostering green technology innovation. Coopetition with competitors facilitates knowledge sharing and problem-solving, accelerating sustainable practices adoption. Using panel regression analysis with information from Encuesta sobre Estrategias Empresariales (ESEE), this study validates Network Theory and RBV hypotheses, highlighting collaboration's significant impact on firms' green servitization. Leveraging relational strategies strengthens market positions and contributes to environmental goals. While industry-specific and country-specific, the study offers actionable insights for integrating sustainability into business strategies. Future research can explore additional contextual factors and global perspectives on collaborative strategies in sustainable innovation and business resilience.

Keywords: Collaborative strategies, green servitization, customers, competitors.

Executive summary

Servitization, the strategic expansion of manufacturers' business models to integrate services alongside products, represents a pivotal evolution responding to contemporary market dynamics and sustainability imperatives. This transformation, documented by scholars such as Vandermerwe and Rada (1988), Raddats, Kowalkowski, Benedettini, Burton and Gebauer (2019), and Kamal, Sivarajah, Bigdeli, Missi and Koliousis (2020), reflects a shift towards providing comprehensive solutions that enhance customer value throughout product lifecycles.

The integration of services within manufacturing not only meets evolving customer expectations but also strengthens market differentiation and competitiveness (Gebauer, 2008). By offering services like maintenance, upgrades, and performance monitoring alongside products, companies foster deeper customer relationships, establish recurring revenue streams, and enhance profitability (Vendrell-Herrero, Parry, Bustinza & O'Regan, 2014). This customer-centric approach enhances satisfaction and loyalty, contributing to sustained business growth in competitive environments (Hidalgo-Carvajal, Carrasco-Gallego & Morales-Alonso, 2021).

Moreover, servitization aligns seamlessly with global trends towards sustainability and circular economy principles (Hidalgo-Carvajal et al., 2021). Companies adopting servitization strategies optimize resource use and extend product lifecycles, thereby reducing environmental footprints and aligning with regulatory expectations (Doni, Corvino & Martini, 2019; Zhang, Wang & Lyu, 2021). This strategic alignment not only supports environmental stewardship but also enhances corporate social responsibility, meeting societal expectations for sustainable business practices.

Innovation lies at the core of servitization, driving the development of new service offerings that cater to market demands (Sjödin, Parida, Kohtamäki & Wincent, 2020; Shen, Sun & Ali, 2021). Leveraging advanced technologies such as AI and blockchain enhances operational efficiencies, personalizes customer experiences, and unlocks new revenue streams (Akter, Michael, Uddin, McCarthy & Rahman, 2020; Hoyer, Kroschke, Schmitt, Kraume & Shankar, 2020). This innovation-driven approach ensures competitiveness in dynamic global markets shaped by technological disruption.

Green servitization represents a significant advancement in sustainable business practices, integrating environmental considerations into service-oriented models (Chang, Ming, Zhang, Zhou, Liao & Cao, 2021). By implementing eco-friendly technologies and digital solutions, companies minimize environmental impacts across product lifecycles (Marić & Opazo-Basáez, 2019). Services like product leasing, remanufacturing, and end-of-life recycling extend product utility, reduce waste generation, and promote resource efficiency, contributing substantively to circular economy principles (Ryan, 1998).

Furthermore, green servitization fosters innovation in sustainable service solutions, accelerating the adoption of environmentally friendly practices globally (Abadzhiev, Sukhov, Sihvonen & Johnson, 2022). By designing services aligned with consumer sustainability preferences and regulatory requirements, companies not only meet market demands but also drive industry-wide shifts towards sustainable development.

Central to our investigation is the role of collaboration with customers and competitors in driving green servitization. Bustinza, Gomes, Vendrell-Herrero and Baines (2019) already signaled the role of collaborative partnership in servitization. Customer collaboration enables companies to co-design services that meet sustainability expectations while enhancing customer satisfaction. Similarly, collaborating with competitors fosters knowledge sharing, resource pooling, and collective action towards addressing industry-wide sustainability challenges (Estrada, Faems & Faria, 2016; Planko, Chappin, Cramer & Hekkert, 2019). These partnerships enrich firms' resource portfolios with environmental knowledge, technological innovations, and operational efficiencies critical for achieving competitive advantage in green servitization (Raddats et al., 2019; Marić & Opazo-Basáez, 2019).

Drawing on Network Theory (Powell, 1990; Burt, 1992; Gulati & Gargiulo, 1999; Podolny, 2001) and the Resource-Based View (Barney, 1991), we suggest 3 hypotheses:

H1: collaborate with customers has a positive effect in obtaining green servitization.

H2: collaborate with competitors has a positive effect in obtaining green servitization.

H3: the effect of the collaboration with competitors is higher than the effect of collaborating with customers in obtaining green servitization.

Our study empirically validates the positive impacts of customer and competitor collaborations on green servitization outcomes. Through panel regression analysis using data from the Survey on Business Strategies (SBS), we demonstrate that these collaborative strategies significantly increase firms' environmentally sustainable services (Barile, Grimaldi, Loia & Sirianni, 2020). This empirical validation provides actionable insights for practitioners and policymakers seeking to integrate sustainability into core business strategies.

In conclusion, our research underscores the strategic significance of collaboration—both with customers and competitors—in advancing green servitization. By effectively leveraging these partnerships, firms not only strengthen their market positions but also contribute meaningfully to sustainability goals and environmental stewardship across industries. This study enriches the academic discourse on sustainable business practices, highlighting the pivotal role of collaborative strategies in shaping a more environmentally conscious and economically viable future.

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This book abstracts summarizes the proceedings of the **11th International Conference on Business Servitization (ICBS 2024)**, held at Nova School of Business and Economics – Lisbon, Portugal.

On this edition, the conference places a special emphasis on the focal theme: **Unlocking Unique and Intelligent Digital Solutions: The Pivotal Role of Frontier Technologies (Blockchain and AI) in Servitization**.

This year's edition aims to debate and shape such critical questions for the future development of the field. Accordingly, the focus of this year is set at the intersection of two increasingly essential topics for servitization that have not yet been sufficiently linked in academia: digital services and frontier technologies with the focus on artificial intelligence and blockchain.

ICBS is a conference traditionally targeted to business professionals, policy makers and researchers. While the focus of this year's conference will be the Pivotal Role of Frontier Technologies in Servitization, as in previous editions the organizers also endeavour to connect works related to other relevant issues linked with servitization such as: business engineering, strategy, business models, international business, operations management and supply chain management.

Funded by Next Generation EU
through the Plano de Recuperação e Resiliência (PRR).

ISBN: 978-84-128130-4-3

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