

9th International Conference on Business Servitization

November 17-18 2022

Book of Abstracts

OmniaScience

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Foreword

Welcome to 9th International Conference on Business Servitization

This book of abstracts summarizes the proceedings of the **9th International Conference on Business Servitization (ICBS 2022)**, held at Hotel Ilunion, Malaga, Spain. On this edition, the conference places a special emphasis on the focal theme: Servitization as a springboard for enhancing Sustainable manufacturing.

Competitive strategies exclusively focused on the use of non-renewable resources are no longer viable in today's manufacturing settings. The 21st century's global business landscape call for companies to be committed to the societal welfare while meeting strict market and regulatory demands for sustainable and environmentally benign production processes and products. A shift towards more innovation-based business models that permit companies to enhance competitiveness along with sustainability impacts on the economy, society, and the environment is increasingly required. Such transition, however, is already underway, led by the adoption of servitized strategies that contemplate the integration of differentiated services into manufacturing offerings— as a means to innovate in manufacturing contexts. The innovative nature of servitization calls for firms to (re)adjust their

organizational and competitive strategies, privileging service infusion over products, thus incentivising the provisioning of product-service solutions that contribute to lower environmental impacts. Hence, servitization can be regarded as a mechanism to expand competitive capabilities through service development in product-based firms, and thus, simultaneously provide a new means to reduce the environmental burdens of production and product performance. For instance, servitization provides an incentive of increasing product lifespan and stop planned obsolescence practices. According to the Business Innovation Observatory of the European Commission, servitization represents a transformational change that increases at a consistent rate in western economies, providing manufacturers with a sustainable medium to achieve differentiation that leads to an enduring competitive advantage, in accordance with the demands for sustainable business development.

Covered topics include the identification of servitization pivotal factors for promoting innovative ways for sustainable production systems, such as Knowledge/Talent, Strategy, Marketing, Operations, Technology capacity, Territory, Sector/Industry related to intra-organizational and/or inter-organizational collaboration, partners, customers and/or KIBS, as well as tools or frameworks for developing, assessing, implementing, and governing sustainable and environmentally friendly manufacturing solutions.

This year's edition of the International Conference on Business Servitization (ICBS) aims at debating and shaping such critical questions for the future development of the field. Accordingly, the focus of this year is on environmental sustainability. This year's conference aims to discuss what the challenges in implementing environmental-friendly production are, and how can the servitization community contribute to this domain.

ICBS is a conference traditionally targeted to business professionals, policymakers and researchers. While the focus of this

year's conference will be "Servitization as a springboard for enhancing Sustainable manufacturing systems", as in previous editions the organizers also endeavor 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 emerging 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 to the 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:

Sustainable manufacturing systems

- Product-end-of-life (EoL) strategy (reuse, repair, reconditioning, remanufacture, and recycling).
- Product lifespan approach (reduced vs. extended life cycles).
- Product life cycle assessment (LCA).
- Product stewardship.
- Operations strategy (market push vs. market pull).
- Production system (make-to-stock vs. make-to-order).
- Resource efficiency (renewable and non-renewable).
- Companies' sustainable transition (including large firms and SMEs).
- Reduction of manufacturing/plants environmental impacts (emissions, waste, and/or hazardous materials).

- Process, product, and/or functional upgrading aimed at sustainable outcomes.
- Environmental management practices.

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.
- 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

- Servitization and collaborative supply chain management.
- Internet of things and linking channels.
- Product-service innovation processes and organizational performance indicators.
- Servitization and customer value perception.
- Servitization role on business ecosystems and networked production systems.

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.

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?

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ABSTRACTS OF PAPERS
PRESENTED AT
9TH INTERNATIONAL BUSINESS
SERVITIZATION CONFERENCE

Session 1

Industrial case studies I

Co-Chairs: Marin Jovanovic & Phillip Davies

(Salon Convenciones-Ejecutivo)

The financial implications for providers and customers of electrification and result-oriented business models

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Abstract

The combination of electrification and servitization is recently observed as a trend for business model innovation in several companies. Electrification and servitization have the potential to reduce the total cost of ownership and to increase revenues through extended product lifetime and additional services. However, servitized business models incur high upfront costs, cash flow challenges, and high risks. The financial implications of servitization and electrification are difficult to understand. Therefore, the aim of this study is to investigate the financial implications of the transition towards electrification and servitized business models from the user and provider perspectives.

Keywords: Servitization, electrification, business models, financial implications.

Introduction

Implementing sustainable activities at the business level requires for example adopting circular strategies for narrowing, slowing, and closing the resource loop (Bocken et al., 2016). A shift from product to service sale is considered as an incentive for sustainable

development (Tukker,2004). This is regarded as a servitization of Business Models (BM). Servitized BM can be product-oriented (i.e., offering after sale services in addition to the product), usage-oriented (i.e., a leasing model where customer pay fees to access the product), or result- oriented (i.e., performance is offered, and customer pays for the result) (Bressanelli et al., 2018). In usage-oriented and result- oriented business model, firms retain the product ownership and have the possibility to close the material loop (Bressanelli et al., 2018). However, according to Tukker (2015), result-oriented business models are the most effective for circularity and sustainable development. In result-oriented BM, the profit become based on the result and all materials, product, and services used to deliver the result become costs, creating an incentive to minimize their use and thereby the total cost of ownership (TCO) (Tukker,2015).

With the emergence of electrification, several companies moved to selling performance instead of physical products (e.g, Volvo trucks¹, Epiroc²). Although electrification entails relatively high investment costs, it allows reducing the operating costs (i.e., repair, maintenance, spare parts) and has therefore the potential to reduce the total cost of ownership (McKinsey & Company, 2019). Furthermore, electrification presents a potential for service innovation adding value to the total offering (e.g, monitoring, and digital charging platforms). However, the cost of the new technology is still high (i.e., electric and digital services) and represents a barrier for the customer. This incentivized firms to innovate in their BM and to implement result-oriented BM.

¹ <https://www.volvotrucks.com/en-en/news-stories/press-releases/2022/mar/volvo-trucks-sells-50-electric-trucks-to-truck-as-a-service-start-up.html>

² <https://www.epiroc.com/en-us/newsroom/2020/epiroc-charges-forward-with-batteries-as-service>

Despite having the potential to reduce the TCO, the financial outcomes for result-oriented BMs in electrification context are still unclear for firms and customers. Result-oriented BMs present cash flow challenges and risks given the time lag between fees received and costs due (Van Loon et al., 2020). Therefore, the assessment of cash flows and risks implications is considered a prerequisite for the design and viability of servitized business model (Linder and Williander, 2017). Additionally, with result-oriented BMs, customers are charged with variable fees depending on the performance use. This presents a financial challenge due to uncertainty in future cash flows.

Most evaluations done by previous studies lack an offering/solution perspective inherent for business model evaluation (i.e., including product, service, and other accessories necessary for fulling the function). Likewise, most studies were concerned with customer acceptance and considered therefore only the user perspective (e.g., Ensslen et al., 2020). Measuring the outcomes of servitized business models and reaching agreement between user and provider is indeed considered as complex (Bressanelli et al., 2018). Therefore, this study takes both the provider and customer's perspectives for answering the following research question:

Which financial implications do result-oriented business models have on providers and customers in the context of electrification?

Methodology

For answering the research question, an explorative case study is conducted for a company operating in the manufacturing industry. The studied company manufactures construction equipment and has recently engaged in electrification. The company is currently

designing a result-oriented business model for their new electric equipment.

For financial evaluation, we did a cost-benefit analysis, and have developed calculation model in collaboration with managers from the studied company. The developed model takes a lifecycle perspective and includes costs, revenues, and cash flows evaluation. For understanding the implications of electrification and servitization, electrified and servitized business models are compared to diesel and traditional sales business models. TCO is calculated from a user and provider perspective for the traditional sale of diesel equipment and compared to the Net Present Value (NPV) of future cash flows expected from retained ownership.

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The relationship between hydrogen, corporate social responsibility, environmental management and human capital in companies related to the energetic sector

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Abstract

The objective of this work is the analysis of the relationship between Hydrogen, Corporate Social Responsibility (CSR), Environmental Management (EM) and Human Capital (HC) in companies in the energy field. In this study, a questionnaire was applied to companies from different sectors related to the energy sector. To obtain the necessary information about the items that will form the constructs of the model, personal surveys have been used, defining these surveys as a search for information through the use of questions. This questionnaire was aimed mainly at directors and managers from different areas of companies in the Spanish energy

sector. In addition to this objective, the relationship between these variables and business results has also been studied. The analysis of the results obtained has been carried out using the Partial Least Squares (PLS) methodology, concluding that there is a positive relationship between the implementation of Hydrogen Technology and obtaining better business results. Similarly, EM and CSR are improved in companies. In addition to hydrogen technology, the effect of EM in relation to HC and RSC has been studied, obtaining a positive result.

Keywords: Hydrogen; Corporate Social Responsibility; Environmental Management; Human Capital; Organizational Results; Partial Least Squares.

Mapping digital servitization from a business model innovation perspective: The case of the Swedish railway industry

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Abstract

Digital transformation is shifting competitiveness among several industries. In the railway industry, digitalization has become crucial for its functioning, offering the potential for improving operational efficiency and information management. However, the railway industry struggles with introducing new digital business models, triggering challenges to efficient information management and knowledge transfer. The lack of suitable IT support, poor internal management, and poor reporting structures are other hindrances when introducing digital business models in this industry. Despite previous efforts to understand the role of digital technologies in the railway industry, the configuration and implementation of novel digital business models have been overlooked. Thus, based on an in-depth and exploratory case study of the Swedish railway industry,

this study aims to understand how digital business models in this sector have been developed and implemented. A qualitative analysis was built on interviews with experts and company perspectives, while secondary data was retrieved from public reports, statistics, internal documents, and academic workshops. As part of the results, a set of digital business model innovations based on digital servitization are mapped. The findings are consolidated into a framework that illustrates various digital business models and the activities that need to be done by firms under the business model dimensions of value, creation, delivery, and capture.

Keywords: Business Model Innovation, Digital Servitization, Railway Industry.

Introduction

The emergence of digital technologies in the last decades is shifting competition in many industries (Porter & Heppelmann, 2014). Digital transformation has become crucial to the railway sector as it offers enormous potential to improve operation efficiency (Jabłoński & Jabłoński, 2020), as well as the possibility of overcoming physical barriers by allowing better information management (Tretten et al., 2021). Digital servitization, referred to as “*the transformation in processes, capabilities, and offerings within industrial firms and their associate ecosystems to progressively create, deliver, and capture increased service value arising from a broad range of enabling digital technologies such as the Internet of Things (IoT), big data, artificial intelligence (AI), and cloud computing*” (Sjödín et al., 2020, p. 471), brings new business opportunities for railway maintenance through digital technologies such as augmented reality or digital twins which allows autonomous inspection and predictive analytics (Tsvetkov et al., 2019).

The railway industry is highly complex, as it is integrated by multiple actors, centrally infrastructure managers, and those carrying out railway undertakings, leading to different and overlapping

business models (Kans & Ingwald, 2021). Digitalization plays a role in their process integration by providing a platform to improve customer service and automatization processes (Jabłoński & Jabłoński, 2019), to name a few. However, the implementation of digital business models in the railway industry is triggered by the lack of suitable IT support, poor internal management, and poor reporting structures (Kans et al., 2016). Challenges relate to obstacles to efficient information management and knowledge transfer across the industry (Kans & Ingwald, 2021). Despite previous academic efforts to understand service-based business models in the railway industry (Kans & Ingwald, 2021), the way digital business models in the railway industry have been developed and implemented has been overlooked. Addressing this gap should enable digitally-oriented firms to design models that increase the chances of successful new digital business offerings.

Considering these gaps in the literature, the present study aims to *advance understanding regarding how firms develop and implement business model innovation when incorporating digital technologies to create, deliver, and capture value in the railway industry.*

Methodology

The study is an in-depth and exploratory case study of the Swedish railway industry, focusing on railway infrastructure maintenance. A qualitative analysis was built on interviews with experts and company perspectives. Secondary data was retrieved from public reports, statistics, internal documents, and academic workshops.

Findings

We find that digital servitization in the railway industry is supported by multiple digital business models, which need to be

operated simultaneously to create value. We map a set of digital business model innovations based on digital servitization, including traffic control system automation or predictive and smart maintenance, enlarging knowledge on the topic. The findings are consolidated into a framework that illustrates various digital business models that have emerged in the railway industry, and the key activities companies need to perform to create, deliver, and capture value. Results show that digital business models allow the configuration of a business ecosystem in the railway industry.

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Servitization and customer value perception in the horticultural industry

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Abstract

This paper explores service business development and opportunities enabled by digital technologies such as remote monitoring, artificial intelligence, and the internet of things based on a single use-case study of a start-up providing smart solutions for plant lighting. The current technological developments enable new opportunities for a Servitization approach in fields such as urban agriculture and vertical farming. Light can have several effects on a plants growth, development, and various traits (e.g., secondary compounds) depending on the plant type and the state of its growth cycle. Currently, plant lighting systems are mainly sold as products with a fixed light spectrum where only limited advanced services focusing on delivering results or performance can be provided. For firms to offer such advanced services, an in-depth understanding of the different value propositions, process outcomes, and product technologies is required. A single case study research was conducted, and the avatar journey mapping tool was applied to better

understand the complex product-service system and find new service opportunities during the life-cycle of the smart lighting system.

Keywords: Digitally-enabled PSS, Digital Technologies, Service offerings.

Introduction

Recent studies showed that the control of the light spectrum depending on the plant type and its current growth cycle state (e.g., germination) could have a significant influence on various plant characteristics (Lazzarin et al., 2021; Ma, Xu & Cheng, 2021; Paradiso & Proietti, 2022). In conventional light sources for plants, such as high-pressure sodium (HPS) lamps, the modulation of the light spectrum was impossible. But with the advancements in the light-emitting diodes (LEDs) technology in recent years, specialized plant lights are promising an optimized light spectrum and significant energy savings compared to HPS. According to Paradiso & Proietti, (2022), the light intensity regulation and the light spectrum's adaptation can be applied to improve production schedules and the crop yield and quality.

During plant growth, light and, more specifically, different spectral wavelengths (such as ultraviolet, visible, and infrared light) influence specific plant characteristics and plant photomorphogenesis responses such as germination, flowering, photosynthesis, or flavonoids (Paradiso & Proietti, 2022). Therefore, a smart lighting solution that can optimize and dynamically adjust the light spectrum can have several quality benefits. There are additional benefits that can be exploited by a smart lighting solution, such as strengthening the stress tolerance of the crops or scheduling of flowering in cut flower crops (Paradiso & Proietti, 2022).

In modern agriculture, several trends such as urban or vertical farming support the application of advanced technology for plant cultivation because the growth occurs in a controlled environment (Kassar, 2020). Therefore, Servitization and product-service systems (PSS) enable to offer of advanced services (Baines & Lightfoot, 2014) and digital Servitization business models (Kohtamäki & Baines, 2019; Kohtamäki et al., 2021) for the horticultural industry. This paper aims to explore new service opportunities for smart plant lighting systems. The research questions in this study focused on:

"What can be learned from a study of a start-up business which is developing a digitally-enabled PSS?".

Methodology

The methodological approach taken in this study is a single case study (Robert K. Yin, 2018) of a Swiss start-up company manufacturing a smart lighting system solution for plants to attain an in-depth understanding of the service opportunities by applying the avatar journey mapping tool introduced by Müller-Csernetzky, West & Stoll, (2020). The visual approach enables mapping a complex PSS during the life-cycle of the smart lighting system and gaining a better understanding of the value creation process within the ecosystem. In a first step, an avatar model was created to gain an overview of the inputs and outputs of the system. The avatar journey map was then applied to identify the data and resources that have to come together to complete previously defined tasks effectively. Finally, new service opportunities were identified and proposed.

Preliminary findings

The avatar journey mapping revealed several opportunities and challenges for advanced services coming from the smart lighting systems; this allows manufacturers of lighting systems that predominantly focus on product-oriented business models to participate in Servitization.

Optimizing the light spectrum and other parameters can considerably influence plant characteristics; therefore, use- and or result-oriented services are becoming more attractive. Through the integration of several sensors and artificial intelligence, advanced services such as condition monitoring and automatic adjustment of the smart lighting based on, for example, the environmental conditions or changing types of crops are made possible.

To achieve this, the boundaries of technologies and business models must be extended beyond the firm and consider various actors within the ecosystem (Kohtamäki et al., 2021). Extended boundaries facilitated co-creation amongst the ecosystem's actors and offered new value propositions.

Within the ecosystem, the business models and technologies used by the involved firms must be aligned and the ecosystem might have to be extended by new partners (e.g., a partner firm with competencies in autonomous water feeding the plants). New value propositions were developed by applying the avatar journey map tool and considering lean start-up principles. These value propositions can be offered to various actors of the ecosystem and can therefore enhance a manufacturer's position in the market and help maintain competitiveness. The core process of a grower can be broken down into three main phases: plant, grow, and harvest. Within those phases, the potential waste along this process (such as or labor needed to grow the plants) and where actual value is

created for the avatars can be identified. An example for each phase is provided below:

Plant: Opportunity identified for a faster germination of the seeds.

Grow: Reduction of qualitative diminished plants and enhancing a better plant quality.

Harvest: Better control of the harvest date.

The understanding of the needed data which has to be collected to offer the advanced services such as the optimization of the light spectrum to enhance the outputs, as well as the understanding of the critical success factors and interaction points with the smart lighting system over its life-cycle are key to design the right service offerings to the avatars being present in the ecosystem. Challenges arising mainly in the quantification of the additional value created since research in the optimized light spectrum for each plant over its life-cycle is still in an early stage.

Closing

The preliminary findings show that many opportunities exist for new service opportunities for a smart lighting system applied to optimize the quality and growth of plants e.g. in the horticultural industry. The avatar journey mapping (Müller-Csernetzky et al., 2020) helped to identify the opportunities by visualizing the complex value networks. The approach used shows the usability of the avatar journey mapping method to gain a better understanding of the avatars needs within an ecosystem and based on this derive new value propositions and service offerings. However, more research is needed as it was not clear how to visualize multiple value routes within the digitally-enabled PSS.

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Automotive industry- on the road to servitization

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Abstract

The global financial crisis of 2008-2009 and more recent COVID-19 pandemic related economic downturns have hit the automotive industry, especially in Europe. Not only the economic concerns, the environmental concerns and regulations pose a competitiveness challenge for automakers. Therefore, the automotive industry has embarked on a product-services innovation (PSI) track to address existing operational challenges as well as

contribute to environmental issues. The present study will examine the effect of PSI, also known as servitization, on organizational performance indicators. We will create a multi-country sample of firms in the automotive sector to test hypotheses related to PSI and its relationship with firm performance. Our findings will have significant bearings on priorities, specifically in green supply chains, that firms could focus on to achieve economic as well as environmental betterment.

Keywords: Automotive industry, product-service innovation, sustainability, green servitization.

Introduction

The automotive industry globally, and more specifically in Europe, is undergoing several changes in the form of digital transformation, electrification and the development of self-driving vehicles (Rocchetta & Upadhayay, 2021). The economic downturns like the 2008-2009 financial crisis, and the more recent COVID-19 pandemic, have further emphasised the fragilities this sector faces in terms of supply chain disruptions, overcapacities, shrinking markets in Europe and North America, and, increased laws and regulations aiming at protecting the customers and environment (Gaiardelli, et al., 2014).

Amidst these problems, the automotive sector has turned to the service business to provide the vital push needed for a struggling industry. This is primarily because of four reasons: (i) at the economic level, services generate higher profits, (ii) at the strategic and marketing level, services lock on customers for a longer period, (iii) services enable continuous improvement of product design and quality, and (iv) sustainable mobility business models transform the vehicle into an appliance providing mobility (Gaiardelli, et al., 2014). Therefore, there is a possibility to shift from an *industrial economy* where the central value is based on the exchange of products to be

consumed to a *functional economy* where businesses satisfy consumers with functions rather than products³ (Mont 2002; Ceschin 2010).

Traditionally, the automotive industry was characterized by a business model that encourages selling a greater number of cars rather than increasing the longevity of the vehicle or reducing the running costs. In other words, the economic interests of the industry did not converge with the environmental ones (Ceschin, 2010). However, more recently, *digital servitization* has enabled automakers to support operations and improve firm performance (Lindström, et al., 2015). Not only this, servitization also branches out into *green services* which lay the foundation of *green servitization* as a broad strategic approach to enable firms in addressing environmental issues. These green services target CO₂ emissions reduction, reuse-repair-recycle materials, green design, green manufacturing, sustainable life-cycle and end-of-life practices for automotive (Opazo-Basáez, et al., 2018).

With this background, we propose to understand how the transition from products-only business to PSI impacts productivity of firms. To do this, we develop research questions, data sample and econometric methods that are detailed in further sections.

Research questions and hypothesis

This study proposes an analysis of the relationship between PSI and firm performance indicators with a focus on green supply chain management. Literature suggests that servitization could enable faster response to customer demands, increasing firm's performance and competitiveness (Hanelt, et al., 2015) and improvement in quality of service provision (Vendrell-Herrero, et al., 2017). Therefore, our hypotheses will be developed around the following

³ For example, mobility instead of cars, clean clothes instead of washing machines, cooling solutions instead of Air conditioners.

idea: *Automotive firms/automakers that implement product-service innovation (PSI) or servitization have higher productivity gains when compared to firms that do not implement PSI.*

Data source and econometric strategy

Data and Sample selection

For the empirical analysis we will construct a sample of commercial and passenger automotive vehicle manufacturers in different countries. This sample can be constructed using the ORBIS database for most recent years (2018-2020). ORBIS not only offers information on accounts and finance but also primary and secondary sectors of activity. Our sample will be sub-divided into small, medium and large firms to better uncover the scale of servitization and its impact on organisational performance. We will also control for market specificities for which we include GDP per capita per year. We will also peruse the EDGAR (Emission Database for Global Atmospheric Research) to analyse the CO₂ emissions by country.

Variables and Empirical strategy

Given that our interest lies in understanding the link between productivity and servitization, our dependent variable is an economic measure of firm competitiveness that explains whether firms make efficient use of inputs to generate outputs. This is calculated as the ratio of total sales over number of employees.

Our main independent variables are related to PSI and can be trifurcated as follows: *first*, a binary variable that takes value one if the firm in our sample offers digital services (in addition to products) and zero otherwise. *Second*, a dichotomous variable taking value one if a firm offers green services in addition to products and

zero otherwise. *Finally*, a variable which is a combination of the first two.

We include a battery of control variables to capture country and firm characteristics. Furthermore, our results will be a multi-variate estimate of the following specification,

$$P(Y = 1 | X_1, X_2, \dots, X_k) = \theta(\beta_0 + \beta_1 * X_1 + \beta_2 * X_2 + \dots + \beta_k * X_k)$$

where, the probability of dependent variable to have a value of one is estimated using dependent variables X_1, X_2, X_k etc. using a binary outcome model like probit or logit.

Progress of the work

At this time, we have already built the initial panel, regrouping the automotive sector firms based on size (number of employees). Economic activity of the firms has been identified using the North American Industry Classification System. In line with (Opazo-Basález 2018), we did not incorporate non-servitized automakers. This is done so that firms without a secondary sector which might also be operating in other economic sectors could be classified as non-servitized firms.

Data treatment is in progress and we have already identified over 250 servitized firms operating globally. This number of servitized firms could increase with the data cleaning and the study of the multiple particular cases.

Discussion

This paper will build on a rich and mature literature that has shown that innovation has a positive effect on firm performance, especially during negative business cycles. More recent studies have also found that PSI is a promising approach to address green supply chain and sustainability challenges in the automotive sector. Our contribution to this literature will be to ameliorate the strand of

studies focusing on automotive sector. However, we also plan to expand this study to other sectors like pharmaceuticals, chemicals and computer manufacturing where PSI has a substantial presence. We believe this will be a logical comparison of a mature industry (automotive) and more recently developed industries (computers).

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Session 2

Industrial case studies II

Co-Chairs: Paul Matthyssens & Josip Marić

(Salon Convenciones-Ejecutivo)

Creating markets for autonomous solutions: A market-shaping perspective

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Abstract

Autonomous solutions are radical innovations that promise great benefits and threatens disrupting a wide array of industries like logistics, farming, and mining. Yet, the commercial potential of autonomous solutions has not yet been realized due to market barriers in adopting novel technology and providers recognize the need to actively shape markets. This study seeks to understand how providers shape markets for autonomous solutions. We specifically, uncover the underlying processes and activities of market-shaping across interdependent actors in industrial ecosystems. Our findings contribute to literature on autonomous solutions, digital servitization, green supply chain management and market-shaping.

Keywords: Market-shaping, Autonomous Solutions, Digital Servitization, Green Supply Chain Management.

Introduction

Autonomous solutions are radical innovations that promise great economic and environmental benefits and threatens disrupting a wide array of industries from logistics to mining. For instance, the fertilizer company Yara, in greening their supply chain, newly launched the world's first fully autonomous zero emission container ship "Yara Birkeland" aiming to replace 40000 diesel powered truck journeys yearly. Autonomous solutions may yield substantial economic and sustainability benefits, by reducing operational expenses through staff reduction and energy optimization. However, introducing radical innovations like autonomous vehicles and vessels requires fundamental industrial shifts. As many radical innovations fail, researchers point to lack of market creation capability as a possible explanation (O'Connor & Rice, 2013). Jaworski & Kohli (2017) request empirical work on market-shaping, and Neonen et al. (2019) calls for researchers to investigate market-shaping capabilities in the context of market creation for radical innovations. We answer to those research calls by investigating how autonomous solution providers employ market-shaping activities to create markets for autonomous solutions. Our research targets important gaps in prior knowledge as there is a lack of understanding on how to succeed with commercialization of autonomous solutions to advance digital servitization (Kohtamäki et al., 2022). Indeed, autonomous solutions represents the highest level of digital servitization (Kohtamäki et al., 2019; Thomson et al., 2022), yet the path to succeed with commercialization is unclear and providers face paradoxical tension shifting to autonomy (Sandvik et al., 2022). Second, there is a need to further understand the specific market-shaping processes employed for commercializing radical technological innovations (Neonen et al., 2019).

Technological shifts, Market-Shaping and Ecosystems

The technological shift towards Autonomous Solutions

Autonomous solutions encompass operator assisting technologies, semi-autonomous with human supervision, to fully autonomous solutions (Thomson et al., 2022). They are conceptualized as the most advanced form of digital servitization, implying a radical change in business model logic (Kohtamäki et al., 2019). Autonomous solutions represent a technological discontinuity that promise radically improved performance and enabling green transition in a wide range of industrial settings. However promising, reducing human interaction creates substantial barriers from regulations, customers and ecosystems, and autonomous solution providers (hereafter: providers) face paradoxical tensions on several levels (Sandvik et al., 2022). Thus, transforming industries towards autonomous solutions is challenging and requires technological-, business model- and ecosystem- maturation (Thomson et al., 2022). Providers therefore work proactively to create the right conditions for commercialization through market-shaping processes.

Market-shaping and ecosystems

Market-shaping strategy is “*a set of purposeful activities a firm employ to shape a market in order to increase its competitiveness and create new opportunities*” (Flaig et al, 2021, p. 255). Market-shapers actively seek to change market characteristics to establish “*new opportunities to link resources of various stakeholders in ways that improve value creation in a market*” (Neonen et al., 2019, p. 618). Market-shaping takes a broad view of the market and go beyond the buyer-seller dyad to include value creating ecosystems (Neonen et al., 2019). By viewing ecosystem as a structure, the market-shaping activities are directed at

the *multilateral set of partners necessary for an autonomous solutions value proposition to materialize* (Adner 2017, p.42).

Methods

Our research followed an explorative multiple case study design (Eisenhardt, 1989). The cases were selected using a theoretical sampling strategy (Corbin & Strauss, 2014). We conducted 27 semi-structured interviews with top level managers from eight leading autonomous solution ecosystems (e.g. Autonomous trucks/ships). We used a thematic analysis approach following the iterative steps outlined by Braun & Clarke (2006): familiarization, generating initial codes, searching for themes, reviewing themes, creating aggregates, refining, and producing report.

Findings

Our findings are summarized in Figure 1. Data structure and briefly elaborated in the following sub-sections.

Changing Industry Logic

To fully unlock the disruptive potential from autonomous technology, providers need to make sure potential customers and partners are ready to adopt new industrial logics, as simply applying the new technology in the old way limits its value potential.

Market-shaping autonomy providers work to *redefine value logic for autonomy* by convincing their respective industry to abandon the traditional industry logic of large single products in favour of adopting a granular systems logic with a fleet of smaller autonomous units collaborating to perform tasks. Market-shaping providers impose shifting the logic from product oriented to autonomous-service oriented, enabling entire operations to be outsourced, and highlighting how autonomous solutions play a key

role in enabling industries achieve ambitious social, economic, and environmental sustainability goals.

Providers *re-design vehicles for autonomy* by downsizing to smaller and more agile units, redesigning the traditional driver facilities for other utilizations, reshaping vehicle design to optimize safety, energy consumption and performance, and creating modular designs for flexibility.

Providers engage in *business model experimentation* as they shift from traditional revenue- and ownership- models from product-based towards service-based logic, changing KPIs, payment structures and price points, and establishing service organizations with a fundamental understanding the customers' value creation process.

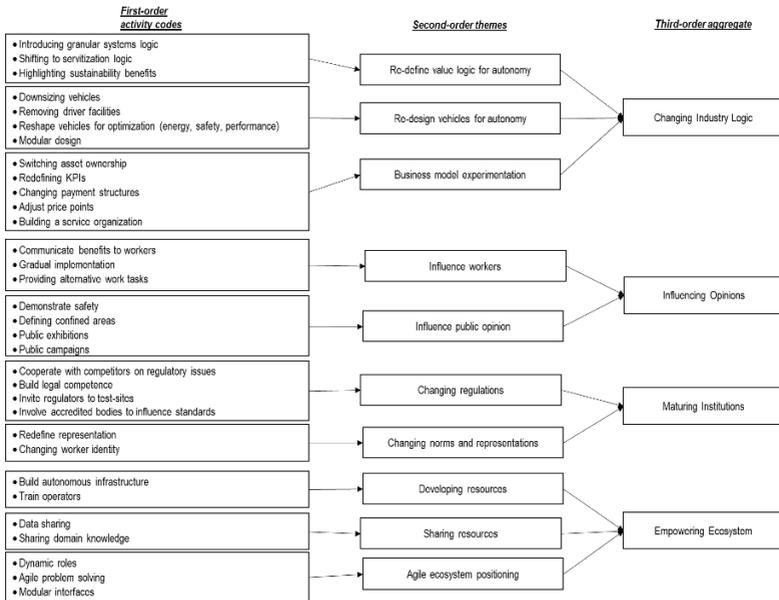


Figure 1. Data structure

Influencing Opinions

Our informants described how opposing opinions in the workforce and general public can create real resistance to adoption of autonomous solutions. Providers therefore perform market-shaping activities to *influence workers* by communicating worker-benefits, gradually implementing the solutions while keeping driver aboard, and by providing alternative work tasks to signal worker security.

The public often perceive unmanned vehicles as unsafe. Providers *influence public opinion* through thorough safety testing. Defining confined areas for autonomous solutions reducing potential accidents. To spur positive engagement, we found examples of providers and customers performing public exhibitions and instigating public campaigns highlighting how the solutions may create positive waves spilling over to other areas of public life.

Maturing Institutions

Perhaps the most substantial barriers to autonomous solutions are institutional. Existing regulations and standards do not comply with driverless technology, thereby obstructing various appliances. Providers employed several means to *change regulations*. They influence authorities on many levels, cooperate with competitors to identify common barriers and push for changed regulations, build legal competence, invite regulators to test sights to facilitate learning for regulators, and involve accredited bodies in development to influence standards.

Conventional thinking about norms and representation may hinder identification of valuable appliances and create inertia in convincing potential customers to switch. Efforts to *change norms and representation* include changing perceptions of solution representation

from tools to functions, and changing worker identity from drivers to operators.

Empowering Ecosystem

Developing, improving, and operating autonomous solutions require a higher level of collaboration between ecosystem actors than conventional solutions. Ecosystem actors collaborate in *developing resources* such as autonomous infrastructure and training of operators.

Sharing resources like data and domain knowledge with other ecosystem actors is key to enable problem identification and implementation of autonomous solutions.

As the ecosystem structures for autonomous solutions forms, ecosystem actors employ *agile ecosystem positioning*, characterized by taking on dynamic roles to allow new actors to enter and change their positions, agile problem solving to tackle unforeseen problems arising, and modular interfaces to allow other actors to leverage the solutions.

Discussion and Contributions

Our findings are summarized in a market-shaping framework for autonomous solutions (Figure 2). Providers employ interrelated market-shaping activities to change current market conditions towards envisioned future market conditions. The feedback loop continuously updates current market conditions informing market-shaping activities.

Our research contributes to literature in several ways: First, by increasing understanding of specific market-shaping processes for managing radical innovations (Neonen et al., 2019). We outline concrete measures companies employ to succeed with commercializing the most advanced form of digital servitization

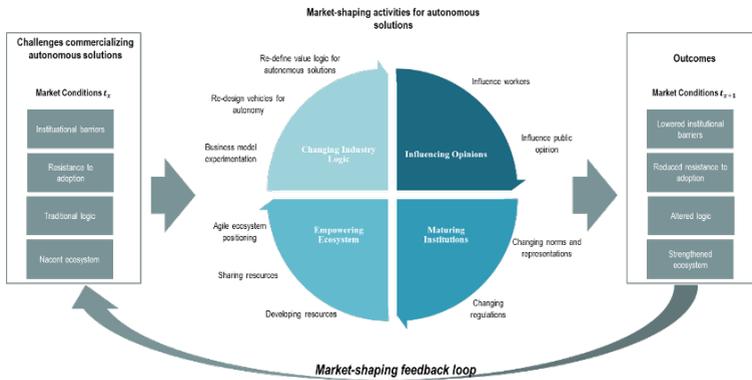


Figure 2. Market-shaping framework for autonomous solutions

(Kohtamäki et al., 2019; Kohtamäki et al., 2022), and identify processes enabling green transition affecting supply chains. Additionally, our findings increase knowledge on the emerging topic of autonomous solutions (Thomson et al., 2022; Sandvik et al., 2022).

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Digital servitization in healthcare: A paradox perspective on provider-customer-tensions

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Abstract

The existing literature on digital servitization scarcely addresses the complexities and conflicts originating from provider-customer interactions. This study approaches the topic with an original, relational perspective, adopting the paradox theory lens to investigate inter-organizational tensions between providers and customers of smart product-service-software systems in healthcare. Drawing on 32 interviews with providers and customers, we identify 15 tensions, highlight the prevailing context in which these tensions emerge, and derive 4 provider coping strategies. This study contributes to emerging digital servitization literature and sheds light on the nested nature of provider-customer tensions in an industry exhibiting very specific characteristics. Our findings provide evidence that digital servitization is more complex for providers than pursuing service growth alone. For managers, our study underlines the importance of context-specific decision-making and

the necessity to act ambidextrously to cope successfully with conflicting internal and external expectations. Building up resources, developing capabilities, adapting processes, and defining new roles for digital is important but cannot alone help providers to overcome prevailing tensions with their customers. Instead, service providers are well-advised to pursue and develop customer-segments-specific strategies and business models while learning to accept and deal with persistent trade-offs and conflicts.

Keywords: Digital servitization, tensions, paradox theory, healthcare.

Introduction

Digital servitization describes the process of product-centered firms to transform toward service-led value creation, value delivery, and value capture through smart product-service-software systems (Gebauer et al., 2021; Kohtamäki et al., 2019). Yet, despite ample strategic and financial benefits associated with digital servitization, many firms struggle with mastering the transition successfully (Tronvoll et al., 2020).

Looking at barriers on the provider and customer side, however, does not fully grasp the full complexities surrounding digital servitization. Instead, we posit that paradoxical tensions between providers and customers on organizational-level exist and that may explain why providers face the so-called “service paradox” (Gebauer et al., 2005) or “digitalization paradox” (Gebauer et al., 2022). Paradoxical tensions are “contradictory yet interrelated elements (dualities) that exist simultaneously and persist over time; such elements seem logical when considered in isolation, but irrational, inconsistent, and absurd when juxtaposed” (Smith & Lewis, 2011).

Studies on paradoxical tensions in the context of digital servitization and particularly on inter-organizational level are scarce, but initial work has yielded strong indications that such tensions

exist and play a significant role (e.g., Galvani & Bocconcelli, 2021; Gebauer et al., 2020; Toth et al., 2022; Gebauer et al., 2020). Against this backdrop, our study adopts a paradox-theory-based approach to *investigate the nature of provider-customer tensions in digital servitization and how providers respond to their occurrence.*

Research methodology

To answer the research questions raised in this study, an exploratory case study approach was chosen. Data was collected through in-depth interviews using semi-structured interview guidelines held with 32 mid-senior level individual respondents, belonging to 13 medical technology and 6 pharmaceutical companies operating in Switzerland on the provider side as well as 11 Swiss hospitals on the customer side. The interviews had a duration of 58 to 126 min and were conducted remotely. Studying the phenomena of relational paradoxes in digital servitization in the healthcare sector seemed reasonable, mainly because the healthcare industry is known for its various tensions (e.g., financial objectives vs. quality of treatment).

Data were analyzed guided by literature in three steps using ATLAS.ti and triangulated using internal materials, such as project reports, and publicly available information. We applied inductive coding (Glaser & Strauss, 1967). For validation purposes, the research findings were presented to the interviewees in a webinar and discussed for 3 hours. With selected informants, individual follow-up discussions were arranged.

Finding and contributions

Our findings reveal the existence of 15 tensions that relate to “value creation”, “value delivery”, and “value capture”. We highlight the prevailing context in which these tensions emerge and derive 4

coping strategies of providers, namely “avoidance”, “accommodation”, “concession”, and “confrontation”. While many recent studies in digital servitization-related literature adopt ecosystem perspectives, we adopt a dyadic, provider-customer perspective.

Contributing to building new knowledge in the interdisciplinary field of digital servitization, this study makes two main contributions to theory.

First, the research adds insights into the nature of inter-organizational tensions that are increasing the complexity of the digital servitization journey. Extant research on digital servitization is typically focused on intra-organizational phenomena. We, in contrast, identify and categorize paradoxical tensions at the inter-organizational level and link them with driving forces on the provider and customer side. By doing so, our research unravels how external and internal factors trigger tensions and how companies cope with their occurrence.

Second, among very few previous studies, this research investigates digital servitization in healthcare, thus addressing the calls for more studies on digital servitization barriers in specific industries (Marcon et al., 2019; Paiola & Gebauer, 2020; Peillon & Dubruc, 2019) and adding insights into the ongoing discussion on how digital technology implementation and new service-centered business models impact the healthcare sector (e.g., Halamka, 2015; Kalis et al., 2018).

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Transforming service-centric business models during core technology innovations: The case of electric vehicles

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Abstract

Technology innovations are intertwined with innovations on service-centric business models, but this form of innovation has yet little profound theoretical understanding. This paper presents the transformation of the service-centric business model for technology innovations on electric vehicles. By relying on a longitudinal, qualitative study together with a European commercial vehicle manufacturer, we advance the theoretical understanding of innovations on service-centric business models. Technology innovations on electric vehicles make business models not more or less service-centric but transform the service-centric business model. We highlight that technology innovations on electric vehicles require a directed transformation of the service-centric business model. This transformation progresses as a business model innovation along the phases of 1) clarifying the business logic, 2)

revising the key components in the service-centric business model, 3) and keeping a duality in the business models for the product technologies. Each phase unfolds through specific activities, but surprisingly the mechanisms differ. Activities in phase 1 follow a distinct sequential mechanism. In phase 2, the activities occur iteratively, whereas in phase 3, business model innovation activities evolve simultaneously.

Keywords: Business models, business model innovation, Servitization, Digitalization, Technology Innovation, Electric mobility.

Introduction

Climate change pushes the automotive industry to invest into technology innovations on electric vehicles to rapidly replace combustion vehicles with their carbon dioxide emissions. Such innovations in electric vehicles emerge within the existing service-centric business model of vehicle manufacturers. Service-centric business models express that product companies rely not only on their core products but also on services for creating value together with customers. In service-centric business models, product companies offer product-software-service systems for creating value-in-use for customers (e.g., Baines et al., 2017).

Literature on service-centric business models (servitization literature) and technological innovations are both established research fields. Nevertheless, their theories are still rarely combined and used together to study important research issues. Literature on service-centric business models rarely considers the possibility that technological innovations will change the core product technologies within the product-software-service systems. The literature is occupied with technology innovations on making products smarter to provide more (digital) services and software applications (e.g., Kohtamäki et al., 2019; Vendrell-Herrero et al., 2017). But there are

also technology innovations replacing (substituting) an existing core product technology with a new, alternative product technology (e.g., electric vehicles substituting combustion vehicles).

To achieve a coherence of service-centric business models with technology innovations on electric vehicles, it remains open whether such technology innovations should be accompanied through i) an incremental evolution, ii) a directed transformation, or iii) a radical replacement of service-centric business models? If service-centric business models incrementally evolve, getting transformed or even become replaced during the technology innovations how does the process of business model innovation would unfold in terms of phases, concrete activities and mechanisms?

Confronted with such open questions, this paper develops insights into business model innovations and technology innovations. Triggered through technology innovations on electric vehicles, we investigate the innovations in the service-centric business model.

Research methodology

Our context is the commercial vehicle industry. Here, we conducted a single, longitudinal case study together with a major European commercial vehicle manufacturer. This manufacturer has been continuously advancing its business model from being product-centric to more service-centric. They have recently launched electric vehicles in addition to combustion vehicles in the market. We focused on the innovations in its service-centric business model as a response to the market introduction of electric vehicles. In particular, we studied the type of business model innovations (incremental evolution, directed transformation, and radical replacement) and the process (phases, activities, and mechanisms) for unfolding innovations in the service-centric

business model during the interplay between the existing (combustion vehicles) and new product technologies (electric vehicles).

Findings and contributions

Our findings reveal the existence of 15 tensions that relate to “value creation”, “value delivery”, and “value capture”. We highlight the prevailing context in which these tensions emerge and derive 4 coping strategies of providers, namely “avoidance”, “accommodation”, “concession”, and “confrontation”. While many recent studies in digital servitization-related literature adopt ecosystem perspectives, we adopt a dyadic, provider-customer perspective.

Contributing to building new knowledge in the interdisciplinary field of digital servitization, this study makes two main contributions to theory.

The findings go beyond the previous assumption that in service-centric business models and the corresponding product-software-service systems, product technologies remain stable - neglecting that (core) technology innovations can lead to a product substitution. In more detail, there are two theoretical contributions. First, we underscore the importance of combining technology innovations and business model innovations. Business models are, in general, important to convert technology innovations into commercial successes. Electric vehicles require not a replacement of the service-centric with a new business model (e.g., outcome-based business model). An incremental evolution of the service-centric business model is also not sufficient to let electric vehicles succeed. Confronted with the technology innovations on electric vehicles, a directed transformation of the service-centric business model is most suitable. Interestingly, this directed transformation of the

service-centric business model is not leading to a different business model for the existing (combustion vehicles) and for the new product technology (electric vehicles). Instead, both technologies benefit from two separate (dual) service-centric business models with a similar service-centric business logic but different service-oriented configurations of business model components.

Second, we develop a process framework on business model innovations for technology innovations. This process framework consists of in three phases: 1) clarifying the business logic, 2) revising the key components in the service-centric business model, and 3) keeping a duality in the business models for the product technologies. Phase 1 resonates with the discussions on the cognitive constraints on business model innovations. Distinct sequential activities and tasks in phase 1 overcome these cognitive constraints. Phase 2 extends research on making business models internally consistent and keeping them aligned throughout the business model innovations process. Such business model consistency is not restricted to internal issues, but reaches out to external issues, where business models become more to include partners. Conducting the activities iteratively is the best way of achieving such an alignment. Phase 3 shed light into the duality of business models but letting business model innovation activities evolve simultaneously. First, the research adds insights into the nature of inter-organizational tensions that are increasing the complexity of the digital servitization journey. Extant research on digital servitization is typically focused on intra-organizational phenomena. We, in contrast, identify and categorize paradoxical tensions at the inter-organizational level and link them with driving forces on the provider and customer side. By doing so, our research unravels how external and internal factors trigger tensions and how companies cope with their occurrence.

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Everything as-a-service: Conceptualization and application in manufacturing

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Abstract

Many manufacturing companies are increasingly moving from product-centric offerings to services and solutions, in what has been defined as servitization. Servitized business models have gained attention companies for the possibility to establish long-term partnerships with customers by providing solutions on a continuous basis in return of recurring payments. In these years, a plethora of different terms have been used, sometimes unpropitiously, to identify these models. In the managerial community, the term Everything-as-a-service (XaaS) has recently become popular. The concept of XaaS has its origin in the information technology domain, with the Cloud Computing paradigm, a term introduced in 2007 to indicate an IT delivery model based on virtualization where resources, consisting of infrastructures, applications and data, are provided as an on-demand service via Internet. Various declinations of the term have emerged generally linked to the sales object and the application sector (e.g. software-as-a-Service, network-as-a-Service, Consumable-as-service, Heat-as-a-Service, Mobility-as-a-Service...). Although some differences among these concepts exist, they are all used to define business models in which digital technologies and the cloud are the enabling factor for making on-demand products-services accessible through subscription-based or *pay-per-x* models.

In manufacturing, one of the most widely used declinations is the “Equipment-as-a-service” (EaaS), where the manufacturer is responsible of all activities required for the proper functioning of the equipment and performs therefore all required services over the product life-cycle (e.g. taking care of spare parts, consumables, technician time and recalibration of setting, ...).

For most manufacturers, this term is not exactly a novelty. The shift from one-off sales of capital goods to recurring revenue streams based on equipment usage or output has been a common practice in certain industries for more than a decade. One prime example is the well-known “power-by-the-hour” model by Rolls-Royce. Though the concept itself may not be new, companies still struggle in the adoption of the EaaS paradigms (Adrodegari & Saccani, 2017). In fact, if from one side the literature on the topic is very scattered, from the practical side there are still many aspects that need be clarified. In fact, this transformation is challenging as, for example, it entails that the provider assumes all the risks historically in charge of the customer, i.e. financial, operational and behavioural risks of the user of the product-service itself (Gebauer et al., 2005). On the other hand, companies undertaking a Servitization path (including the XaaS) have to build the organizational structure, culture and capabilities to reach an adequate maturity level (Adrodegari & Saccani, 2020).

This research carries out an in-depth study of the scientific literature, the analysis of successful cases and empirical research in 10 manufacturing companies. The objective of the research therefore is twofold: (i) to develop a framework of the XaaS paradigm, identifying the benefits and the key aspects that characterize this model for manufacturers; (ii) to connect the adoption of the XaaS paradigm by companies with the maturity level of the company on a set of dimensions (culture, organization, resource, capabilities, processes).

As mentioned, this research follows a combined methodology by integrating a literature review with an expert panel and case study analysis. This approach is suited to collect opinions with respect to unstructured and complex problems, which allows to move from individual reflection to engagement of the involved companies. First, following the methodology suggested by Thomé et al. (2016),

we have retrieved papers dealing with XaaS topic from scholarly databases such as Scopus and WoS. This led to a first conceptualization of the phenomenon in manufacturing and allow us to define a series of guiding question that have been used in a first workshop with 10 managers belonging to different companies. Following previous research (Rengarajan, Moser & Narayanamurthy, 2021) we adopted an online/real-time variation of the method, that greatly encouraged the dialogue between the academic and industrial counterparts. The information gathered in this workshop was then analysed in the light of the existing literature. This led researcher to derive a specific research protocol that has been used to carried-out 10 in-depth interviews with managers involved in the research.

The preliminary results show that most of the surveyed companies have planned to implement the XaaS in their company within the next two years. Most of them have already started some pilot studies, in particular offering specific services with a subscription business models. To this end the development of product technology stack (IoT, embedded intelligence, control systems and fleet management systems, ...) are seen as a prerequisite in order to collect data to provide valuable information to customers and service partners, e.g. for maintenance needs and cost estimation (Zambetti et al., 2021). However, the integration of machine data with ERP and company systems seems still far to be achieved (IT vs OT challenge). A common persisting challenges that has emerged is related to the financial risk: companies experienced that rental or subscription models may be particularly attractive to customers with financial problems, that would not approach traditional "capex" offers.

Finally, the analysed companies show a various degree of maturity both in the offering and in the maturity dimensions analysed.

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Identifying best practices in the servitization of a manufacturing company

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Abstract

Benchmarking has been an indispensable requirement in strategic and operations management for decades. In order to make decisions, companies need to know what the best practices are. The servitisation strategy of a manufacturing company is not an exception. On the contrary, researchers have highlighted the difficulty of making the necessary transition from manufacturing to services. On this path, learning in detail about the best practices of other companies can be of great interest and use. However, although scientific production on servitisation has increased exponentially in recent years, little has focused on best practices.

This study tries to shed light on this problem by identifying best practices for the development of servitization strategy by a manufacturing company. Through a systematic review of the literature, best practices have been identified and grouped in four main groups: lifecycle perspective of business model, collaboration with stakeholders, leadership and widen knowledge and skill in the use of digital tools.

Keywords: Servitization, best practices, literature review, product service system.

Objective /rationale

There are more and more manufacturing companies betting on the joint offer of products and services as a way to improve their competitiveness. However, this strategic initiative described as servitization (Baines et al., 2017), raises doubts about its profitability (de la Calle & Freije, 2016). One of the main reasons that support these doubts is found on the objective of the servitization approach. The motivation for going ahead with this strategy could be defensive or offensive (Neely, 2008). Another important reason is that new and different capabilities are required. Companies must adapt to incorporate services as developing, managing and selling a product entails significant differences. (Kimita et al., 2022).

Servitization is being associated with different topics about the structure and management of the, specially manufacturing companies. It has been determined that the servitization adoption, that begins with the incorporation of services into the product offering, is in close interaction with other processes such as operational processes, organizational structure and digital technologies (Vendrell-Herrero et al., 2021). As a matter of fact, it spreads to the entire business model and culture. The academia is paying more attention to servitization as its adoption can develop more sustainable competitive advantages as they are more difficult to replicate by the competitors. However, there is still a lack of knowledge on service and industry practices (Bigdeli et al., 2021). Most of the research approach is based on a theoretical perspective

This study tries to shed light on this problem by identifying best practices that facilitate and support the development of servitization strategy in the manufacturing company. These practices will be identified through a systematic literature review and will be classified according to their characteristics and objectives.

Methods / Results / Findings

It was developed a search using “Servitization” and “Literature review” as keywords in order to identify to what extent the set of best practices in the context of servitization has been investigated.

According to a description of review process (Brereton, Kitchenham, Budgen, Turner & Khalil, 2007) systematic literature reviews contain a well-defined set of methodological stages. The three steps of the systematic review approach used in this study were (1) planning, (2) execution, and (3) analysis of the results (Pigosso & McAloone, 2016).

While starting the systematic literature search, the aim of the project was determined according to the problem we want to face, in our case, to identify best practices in the development of servitization strategy. We focus on the Web of Science database. The search results lead to gain interesting knowledge about the characteristics of the different publications: the distribution by years, the weight of the journals in which were published, the number of authors and the categories in which they are classified. Then, by reading the abstracts of the publications, it was decided how they would be classified: Practices, Conceptualization, Explaining Relationship Between Other Topics and Irrelevant. The aim was to draw attention to the lack of practical recommendations in the literature and to examine existing practices. The practices in the selected papers would be analysed in detail, other sources on the subject would be used if necessary, and a new practical approach would be presented.

The next stage, execution, was followed, after the planning stage was completed. According to the criteria for selecting research articles that identify best practices, just 7 out of 43 remain.

The analysis of the articles allows us to identify up to 51 proposed practices. All of them can be clustered into 4 main key

groups: (1) Lifecycle perspective of Business Model; (2) Collaboration with stakeholders; (3) Leadership; (4) Widen knowledge and skills in the use of digital tools.

The first main group, Lifecycle perspective of the business model, is based on the belief that for the successful implementation of a servitization strategy is mandatory to design a Product-Service system considering the whole life cycle (Aurich, Fuchs & Wagenknecht, 2006; Sundin & Bras, 2005; Reim, Örtqvist & Vinit, 2015). The Collaboration with stakeholders groups, can be divided according to the specific stakeholder with which the company collaborate. Thus, there are identified four subgroups such as, internal collaboration, customers or suppliers, other partners and, finally, cross functional teams. The third main group, Leadership, highlights the role of the project manager of the servitization transformation process. In this case, the person in charge and the methodology for managing the strategy conceptualization and implementation are the key aspects for the success of the servitization process. Finally, the Widen knowledge and skills in the use of digital tools group of practices, deals with the importance of using digital tools for both the offering of the service itself (marketing and sales) and to manage the service once the customer has already contract it. In addition, the company should train the employees in order to develop the appropriate skills.

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Session 3

Strategy and business models

Chairs: Glenn Parry & Heiko Gebauer

(Salon Convenciones-Ejecutivo)

The role of managerial heuristics in smart solutions: What manufacturers learn and how the use of 'simple rules' can facilitate strategic renewal?

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Abstract

Manufacturing companies are pursuing digital servitization strategies and thus, becoming smart solution providers. Manufacturer's strategic transition from selling products to selling smart solutions is creating various managerial challenges to executives as digital element forces manufacturers to make decisions and learn faster. This paper suggests that manufacturers need to rely more on use of mental shortcuts in decision-making, namely managerial heuristics, in order to thrive and learn. This paper contributes to the digital servitization literature by assessing what manufacturers learn when they servitize and unfolding how the use of heuristics can help them to become more agile and sustain competitive advantage when markets become more volatile and disruptive because of increased digitalization initiatives.

Keywords: Smart solutions, heuristics, simple rules, strategic renewal, digital servitization .

Introduction

Manufacturing companies have been pursuing digital servitization strategies to sustain competitive advantage and generate economic rents (Sklyar et al., 2019). This transition from selling equipment to selling product-service-software systems i.e. smart solutions (see Huikkola et al., 2022b) sets various challenges for manufacturing firms as capabilities required in this business discipline are different (Coreynen et al, 2020; Töytäri et al., 2018), business processes differ (Immelt, 2017) and also the routines to make decisions are different (Huikkola et al., 2022a).

This paper attempts to unfold the role and use of managerial heuristics to manage digital servitization process successfully. In particular, this paper attempts to shed light on how the use of managerial heuristics and ‘simple rules’ heuristics facilitate manufacturer’s strategic renewal and organizational learning. The contributions of this paper are twofold, as the article suggests that 1) understanding simple rules heuristics helps to assess what manufacturers learn when they servitize, and 2) use of simple rules heuristics can facilitate manufacturers strategic agility and learning capability.

Theoretical background

This paper contains two main literature streams: digital servitization and managerial heuristics. This paper contributes to the intersection of these distinct literature streams, thus increasing our understanding what 1) digital servitization stream can learn from the psychological foundations of strategy (microfoundations) and 2) what strategic renewal phenomenon (servitization) in middle-velocity industry (manufacturing) can reveal about managerial decision-making when markets are becoming increasingly volatile and disruptive.

Digital servitization

Digital servitization (DS) is a special stream under servitization research that highlights the role of digital tools for transformational process whereby a manufacturing firm shifts its business logic from product-centric to service-centric (Paschou et al., 2020). Digital element embedded in solutions makes them smart as they become connected to client's other systems (Porter & Heppelmann, 2014), helping customers to gain productivity benefits but becoming also more vulnerable to certain risks (e.g., data security; relying on only few suppliers). This strategic transition has been defined to require changes not only in offerings (Ulaga & Reinartz, 2011), but also on customer relationships (Töytäri et al., 2018), capabilities (Huikkola et al., 2022b), boundaries (Bigdeli et al., 2021; Bustinza et al., 2017), routines & processes (Immelt, 2017), and decision-making (Cui et al., 2019; Huikkola et al., 2022a; Kristensson & Magnusson, 2019).

Managerial heuristics

How managers make decisions has become an interesting topic for a few servitization scholars (see Cui et al., 2019; Dahmani et al., 2020; Huikkola et al., 2022; Kristensson & Magnusson, 2019). Huikkola et al., (2022) has found that in the era of digitalization and disruption, managers need to make decisions with autopilot, relying on mental shortcuts and “heuristics” that provide a fast and frugal way to achieve “good enough” (see Gigerenzer, 2008) or better decisions (Bingham & Eisenhardt, 2014). Even though the use of heuristics in decision-making may contain drawbacks such as framing and anchoring errors because of universal cognitive biases (see Kahneman, 2011), experts such as business specialists and executives may benefit from using this decision-making approach (Antretter et al., 2020; Sull & Eisenhardt, 2015). One specific form of heuristic thinking is “simple rules” heuristics (see Eisenhardt &

Sull, 2001) that stem from business managers' accumulated experience regarding certain strategic business processes such as making decisions about mergers, acquisitions, and investments (Bingham & Eisenhardt, 2014). These deliberative rules of thumb give not only strict guidelines on how to manage and run certain processes but also flexibility to operate under those rules. They also reflect what organization has learned along the way (Bingham & Eisenhardt, 2011).

Use of simple heuristics to manage digital servitization

Different types of heuristics can be depicted to understand what and how manufacturing companies learn when they try to become smart solution providers. We provide few practical illustrations of the use of heuristics to manage this type of strategic renewal. These heuristics are 1) selection heuristics, 2) process heuristics, 3) boundary heuristics, 4) priority heuristics, 5) time heuristics, 6) similarity heuristics, and 7) end heuristics.

Selection heuristics refer to guidelines regarding where to enter, for instance which service markets to serve (e.g., enter only English-speaking markets). *Process heuristics* guide how yes/no decisions are made in practice and how to execute a business process (e.g., always establish a separate digital and service unit). *Boundary heuristics* give clear limits how to allocate resources (e.g., 70/20/10 rule of allocating development resources to existing business, emerging businesses, and risky businesses). *Priority heuristics* accord with preferences and priorities for an organization (e.g., prioritize the most profitable customers and solutions over others). *Time heuristics* deal with managing schedules (e.g., new idea should not take more than 60 days from submission to decision). *Similarity heuristics* reflect how managers can utilize analogical thinking in their business decisions (e.g., follow the IoT development in the truck industry as

development there will be materialized in our industry after 2-3 years). *End heuristics* guide when to stop the activity or withdraw from the opportunity (e.g., stop the development project when the key customer withdraws from the project).

Use of these simple heuristics can increase manufacturers agility and facilitate organizational learning. When business environment is foggy, turbulent and volatile for instance because of digitalization initiatives, relying on heuristics may be highly useful for business managers to manage firm renewal in an agile manner.

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Fine-tuning the paradox lens for servitization research

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Abstract

Fine-tuning the paradox lens for servitization research

Despite growing research, the promised land of servitization remains hard to reach (Wagstaff, Burton & Zolkiewski, 2020; Zhang & Banerji, 2017; Valtakoski, 2017). Servitization, or “a strategy to add services to existing product-based offerings” (Khanra, Dhir, Parida & Kohtamäki, 2021, p. 151; Vendrell-Herrero et al., 2021) is said to enhance servitizing firms’ competitive position and potentially generate novel income streams (Raddats, Kowalkowski, Benedettini, Burton & Gebauer, 2019). However, financial benefits are seldom realized (Kohtamäki, Parida, Patel & Gebauer, 2020b; Wagstaff et al., 2020). Realizing successful implementation remains difficult (Alghisi & Saccani, 2015; Horváth & Szabó, 2019) and companies might face the ‘servitization paradox’ (Brax, Calabrese, Levialdi Ghiron, Tiburzi & Grönroos, 2021; Gebauer, Fleisch & Friedli, 2005).

A partial explanation for this persisting challenge can be found in the existence of numerous paradoxical tensions inherent to servitization (Kohtamäki, Einola & Rabetino, 2020a). The term *tensions* refers to oppositional tensions such as contradictions and dialectics leading to stress and discomfort when making choices (Panayiotou, Putnam & Kassinis, 2019). Tensions “underly the other constructs in this arena” and is the concept “scholars frequently use to signify all paradoxical dynamics” (Putnam, Fairhurst & Banghart, 2016, p.68). Paradoxes are “contradictory yet interrelated elements that exist simultaneously and persist over time” (Smith & Lewis, 2011, p. 382). In servitization literature, authors often combine paradox with tension, using the term “paradoxical tensions” (e.g., Tóth, Sklyar, Kowalkowski, Sorhammar, Tronvoll, Wirths, 2022).

Manufacturers experience difficulties in facing paradoxes (Gebauer, Fleisch, Lamprecht & Wortmann, 2020b) because they persist over time and are inherently unsolvable (Smith & Lewis, 2011). Being able to cope with them, however, is crucial. Especially in servitization-related business model changes (Paiola & Gebauer, 2020) and in complex, advanced product-service systems (Story, Raddats, Burton, Zolkiewski & Baines, 2017) fueled by the rising inclusion of digitization in companies’ servitization efforts (Gebauer et al., 2020b), B2B managers might be caught in a *web of paradoxical tensions*. As a result, we see a notable rise in *paradox-in-servitization* research in recent years with contributions such as Tóth et al., 2022; Dmitrijeva, Schroeder, Bigdeli & Baines, 2022, Gebauer et al. 2020b, Kohtamäki et al., 2020a, Sandvik, Sjödin, Brekke & Parida, 2021, Galvani & Bocconcelli, 2022 (non-exhaustive list).

Several authors called for strengthening the paradox theory lens in the field of (digital) servitization (Tóth et al., 2022; Kohtamäki et al., 2020a; Tronvoll, Sklyar, Sörhammar & Kowalkowski, 2020; Gölgeci, Karakas & Tatoglu, 2019). Therefore, in this paper we make an evaluation of the nascent and growing literature on paradox-in-servitization. We ask: “*What is the present status of the application of paradox theory in paradox-in-servitization research?*” The aim of our study is to evaluate the status of the application of paradox theory in (digital) servitization literature and to formulate recommendations on how potentially to fine-tune the paradox theory lens. To do so, we build on Cunha and Putnam’s (2019) “paradox of success”

analysis of the application of paradox theory in strategic management and organization studies. We deliberately search for symptoms of the paradox of success trap in servitization studies, not to criticize colleagues' early efforts to apply paradox theory to our field, but to develop a fine-tuned lens for engaging in the next stage of the paradox-in-servitization field's development. In fact, based on our analysis, recommendations can be formulated enhancing conceptual clarity while conceiving paradox-as-process, considering webs of tensions and paradoxes, and developing a portfolio perspective on paradox coping strategies. The articles have been identified and studied through a focused literature review (Snyder, 2019) of (digital) servitization review articles (e.g., Khanra, Dhir, Parida & Kohtamäki, 2021, Rabetino, Kohtamäki, Brax, Sihvonen, 2021; Raddats, Kowalkowski, Benedettini, Burton & Gebauer, 2019) and articles studying specifically paradoxes in servitization.

Paradox theory has been widely applied in different management fields. However, Cunha and Putnam (2019) pinpoint the danger of such proliferation. They claim paradox theory might fall into the trap of its own success, the so-called "paradox of success". They denominate three symptoms of this paradox of success: "premature convergence on theoretical dimensions, overconfidence in dominant explanations, and institutionalized labels that protect dominant logics" (Cunha & Putnam, 2019; p. 96). Four ramifications are the result of the above-described symptoms: Conceptual imprecision whereby paradox becomes an umbrella concept for all types of tensions; the reduction in perspective to look at paradox as a tool or a problem; the taming of paradox; and reification (Cunha & Putnam, 2019, p. 101). The interrelated nature of paradoxes leads to the fact that paradoxes cannot be harnessed nor tamed. In this paper, we operationalize their suggested symptoms and ramifications and analyze/evaluate the core papers on paradox-in-servitization literature along these operationalized qualitative measures.

The analysis reveals some evidence of the paradox of success in this field. We see:

(1) *premature convergence on dimensions and concepts* because servitization research has been mainly characterized by *either-or thinking*

(Kohtamäki et al., 2020a). However, though banking on one pole of a paradox can, in the short-term, alleviate the stress and anxiety evoked by paradoxes' irreconcilable nature, this tactic can only provide temporary solace (Miron-Spektor, Ingram, Keller, Smith & Lewis, 2018). Several authors have therefore suggested moving from this 'either-or' mindset toward a 'both-and' and 'more-than' strategy in which paradoxes are addressed as inseparable and co-dependent (Smith & Lewis, 2011; Andriopoulos & Lewis, 2010). Kohtamäki et al. (2020b) apply a 'both-and' view in the servitization field.

(2) *overconfidence in dominant explanations* such as the Smith & Lewis (2011) paradox typology (e.g., in Kohtamäki et al., 2020b).

(3) a degree of *conceptual imprecision* and the conception of *paradox as problem*. For instance, Dmitrijeva et al. (2022), Tóth et al. (2022) and Galvani & Bocconcelli (2022) seemingly use the term paradoxical tensions also for contradictions, ambiguities, and similar problems. The *equilibrium model* (Fairhurst & Putnam, 2019) is clearly apparent in most paradox-as-servitization research contributions leading to a 'problem solving' rather than a more dynamic paradox 'taming' or 'coping' perspective.

Next, we conceive how the paradox theory lens can be *fine-tuned* in servitization research and a richer perspective on paradox and paradox coping can be developed building on general paradox theory and paradox theory applications in the strategic management field.

Several theoretical contributions are made. To servitization literature, we add by highlighting the interdependent, co-evolving nature of servitization paradoxes, and by substantiating the need for a novel approach that deepens our understanding of these dynamics. Congruent with Cunha & Putnam's (2019) suggestion for future research, we treat paradoxes "as nested and knotted" (p. 102) organizational elements for which effective management requires a combination of *trade-off and synergy approaches*. Finally, we invite deviating from the *equilibrium model* for coping with paradoxes (Fairhurst & Putnam, 2019) thereby suggesting scholars in servitization to embrace fully the dynamics in paradoxes and paradox coping.

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A state-of-the-art analysis of the interplay among digitalization, servitization and business model

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Abstract

In the present scenario, servitization and digitalization are gaining attention as opportunities to strengthen companies' market power and strategies to face the increasing levels of globalization and competition. The combination of these trends, known as digital servitization, leads to the development of integrated product-service systems, made intelligent by digital technologies and able to offer customized solutions. This transition implies not only a change in the firms' offerings but also a transformation of their business models (BMs). However, given the recent emergence of the two phenomena, the academic literature, especially for what concerns the analysis of business reconfigurations needed has been developing rapidly and in a quite fragmented way. This article aims to perform a systematic literature review, in order to identify patterns and trends in the extant academic research. The paper contributes to advance the literature on digital servitization and BM innovation and to support practitioners in facing the challenges implied by the transformation.

Keywords: Servitization, Digitalization, Business model, Literature review.

Introduction and relevance of the research

In the current scenario, characterized by globalization and increasing competition, two phenomena have started reshaping firms' competitiveness, named servitization and digitalization. Servitization consists in integrating services in firms' portfolio (Weking et al., 2020): companies' offerings shift from pure products to integrated systems of products and services, able to satisfy customers' needs through personalized solutions. Digitalization refers to the use of advanced technologies in products and processes, to exploit the enhanced efficiency and effectiveness (Opazo-Basález et al., 2018; Tronvoll et al., 2020; Taylor et al., 2020). Both trends contribute to increase competitiveness, create differentiation, and reinforce the relationship with customers, supplying personalized offerings (Martín-Peña et al., 2019), through digitalization. The merge of the two trends – named “digital servitization” – consists in developing new/progressed services, made smart through technologies (Paschou et al., 2020). The results are digitally enabled product-service systems (PSSs), representing customized offerings and satisfying customers' needs (Gebauer et al., 2021).

To be effective, the transition of manufacturing companies towards digital servitization needs a business model (BM) transformation, which, in turn, necessitates new capabilities, processes and strategies (Paiola & Gebauer, 2020; Vendrell-Herrero et al., 2021).

The literature on the topic has been growing rapidly and in a quite fragmented way, thus making it fundamental to systematize it and provide a complete overview on which future research might depart from.

Given the abovementioned characteristics of the theme and extant research, this article aims to perform a literature review and

analyse the state of the art about digital servitization, to identify the features of the topic, issues addressed in past research and gaps in the literature.

Methodology

The authors addressed the purpose of this article, performing a systematic literature review. According to Pittaway et al. (2004), authors first defined the query, combining keywords related to the three topics: digitalization, servitization and BM. As a result, the WoS database returned 667 articles. Authors fine-tuned results according to disciplines (i.e. management, business and operations research management science), document type (i.e. article, review and early access), language (i.e. English) and by reading abstracts and full articles, when needed, applying inclusion/exclusion criteria: only articles focusing simultaneously on servitization, digitalization and BMs and considering companies operating in manufacturing sectors were retained. After the scrutiny, authors ended with a final sample of 66 articles, dealing with the relationship between digital servitization and business model components.

Preliminary results

Results show that the topic is in its infancy and further research is needed to deepen it. Particularly, most articles examine servitization without specifying the type of service or whether, which and how digital technologies support such offering, as well as the implications on BM components. Only few articles investigate specific PSS, namely product-oriented, use-oriented and result-oriented services (based on the classification by Tukker, 2004); in this case, the value increasingly moves from the product towards the service along the three types of PSS. Literature mostly investigate product-oriented services, for which some indications on how

specific technologies can support them and, in few cases, on implications on BM components, as classified by Teece (2010), are provided. Based on the literature review results, an agenda for future research is discussed, considering the interplay between servitization, BM components and digital technologies.

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Mapping knowledge in servitization and corporate entrepreneurship: A bibliometric co-word analysis of academic literature

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Abstract

This paper aims to contribute to a better understanding of the literature on servitization and corporate entrepreneurship. Several studies have used bibliometric methods to study servitization and corporate entrepreneurship separately. However, no study has considered these fields in combination using a bibliometric approach. The main objective of this paper is to understand the relationship between servitization and corporate entrepreneurship in order to show the morphology of existing research. Based on a co-word bibliometric analysis our research identifies the main topics investigated in the literature on servitization and corporate entrepreneurship, trends in research and possible future developments. Visualization of co-word networks and the strategic diagram associated further helps clarify researcher' common research foci and relevant research trends. Derived discussion and potential research directions are also provided.

Keywords: Servitization, corporate entrepreneurship, bibliometric analysis, co-words analysis.

Introduction

Research focused on analysing the transition of industrial companies towards new business models increasingly dominated by

services started to develop in the late 1980s and is coined with the term servitization (Vandermerwe & Rada, 1988).

When a company wishes to implement a servitization process, organisations must design new capabilities, business models, and processes to enable and support this paradigm shift (Baines et al., 2009). In this sense, Servitization implies Entrepreneurial opportunities for services/service innovation in industrial firms. Servitization entails entrepreneurial endeavour and decision makers in the servitization process face very similar situations to entrepreneurs in their start-up.

However, despite the relationships that can be established between the research topics “servitization” and “entrepreneurship”, there are bibliometric studies in the literature that analyse them separately.

Thus, this work aims to advance along this line. In particular, the objective is to identify different themes treated by the field (servitization and corporate entrepreneurship) to create a science map.

This study contributes to servitization research and theory by broadening its boundary from the field of entrepreneurship into servitization field in order to achieve new theoretical insights.

Methodology

The data for this study were collected from the Web of Science core database. The selected time was from 1992 to 2022. The database was searched using the terms: (“corporate entrepreneurship” OR “corporate venturing”) AND (“serviti*” OR “service orientation” OR “service strategy” OR “digital serv*” OR “integrated products and service*” OR “industrial service” OR “industry 4.0”). A total of 369 compliant publications were found.

Results

Evolution over time

Figure 1. shows that most of the documents were published in the last decade.

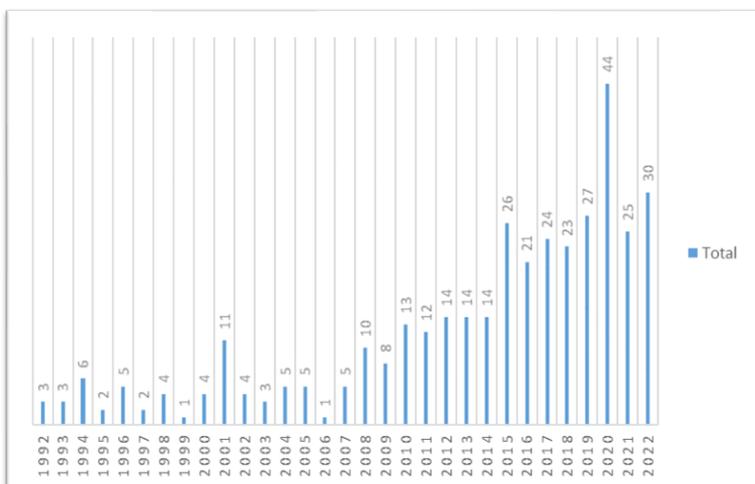


Figure 1. Evolution over time

Co-word analysis

We analyze the keywords assigned by the authors of the documents. The methodological foundation of co-word analysis is when keywords frequently co-occur in documents, it means that the concepts represented by those key- words are closely related.

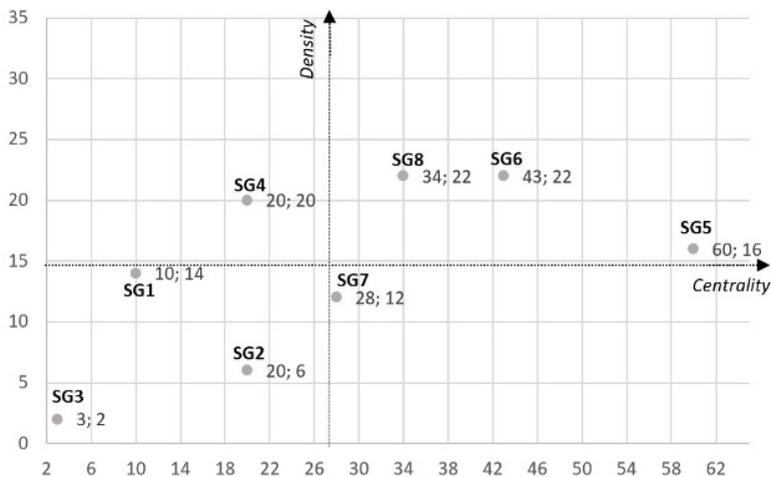
A total of 1108 keywords were identified. The total number of words that are repeated more than once, i.e. in two or more documents, is 141. We used those articles that had been cited at least 3 times. In this way, 61 keywords (Table 1) were selected to serve the starting point for subsequent co-occurrence analysis.

Strategic diagram

Callon, et al. (1991) point out that the fundamental basis of co-word analysis is that the co-occurrence of keywords. The more words co-occur frequently between different documents, the more the research themes and the connections between those themes are reinforced. As a result of this methodology we have been able to find eight clusters of words that are assimilable to research topics whose content is described by the words that constitute the aggregate.

Cluster sets are graphically displayed using standard software in so-called strategical diagrams (Callon et al., 1991) according to their cluster centrality (abscissa) and density (ordinate). The axes' origin is determined by the medians of centrality and density.

Figure 3 presents the strategic diagram of servitization research and corporate entrepreneurship.



Median centrality = 27.25; median density = 14.25

Figure 3. Strategic diagram

Eight research lines have been identified (Table 2).

Peripheral and developed	Central and developed
<ul style="list-style-type: none"> ▪ (SG4)Sub-group 4: Corporate social entrepreneurship; Corporate social responsibility; Dynamic capabilities; Internationalization; Social entrepreneurship; Social innovation; Sustainability. (See Figure 3: centrality=20; density=20). 	<ul style="list-style-type: none"> ▪ (SG5) Sub-group 5: Case study; Corporate entrepreneurship; Entrepreneurship; Firm performance; Intrapreneurship; Organizational learning; Patents; personal values; Risk-taking. (See Figure 3: centrality=60; density=16). ▪ (SG6) Sub-group 6: Competitive advantage; Corporate culture; Corporate governance; Corporate strategy; Customer orientation; Emerging Economies; Environmental management; Foreign direct investment; Growth; Innovation; Innovativeness; Trust. (See Figure 3: centrality=43; density=22). ▪ (SG8)Sub-group 8: Entrepreneurial orientation; Industry; Product innovation; Resource-based view; Small firms; SMEs; Structural equation modelling; Vietnam. (See Figure 3: centrality=34; density=22).
Peripheral and undeveloped	Central and undeveloped
<ul style="list-style-type: none"> ▪ (SG1) Sub-group 1: Ambidexterity; Business model; Corporate venture capital; Emerging markets; International business; Stakeholders; Sustainable development; Sustainable entrepreneurship. (See Figure 3: centrality=10; density=14). ▪ (SG2) Sub-group 2: Corporate venturing; Family firms; Industry 4.0; Open innovation; Performance; Telecommunications; Venture capital. (See Figure 3: centrality=20; density=6). ▪ (SG3) Sub-group 3: Big data; Business model innovation. (See Figure 3: centrality=3; density=3). 	<ul style="list-style-type: none"> ▪ (SG7)Sub-group 7: China; Competitive intensity; Entry modes; Financial performance; Human capital; Knowledge management; Organizational performance; Social capital. (See Figure 3: centrality=28; density=12).
<p><i>*The word in bold is the central one within the aggregate and serves to designate it</i></p>	

Table 2. Characterization of the clusters

The location of the research lines in the strategic diagram illustrates their significance. SG1, SG2 and SG3 which represent peripheral, underdeveloped lines of research that currently show little connection in their internal relations and little external recognition.

Cluster SG4 is not very central (they can be classified as peripheral) but with a high density in their internal relations. This SG4 cluster can be interpreted as an area of specialisation that interacts weakly with respect to the rest of the sub-networks within the field of servitization and corporate entrepreneurship research.

Cluster SG7 is located in the quadrant where lines of research are represented that are broadly connected to each other, but where the density of internal relationships within the cluster is relatively weak. It should be noted that this is the emergence, within the network of servitization and corporate entrepreneurship, of a research problem that is becoming central, but is not yet the subject of significant investment: it is a maturing line of research, and its importance for the field is already indicated by its degree of centrality.

Clusters SG5 (Corporate Entrepreneurship), SG6 (Corporate strategy) and SG8 (Entrepreneurial orientation) are central lines of research in the overall network and are crossed by intense internal relationships that show their high degree of development and integration. These three clusters illustrate the existence of consolidated lines of research from which corporate entrepreneurship is addressed as innovation, customer orientation or product innovation. In short, innovation has been conceived as central to corporate entrepreneurship where servitization, in its different forms, involves new combinations of resources that are related to opportunities for the firm.

Conclusions

The main objective of this work has been to configure the strategic diagram of joint research in servitization and corporate entrepreneurship. The results of the study provide a systematic and objective means of identifying the different knowledge nodes in the development of research in servitization and corporate entrepreneurship. It presents the state of the art of the literature on servitization and corporate entrepreneurship through the identification of research clusters that allow us to present some potential areas for future research.

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Boundary conditions for adopting scalable and relational servitized business models

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Abstract

The following research focuses on identifying associations between market scope, i.e., industrial boundary conditions, and market strategies, i.e., scalable, and relational business models. For this purpose, we seek to understand the different optimal strategies in servitization, depending on the nature of the final consumer: another business (B2B) or a household (B2C). Using primary data collected from 166 Spanish manufacturing firms, results depict that scalable servitization is superior in B2C markets, whereas relational servitization is superior in B2B markets.

Keywords: Relational, Scalability, B2B, B2C, Servitization.

Introduction

The rapid growth in firms over the last decade through services and technology has brought new challenges for academics and,

specific, the servitization field theory. (Gomes et al., 2021; Vendrell-Herrero et al., 2021a). Researchers are pursuing the different causes and contexts in which servitization can prosper (Gomes et al., 2021; Rabetino et al., 2021; Raddats et al., 2019; Vendrell-Herrero et al., 2021b). Among these studies, however, there is a gap in the understanding of how the market scope (B2B and B2C) in servitized companies can benefit from the market strategies orientation pursuing a relational or a scalable approach (Kamalaldin et al., 2019; Kowalkowski et al., 2015; Monteiro, 2019; OECD, 2021). Deciphering this intangible relation can benefit the servitization theory by adding new variables in understanding the success and failure of implementing servitization in the business ecosystem and firm performance (Aspara et al., 2010; Opazo-Basáez et al., 2022).

In B2B business models, it is clear that a relational approach can benefit servitization (Kamalaldin et al., 2019), while in B2C models, a scaling or scale-up strategy will affect stronger relations to the business performance (Monteiro, 2019). However, this field of theory has not been worked on by researchers in servitization theories (Rabetino et al., 2021; Vendrell-Herrero et al., 2021a). Many studies look for servitization success or failure in B2B firms, and little is known in the B2C context, whose studies frequently put marketing and service theories before business performance (Kowalkowski et al., 2017).

This research attempts to discover how B2B and B2C business models are related to business performance through a relational view (B2B) and a scalable view (B2C). In particular, it seeks to describe the characteristics of these two perspectives, with the variables of retention that can measure customer and firm's relationship and scalability, or how the company exponentially grows in different markets with the same business model. Preliminary results confirm the bond between businesses' market

strategy and the market scope for market value identification. B2B companies are more prone to establish relational market strategies, whereas B2C servitized companies are more inclined to scalable market strategies.

		Market strategies for servitization	
		<i>Scalable</i>	<i>Relational</i>
Market Scope	B2C	Optimal strategy	Sub-optimal strategy
	B2B	Sub-optimal strategy	Optimal strategy

Table 1. Market scope and market strategies approach in servitization

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Session 4
Digital transformation

Co-Chairs: Oscar Bustinza & Marco Opazo

(Salon Convenciones-Ejecutivo)

Learning by exporting: the role of digitalization and servitization

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Abstract

We draw on the learning-by-exporting perspective to argue that digitalization and servitization offer new opportunities for firms to increase their productivity by raising their export intensity. We test these effects on a unique balanced panel data from Portuguese manufacturing firms composed of 182,488 firm-year observations. Results have important managerial and policy implications.

Keywords: Servitization, exporting, learning by exporting .

Executive summary

Exporting has become the most popular means for firm internationalization, now representing about 29% of global gross domestic product (World Bank, 2021). Scholars from various backgrounds have consequently devoted a great deal of attention to understanding the drivers and impact of export activity. One central

conclusion from most of these studies is that firm productivity and export activity are strongly related (see Bernard & Jensen, 1999; Gomes et al., 2018; Love & Roper, 2015).

The internationalization process model offers important insights regarding this relationship and has given rise to two complementary research streams (Vahlne & Johanson, 2017): Self-selection and Learning-by-exporting (LBE). We focus on the latter, which posits that export activity exposes firms to new knowledge that may not be available in the home market, thereby producing opportunities for learning from operating in foreign markets (Salomon & Jin, 2008). Recent research has found that LBE effect is stronger in less developed countries, and that the LBE effect for high income countries is practically negligible (Vendrell-Herrero et al., 2022). In this study, we aim to examine whether the LBE effect in developed nations may be constrained to certain business models, i.e., digitalization and servitization.

On the one hand, our model posits that digitization allows companies to store all knowledge flows and speed up internationalization processes (Lee et al., 2019; Opazo-Basáez et al., 2021), giving companies more flexibility to learn from exporting. On the other hand, our model proposes that servitization provides companies greater commitment to international markets (Shleha et al., 2022) and international performance (Aquilante and Vendrell-Herrero, 2021), hence offering greater opportunities to learn from exporting. In fact, this phenomenon of international expansion through services has been described in the literature as bi-exporting. Companies that do bi-exporting are competitive because while they account for less than 10% of companies, they account for more than 30% of a country's international trade (Ariu, 2016). We also consider purer models of servitization in which manufacturers export only services (service exporters).

These hypotheses are tested with a balanced panel data obtained through the Bank of Portugal. Said database contains complete longitudinal information for 22,811 manufacturing firms for the period 2011-2019, thus obtaining 182,488 firm-year observations after imposing one year lag. One of the relevant features of this data is that separates exports by products and services.

Preliminary results are exhibited in Figure 1. Our findings show that in Portugal the LBE grows with two country-level indicators: Digital and society index (DESI) (European Commission, 2021) and the percentage of internet users (World Bank, 2021). This result confirms that digitalization boosts the LBE effect. Our results also show that the LBE is stronger for service exporters for standard levels of internet adoption and DESI. This shows that purer models of servitization offers the appropriate conditions to engage and

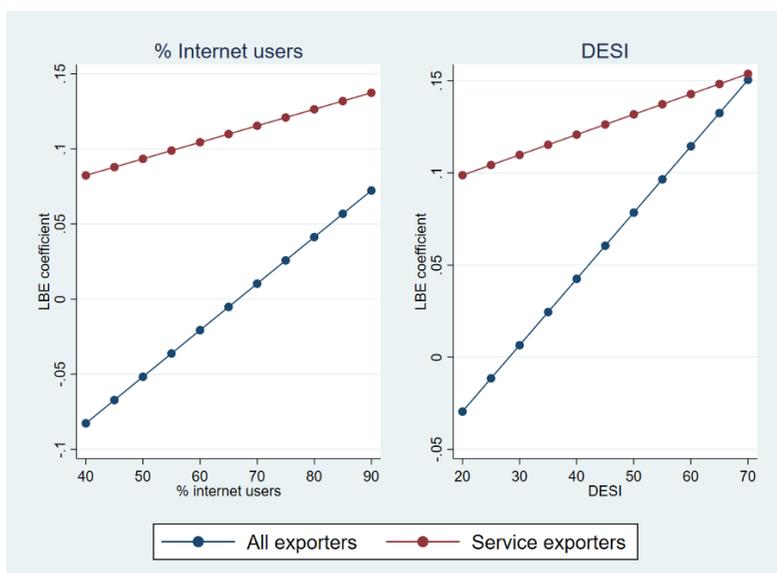


Figure 1. LBE effect by % internet users and digitalization index

learn from foreign customers. Our results are important for policy making, as they suggest that services and digitalization may reopen the interest in export promotion policies in developed nations (see Grossman (1986) for a review and critique).

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A value architecture perspective of product-service-software systems

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Abstract

Product companies continue to struggle with transitioning from product-centric to servitized business models delivering product-service-software systems (PSSS). While the literature on digital servitization continues to grow, practitioners gradually infusing their business with servitized and digitized elements are still keen to understand the underlying value creation and delivery. Our study examines the complex dynamics of PSSS value architectures in light of existing value networks. Combining a longitudinal single case study spanning over three years in the construction industry with a cross-industry multiple case study approach, we collect insights from product companies, value network actors such as distributors, and customers. In an interdisciplinary approach, we integrate marketing and channel management perspectives to derive collaboration archetypes to deliver PSSSs in existing value networks and address the question of which player can contribute to the value proposition in which way. For managers, this study offers an

overview of relevant change drivers shaping PSSS value architectures and their implications on essential capabilities and processes.

Keywords: Servitization, IoT, Product-service systems, value architecture, supplier relations, channel management, distributor, value network.

Research Motivation

In today's fast-moving world, megatrends such as digitization and servitization reshape international value creation and delivery – intensifying global competitive pressure and shifting market and even company boundaries. Hence, companies are forced across industries to challenge traditional product-oriented business models seeking innovative value-generating opportunities. Under those circumstances, product-service-software systems (PSSS) offer intriguing paths to creating resilient businesses.

Within the past centuries, the knowledge of servitized business models evolved into a well-established research field. Especially in the light of emerging technologies and the COVID19 pandemic, interest in possibilities enabling remote digital services continues to grow. Although existing literature offers broad insights into the desirability of PSSS, many manufacturers continue to struggle to implement PSSS value architectures in practice. In past research efforts, the role of software and digitalization in servitization was underestimated (Coreynen, Matthyssens & Van Bockhaven, 2017), so researchers and practitioners alike are keen to fully understand the practical design, development, management, and marketing of PSSSs (Kindström & Kowalkowski, 2014).

While most exploratory research investigated servitized value constellations under the implicit assumption of direct relations between the provider and the customer, a parallel research stream investigating PSSSs delivery in the context of complex ecosystems

emerged. However, to the best of the authors' knowledge, until today, common product companies' value structures building on distribution partnerships has been mostly neglected in PSSS literature. Filling this blind spot, we raise the following overarching research question:

How can the value architecture for PSSS be designed between product companies, distribution partners, and customers?

This study focuses on established product companies transforming their business models and investigates servitized value architectures in the context of existing product-oriented business models and value networks. Transitioning towards PSSSs entails a purposeful adaption of the complete value constellation. In practice, companies are often confronted with a business model duality instead of entirely betting on a fundamental shift. Especially large manufacturing firms hesitate to radically replace goods sales with PSSSs but instead choose to “infuse” servitized business models into their existing sales approaches (Ulaga & Reinartz, 2011). This gradual shift entails many challenges, such as balancing potentially contradicting business models with diverging value creation logics. Especially manufacturers typically relying on indirect sales through channel intermediaries face the challenge of aligning all sales initiatives with their existing distribution network to avoid conflicts.

Contribution to Theory and Practice

With this study, we follow the call for a better understanding of the implementation of PSSSs (Adrodegari & Saccani, 2017; Baines et al., 2017; Reim, Parida & Örtqvist, 2015) and contribute to the rising research body on the transition towards PSSSs (Kohtamäki, Rabetino, Einola, Parida & Patel, 2021). More specifically, we address the research gap on manufacturers' capabilities in PSSSs required to elaborate value creation and delivery jointly with

distribution partners by channeling competitive advantages through digital and strategic capabilities and the reconfiguration of resources and processes (Kohtamäki, Parida, Oghazi, Gebauer & Baines, 2019, p. 385).

This study addresses the overarching research problem of PSSS value architectures by large product companies shifting from product-centered business models towards PSSSs. Following the research efforts on adapted organizations, sales processes, and capabilities when transitioning towards selling PSSs (Oliva & Kallenberg, 2003, p. 167; Ulaga & Reinartz, 2011), we plan to extend this understanding to selling PSSS offerings. This study shall lead to a detailed knowledge of the capabilities required for effective PSSSs sales and, hence, contribute to feasible value delivery. To tackle this complex problem, we integrate insights from the marketing discipline such as channel management and value proposition design and delivery. Such an interdisciplinary approach allows us to address the issue beyond the scope of the servitization discipline (Wagner et al., 2011).

The following sub-research questions address the overarching problem of PSSS value architectures in existing value networks:

- (1) Why are value architectures changing?
- (2) How does a business model transition from product to PSSS sales affect the value network?
- (3) How does a business model transition from product to PSSS sales affect value creation and delivery?

Methodology

The methodology is of dual nature and combines a longitudinal single case study with a multiple case study approach. Over three years, we will examine a reference case of a product-oriented power tool manufacturer to understand the value architecture in-depth.

Addressing common single-case study shortcomings such as limited transferability and generalizability, an additional analysis of multiple cases in the agriculture and automotive industries broadens the database and increases the findings' overall validity (Eisenhardt & Graebner, 2007; Stake, 2013). The qualitative data will be collected in semi-structured expert interviews, workshops, and focus group discussions. While most qualitative servitization research currently focuses on the producing perspective only, this research applies a three-fold focus collecting insights from the manufacturer, vital value network actors such as distributors, and customers.

Expected Results

Corresponding to the research questions, the expected results will serve three purposes. First, we want to understand which trends shape PSSS value architectures and networks. Applying perspectives from marketing and channel management practices, we contribute to theory and practice with an overview of relevant change drivers and their implications. Second, we plan to identify different network collaboration archetypes which can be applied to successfully deliver PSSS in existing distribution structures. Building on fundamental channel concepts, we investigate shifting channel competencies, related requirements, and key capabilities. Third, the research aims to consolidate the findings into a transferable and maybe even generalizable understanding of the value architecture of PSSS, including essential capabilities in value creation and familiar patterns of the value delivery within the value network. This understanding shall apply to related operating processes, capabilities, resources, and partnerships.

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Value creation in a digital service ecosystem

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Abstract

Digitalization has changed the boundaries of many firms, involving them in a broader service ecosystem. To offer both traditional manufactured products as well as digital solutions has implications on how ecosystem actors formulate value propositions, business models, and how they collaborate. Therefore, this study aims to create an understanding of the challenges related to the handling of different logics within an ecosystem. The multiple case study of manufacturers offering both digitally enabled services and manufactured products, indicates that challenges are related to various areas, such as actors, collaboration constellations, processes, and value propositions. Moreover, this study empirically illustrates how firms adjust to the challenges related to not only being part of a traditional logic, but at the same time offer services based on a profoundly different service logic.

Keywords: Digital services, ecosystem, business logics, value co-creation.

New technologies (big data analytics, mobile technology, or cloud computing) and the business use of these technologies – digitalization – differ from earlier IT endeavors (Bharadwaj et al., 2013). Digitalization exhibits new properties and is generative, malleable, and combinatorial (Kallinikos et al., 2013). Accordingly, previous assumptions about material characteristics and their consequences for organizations (e.g., Boudreau & Robey, 2005) may

no longer hold. Besides, many digital technologies cannot be restricted to the boundaries of specific firms or industries but involve a broader service ecosystem. The overarching digital infrastructures that emerge are open, flexible, and ready for use by anyone (Tilson et al., 2010). Due to the increasing turbulence, digital service ecosystems are changing the rules of the game in many industries through disruptions of business models (Vendrell-Herrero et al, 2018). Thus, the focus of many past studies on change within an organization seems insufficient and restricted.

Digitalization facilitates and enables digital service ecosystems that embed different actors (e.g., firms, customers, suppliers). This has profound implications on how ecosystem actors formulate value propositions, business models, and how they collaborate. This development contributes to an increased dynamics within industries and service ecosystems, in which firms must now compete with an increasing number of competitors from numerous industries and, in some instances, with entirely different business models. The actors fundamentally build upon widely shared digital technology that is generative and adaptable (Tilson et al., 2010) and are constantly changing (El Sawy & Perreira, 2013). This makes the service ecosystem a complex adaptive system, where change is constant, initiated, and driven from multiple directions and can unfold unpredictably (Tanriverdi et al., 2010). This non-linearity makes the ecosystems better understood from a value co-creation perspective. Taking such stance implies that value is co-created and emerge during interaction amongst actors within the dynamic ecosystem. The shift toward connected service ecosystems converges previously separated firms from different industries increasingly operate and compete within the same markets due to the advantages of digital technologies (Vaillant et al., 2021).

For firms, these connected ecosystems imply challenges not only related to the adaptation to the dynamic ecosystem per se, but also,

at the same time, balancing their traditional position as a product manufacturer. To act only within the 'new' ecosystem is not possible for all firms, many are those who are more or less bound to continue working in a traditional way offering for instance diesel engines, until it is ready to be replaced by new offers. Firms are thus finding themselves in a new position of being able to handle two logics at the same time. Against this backdrop, the study aims to create an understanding of the challenges related to the handling of different logics within an ecosystem.

The paper reports on a multiple case study of multinational manufacturing firms from the transportation-, the pulp and paper-, and the marine industries, working in parallel with digitally enabled services and traditional manufacturing products. The collected data consists of interviews with both firm and customer representants, documents, and observations from workshops and meetings.

The preliminary findings indicate various areas of challenges, all interrelated, involving actors, collaboration constellations, processes, and value propositions. When it comes to the actors, these take on new roles within the digitally enabled ecosystem. The customer is not just a passive receiver of the offer but rather a highly involved co-creator of the value proposition. A change that calls for new processes and new forms of collaborative constellations. This paper contributes by empirically illustrating how firms adjust to the challenges of not only being part of the traditional logic maintained by products that will continue to have a central importance, but at the same time also offer services based on a profoundly different service logic. By highlighting these challenges, the findings offer guidance to practitioners struggling to servitize their organization.

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Innovating the field service technician experience in the business ecosystem for smart digital services

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Abstract

This paper addresses the role of digital technologies in the development of business ecosystems through smart services based on a single case study of a multinational manufacturing company which is developing a global field service solution. The paper takes the field service solution back reporting package and through the lens of service design tools such as service blueprint analyses the experience and pain points of the technicians. In addition, its further analyses the business ecosystem. It was found that smart in terms of technology cannot be considered smart services if they do not take into account the adoption of those by the customers/users. For that, both the business and the IT department should work together. It was found that digitalization strategy is usually creating value for IT and the global business while it often does not have a correlation with value creation for the customers.

Keywords: digital servitization, technology-driven service innovation, field service

Introduction and motivation

Emerging technologies are bringing a digital transformation in which companies need to develop not only products but customized experiences for their customers by improving the value provided or developing new ones in a fierce competitors' environment.

According to (Paschou et al., 2020) research is mostly focused on how digital technologies enable benefits traditionally related to servitization such as competitiveness and reducing costs. Only a few studies indicated new or specific benefits such as enabling platform-based businesses to empower customers that enhance the experience.

In addition, digital technologies plus data can develop smart services for both internal and external customers (Stoll et al., 2020; Vendrell-Herrero et al., 2021). The smartness of services should not be evaluated by the level of technology but based on the service ecosystem, service platform and value co-creation (West et al., 2018). In the case of field service, the solutions are usually pushed from the centre (business) out to the field causing harm instead of improving the technician experience (Bales et al., 2018).

This research bridges the gap by focusing on enabling platforms and the empowerment of the field service technician highlighting the role of technology as an enabler for value creation. In the framework of a multinational manufacturing company and specifically in the field service solution they are developing, a clear value proposition for the technicians was developed. The maturity of the digital services and the smartness of the business ecosystem were assessed based on (West et al., 2018; Neuhüttler et al., 2018), the field service engineer's experience was improved and the role of technology and IT to achieve a smart state was defined. The research question is:

“How to innovate the field service technician experience in the business ecosystem through smart digital services”

Methodology

Five steps were taken to first understand the service business and the digitization of the field service solution in the company (first

diamond) and then, the daily field service engineers' challenges were assessed (second diamond) see Figure 1. Starting with a literature review, company internal interviews/conversations were conducted to understand the field service solution and clustered into the process, people and technology categories (Singapore Smart Industry Readiness EDB, 2018). This was followed up by validation interviews with service experts to validate the internal results obtained before and to assess the maturity and the smartness of the service business. (West et al., 2018; Neuhüttler et al., 2018), The second part of the research was focusing on one of the main packages developed by the IT department, the back reporting (documentation by the technician is required to be written while/ after the work) is analyzed in more detail using service design thinking (Stickdorn & Schneider, 2012) such as customer journey and service blueprint. This analysis was further supported by qualitative interviews with technicians from different industries. Finally, the barriers and challenges found are assessed based on the first diamond's main results.

To conclude, recommendations were set up regarding the role of smart services and technology in improving the field service engineers' experience.



Figure 1. Methodology applied in this paper

Findings

The results of the service blueprint and the customer journey network identified the field service technician as the “key user” of the field service solution. The field service technician provided the main touch point between the customer and the firm. New digitalization tools were found to be adding additional administrative efforts that they did not appreciate. Table 2 summarizes the lessons learnt based on the three dimensions of people, process and technology.

IT was responsible for the development of new tools and technologies including the harmonization of those globally. Operational business units tried to collect as much data, using the field service technician as the main data collector and hence the administrative burden increased. From the business perspective, the more data and information, the better. However, from the technician’s perspective, the adoption of digital is a change where the business needs to explain and incentivize the technician to spend their time not only fixing the equipment but also documenting the process. By doing so, smart services can improve the technician experience and by implication the customer. Therefore, smart services are developed only when they are adopted by the different actors in the ecosystem as they can support value co-creation. To support the adoption of the digitally enabled solution, attention needs to be paid to the change management, to the setting and communication of the right incentives for the field service technician and the customer's adoption.

Conclusions

This research has built on the framework of West et al. (2018), who proposed an assessment tool for smartness based on the application of service-dominant logic. This study identified

Dimension	Lesson learnt
Process	<ul style="list-style-type: none"> • To build up a smart service ecosystem data needs to be exchanged between actors (people and machines). For this, the data must be available in the required quality and consistency. • Having a standardized, global smart service ecosystem allows for improving the business processes. • A balance should exist between standard and local processes.
People	<ul style="list-style-type: none"> • Smart services should bring in value for the customer, but only if those services are co-created and adopted by the customers.
Technology	<ul style="list-style-type: none"> • Technology is an enabler in order to build smart services, the latest technology is not always the best for value creation.

Table 1. Overview of the analysis of the lessons learnt

limitations to the application of journey mapping and blueprinting when trying to understand and define the sequencing of the tasks and interactions. This highlighted the importance of ecosystem engagement to support value co-creation.

The paper described the paradox between IT departments (driven by harmonization and technology) and local businesses (driven by ease of existing processes). The gap between the two positions needs bridging via a change management process if a global smart service is to be successfully developed and deployed. Therefore, innovating the 'technicians' experience successfully requires co-creation between IT and the local businesses. The use of journey mapping and blueprinting is helpful, yet insufficient as tacit knowledge is overlooked, and the early buy-in from the business cannot be achieved.

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Digital service innovation in digital service platforms: pathways and co-innovation framework

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Abstract

Digital Service Innovation (DSI) is a type of technological innovation that is not yet recognized at a theoretical level but is recognized in practice in the innovation structure of companies. Digital platforms offer the ideal scenario for the deployment of DSI in B2B environments, with different actors appearing in the process of co-creation and co-innovation. The breadth of digital technologies that facilitate digital services and the heterogeneous nature of these services leads to the need for analysis to discern the elements and components of these services, as well as the process that culminates in DSI, for a given context. This is the objective of the paper, which aims to contribute to describing the nature and components of DSI occurring within DSP and unveiling the mechanisms that turn this digital service solution into an innovative proposal. Exploratory research is carried out, analysing a provider of a standard leader digital solution in its relationships with customers in B2B context.

Keywords: Digital service innovation, digital service platforms, co-innovation, nature digital services, B2B.

Literature review

With the emergence of information and communication technologies, companies are moving from product-based innovation to service-based innovation (Haikio et al. 2016; Vendrell-Herrero et al., 2021). Service innovation can be understood as a new configuration of actors of a network involved in the process of value generation (Haikio et al 2016). In addition to the servitization trend, digitalization has enabled companies to move from product or service-centric models to digital combined offerings—bundling products, services, and software-hardware systems—with higher value-generating potential (Opazo-Basáez et al., 2018; Huikkola et al., 2021).

As services become more complex, the level of digitization increases (Martin-Peña et al., 2018). Despite the importance of digitization in services, there are still gaps recently identified. Though Oslo Manual includes services among the different types of product innovation and recognizes that these can be delivered digitally, Opazo et al. (2022) recommend including technological and non-technological service innovation in this (and others) innovation framework(s), being digital service innovation one of those technological innovations in services. Digital services are permeating the business fabric and, consequently, the importance has grown significantly (Opazo et al 2022). In manufacturing settings, technological innovation has mainly focused on product and process innovation however as more and more manufacturing industries are incorporating digital technologies, this allows them to incorporate digital service innovation (Kohtamäki et al. 2020; Raddats et al., 2022).

Service innovation and digital platforms have been recently studied as a way to innovate and transform business (Chowdhury et al. 2021). A Digital Service Platform (DSP) is a “modular structure that consists of tangible and intangible components (resources) and

facilitates the interaction of actors and resources (or resource bundles)” (Lusch and Nambisan, 2015, p. 162) that is predominantly supported by a digital infrastructure (Fisher et al., 2020).

DSPs are composed of both technical and organizational elements and rules (de Reuver et al., 2018) and use the skills, knowledge, or resources of diverse actors (including the beneficiaries), to enhance the value of their service offering (Bidar et al., 2016) and even change the way people interact and share experiences (de Reuver et al., 2018). DSP aim to improve the efficiency and effectiveness of service exchange by liquefying resources and increasing the density of interaction between actors (Hein et al., 2019; Lusch and Nambisan, 2015; Fisher et al., 2020).

Digital Service Platforms can become facilitators for Digital Service Innovation since new functionalities and new services can be created, added or customized over time (Yoo et al., 2010).

B2B context establishes relational factors in this analysis. Depending on the specific context, there are also distinct archetypes of innovation (Frey et al. 2019). While DSI provides various benefits for organizations, it also comes with serious challenges since it “requires a change in managing provider-customer relationships by adopting new and innovative co-creation approaches” (Sjödin et al. 2020, p. 479). A co-innovation structure thus emerges.

Against this background, the main objective of this paper is to develop an integrative model to examine the technological, organizational, cultural and strategic context as prominent components of the initiation, adoption, and routinization of digital service innovations. In this vein, the research questions we wish to answer are as follows:

RQ1: What are the elements and components of digital services included in the DSP?

RQ2: What technologies enable the implementation of DSI in DSP?

RQ3: What is the process (requirements, mechanisms, different factors) by which innovation in digital services is produced in DSP?

Methodology

Because DSI is a complex social phenomenon with multiple actors and elements, a qualitative approach seems to be appropriate to answer the proposed research questions (Yin, 1984). The paper offers an exploratory approach to better understand the topics under research (Eisenhardt, 1989). The context of this research is the B2B playing field and we have chosen Salesforce, a leader software solution company that is a service digital platform offered under the paradigm of “software as a service” (SaaS).

Expected results and potential contributions

The aim of this paper is to contribute to the literature on service management, offering categorizations and nomenclatures for classifying DSI, and facilitating a common language for developing a DSI ontology for researchers in the field of service management. In addition, the specific SaaS application context will facilitate the understanding of the specific ways in which DSI implementation differs across organizations and industrial sectors, the different technologies involved in DSI development, and the organizational factors (i.e., systems, structures, functions, practices, culture, etc.) that could either facilitate or hinder the development of a DSI strategy.

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Session 5

Innovation and Sustainability I

Co-Chairs: Carlos Galera & Rodrigo Rabetino
(Salon Convenciones-Ejecutivo)

Servitization and sustainability: A conceptual framework

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Abstract

This study investigates how, and to what degree, servitization supports and encourages sustainable operations. A conceptual framework accounting for three perspectives – the degree of customer focus, the degree of sustainability, and the intensity of the relational connections between the provider and the customer – was developed from the literature. The paper describes each element of the conceptual framework and theorises the relationships between them. In particular, key elements of the proposed framework are that base services offer the least support for sustainability whilst advanced services offer the most support, and actively encourage sustainable operations for the provider. Literature shows that for advanced services there is: 1) greater financial incentives to be resource efficient; 2) improved operational linkages between the provider and customer in the use of the offering; and 3) changes in the structural arrangements that encourage more sustainable practices. The study concludes by suggesting future research use

multiple case studies to validate and refine the conceptual framework. This would extend the limited literature that show a positive and significant relationship between servitization and sustainability and provide an understanding as to why these relationships exist.

Keywords: Sustainability, servitization, product service systems, relationships.

Introduction

Manufacturers are actively engaging in the process of servitization (Baines et al., 2017), whereby they change their business models to provide services based on the capabilities enabled by the use of their products as opposed to product sales alone (Green et al., 2017). Successful examples include Rolls Royce ‘Power-by-the-Hour’, Alstom’s availability contract with Virgin and now Avanti Trains on the East Coast Main Line in the United Kingdom, Orica mining services where they provide ‘blasting outcomes’, and MAN Truck & Bus’s performance-based contracts. Whilst these examples reflect the diversity of services that can be offered, they demonstrate a general trend within industry and academia toward the provision of advanced services, defined as services that are “outcome focused on capability delivered through performance of the product” (Baines & Lightfoot, 2014, pp. 76; Vendrell-Herrero et al., 2021).

Servitization is a widely accepted strategy for manufacturers to pursue to improve their financial performance (Wang et al., 2018), lock-in their customers (Visnjic et al., 2017) and differentiate themselves from low-cost manufacturers who can outperform them based on costs alone (Neely, 2008). These claims are widely accepted in the literature that has shown a positive, but often non-linear, relationship between servitization and financial performance (e.g., Visnjic & van Looy, 2013; Wang et al., 2018). More recently,

research has begun to recognize other benefits of servitization, such as sustainability, and has encouraged further research on this topic (Opazo-Basàez et al., 2018; Marić & Opazo-Basàez, 2019). Based on these calls, this work seek to understand how and when servitization, and in particular advanced services, can support and encourage sustainable operations. This paper seeks to address the following research questions:

RQ1: How does servitization support sustainable operations?

RQ2: When does servitization support sustainable operations?

The following section introduces our framework before presenting the proposed methodology to validate and refine the proposed conceptual framework.

Conceptual Framework

The conceptual framework proposed by this research is presented in figure 1 and indicates that the higher the degree of intensity of the relationship between the provider-customer and the higher the degree of customer focus of the service contribute toward more sustainable operations. The conceptual framework is now discussed.

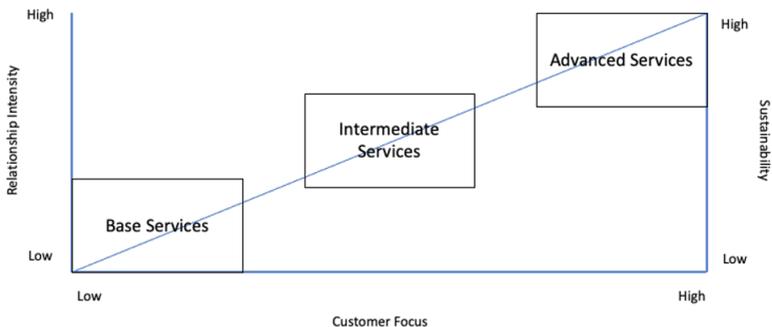


Figure 1. Conceptual Framework

Within the literature, studies continue to suggest that servitization has positive sustainable outcomes. For example, studies show that servitization drives manufacturers to change products' designs to extend their lifetime, reduce energy consumption and provide information to customers' as to how to minimise their environmental impact (Grubic, 2014; Doni et al., 2019; Parida et al., 2014; Tukker, 2015); how it can lead to improved resource/asset efficiency through improved maintenance (Grubic, 2014; Zhang et al., 2021); and how product-as-a-service/outcome-based services bring about retained product ownership which enables the manufacturer to better monitor product condition and that this facilitates reuse and recycling operations, and ultimately a reduction of waste through the lifetime of the assets operation (Zhang et al., 2021). Each of these is argued to increase as providers move from selling products to selling advanced services, where the focus of the customer increases (Baines & Lightfoot, 2014). However, whilst customer focus encourages sustainable behaviours, it requires higher levels of relationship intensity that supports the above activities.

Within the literature, it is argued that as manufacturers shift from selling product orientated services (i.e., base services) to customer orientated services (i.e., advanced services), their relationship transitions from transactional to relational (Bastl et al., 2012). In becoming relational, buyers and suppliers develop complementary capabilities, share resources across organisational boundaries and develop greater levels of trust and commitment to one another (Kamaladin et al., 2020). The shift from transactional to relational reflects the 'intensity' of the relationship. In becoming more relational, Bastl et al., (2012) find that buyers and suppliers develop greater operational linkages, enhanced information sharing and greater trust between the parties facilitate, and enable, this greater customer focus. Therefore, we argue that whilst advanced services provides a customer focus and incentivises greater sustainable

outcomes for manufacturers, this needs to be coupled with the appropriate relationship type i.e., relational. This is because improved asset efficiency through improved maintenance, the use of data to improve asset design and performance and condition monitoring require a greater degree of relational intensity (Baines & Lightfoot, 2014; Grubic, 2014; Ng et al., 2012), particularly greater operational linkages, information sharing and trust which provide the means through which manufacturers can deliver improved sustainable outcomes that are incentivised by the greater customer focus.

Based on the above review, we argue that improved sustainable outcomes improve as manufacturers transition from base to advanced services. This is because advanced services provide incentives for manufacturers to engage in more sustainable practices, addressing RQ2. Delivering (the how, RQ1) these sustainable outcomes then rely on the nature of the relationship between the buyer and supplier. Notably, how manufacturers deliver more sustainable outcomes from servitization is contingent upon the intensity of the relationship. A more intense (i.e., relational) relationship between the buyer and supplier means the provider will gain greater visibility over the customers context, receives greater information about the asset, its use and condition, and trust between the two parties to deliver continued capability will increase. These relational characteristics support the deliver of more sustainable operations that are incentivised by the customer focus and the nature of the contract between the two parties.

Conclusion and Future Research

In conclusion, this research investigated how and when servitization supports and encourages sustainable operations. A conceptual framework accounting for three perspectives was

developed from the literature. The paper described each element of the conceptual framework and theorised the relationships between them. In particular, key elements of the proposed framework are that base services offer the least support for sustainability whilst advanced services offer the most support, and actively encourage, sustainable operations for the provider. This is because for advanced services there is: 1) increased information sharing that provided visibility of product performance fed back into design teams, 2) greater financial incentives to be resource efficient, 3) improved operational linkages between the provider and customer in the use of the offering and 4) changes in the structural arrangements that encouraged more sustainable practices by the provider to enhance trust between the two parties. Future research should consider empirically validating the proposed conceptual framework and refining it based on the resultant findings. In particular, this research encourages an exploratory approach through the use of multiple case studies to generate a deeper understanding as to the relationship between servitization and sustainability from a relational perspective.

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Sustainable supply chain management and servitization in Peruvian manufacturing firms? The mediating role of innovation and digitalization

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Abstract

In contexts where innovation ecosystems are not mature and their economies are based on natural resources, efforts to achieve innovation outcomes and sustainability still seem unclear, especially in manufacturing companies. Supply chains environmentally friendly play for product firms developing bundles of products and services. Using a dataset of Peruvian manufacturing firms from the National Enterprises Survey in 2019, a partial least squares structural equations technique was applied to 1,105 companies. The results show that companies that use sustainable supply chain management practices, increase the digitization and innovation capabilities and company performance. Thus, these practices are an opportunity for managers to improve business performance and at the same time contribute to environmental sustainability.

Keywords: Servitization, innovation, digitalization, supply chain management.

Theoretical Framework

Nowadays, there is more and more empirical evidence about some companies bundle products and services in the same offer, generating a flow of income integrated (Crozet & Milet, 2017). Especially, the manufacturing and technology industries are offering

a hybrid offer that contains both products and services (Vendrell-Herrero & Wilson, 2017; Bustinza et al., 2018; Vendrell-Herrero et al., 2021). From its origination, the concept of servitization (Vandermerwe & Rada, 1988) has been related to the incorporation of services and intangibles into products as a way to create value and obtain competitive advantages. Nevertheless, approaches have been very different, from strategy, marketing, supply chain management to sustainability, and digitalization (Opazo-Basáez, Vendrell-Herrero & Bustinza, 2022). Sustainable Supply Chain Management (SSCM), is understood as an extended perspective on environmental management based on internal and external practices looking after the achievement of an organization's social, environmental, and economic goals for improving the long-term firms' performance (Carter & Rogers, 2008; Opazo-Basáez et al., 2018). Thus, this study focuses on influence of SSCM on firm performance, and on innovation and digitalization capabilities as a means for developing a sustainable competitive advantage (Figure 1). Fundamentally, this is due to pressures from competitive global

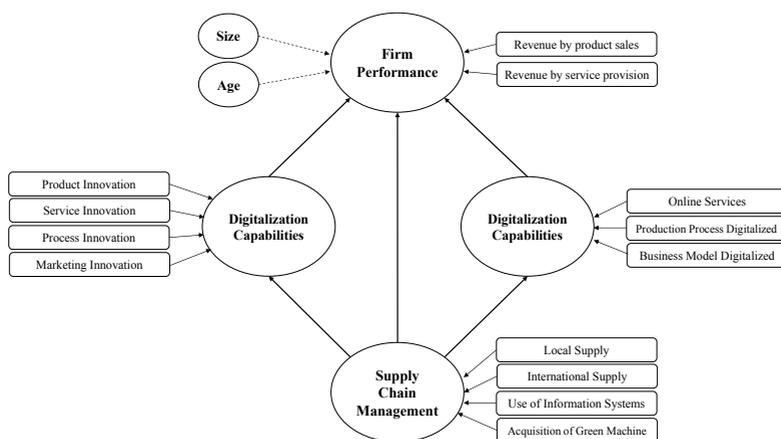


Figure 1. Theoretical Model

markets, environmental regulations and customers have forced industries worldwide to think seriously for the environmental concerns arising out of their businesses (Zhu & Sarkis, 2007).

Method

We use data from the National Enterprise Survey (ENE) conducted by the National Institute of Statistics and Informatics of Peru and the Ministry of Production (PRODUCE & INEI, 2019). The population comprised formal companies operating in 2019 that sold more than US\$ 62,930. The sample consisted of 1,105 companies that reported carried out innovations and also have applied digitization practices.

To contrast the proposed theoretical model the partial least squares structural equations technique (PLS-SEM) was applied. This technique was selected over CB-SEM because the data analyzed are not normal and the measurement models are composite (Dash & Paul, 2021; Henseler, 2021). For the application of the technique, we followed the structural model evaluation procedure collected by Hair et al. (2018). The mediation analysis followed the procedures summarized by (Hair et al., 2018).

Results and Discussion

Our findings show that a greater use of practice related to SSCM has direct and simultaneous effects on innovation capabilities ($\beta = 0.27$; $p\text{-value} = 0.00$), on digitization capabilities ($\beta = 0.14$; $p\text{-value} = 0.00$), and on firm performance as a model measure composed of product and service sales revenue ($\beta = 0.23$; $p\text{-value} = 0.02$) in Peruvian manufacturing firms.

On the other hand, we find no support in the empirical data to claim that digitization capabilities have a direct effect on firm performance ($p\text{-value} = 0.15$); nor do we find it to be a mediating

variable between SSCM and firm performance (p -value = 0.11). On the contrary, innovation capabilities have a small positive effect on firm performance ($\beta = 0.07$; p -value = 0.00) and at the same time, it has a complementary mediated effect, between SSCM and firm performance, enhancing the direct effect.

Thus, we found that SSCM practices are a basis for driving innovation capabilities, digitalization and firm performance. The model has a moderate explanatory power ($R^2 = 0.39$).

Concluding Remarks

Promoting the green transition in organizations is a global public policy necessity (Sitkin, 2020). In Peru this is no different and it is recognized that this is linked to innovation for manufacturing firms (Seclen-Luna, Moya-Fernandez & Pereira, 2021). Our findings show that companies that use SSCM practices, increase the digitization and innovation capabilities and company performance. Thus, these SSCM are an opportunity for managers to improve business performance and at the same time contribute to environmental sustainability. In this way we contribute with more evidence that proves that being socially and environmentally responsible firms is a competitive business in emerging economies such as Peru.

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Green servitization and patents: The moderation role of nationals sustainable development goals achievement

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Abstract

This article draws on servitized manufacturing, patents, and nationals' achievement related to the United Nations (UN) Sustainable Development Goals (SDGs). We focus on green hybrid organizations, a particular kind of servitized firms that entwines digital capabilities and environmentally focused operational initiatives in convergence with their performance objectives. Through contextualizing the analysis to the OCDE countries, we evaluate if the relationship between green servitization and patents is moderated by nationwide attainments in terms of SDGs. In doing so, a multi-country sample of green manufacturers is selected and matched with their SDGs national data. By implementing a propensity score matching and Heckman selection model, we examine the impact of green servitization on patents through the comparison of SDGs national ranking. Our evidence show heterogeneity as to the positive moderating effect of the complete set of SDGs goals and divide those goals in enhancing and dismissing SDGs moderating effects. Altogether, we contribute to the emerging sustainability literature by considering both the

characteristics of green servitized firms, SDGs and macro-contextual environment from a multi-level perspective.

Keywords: Green servitization, patents, SDGs, sustainability, national environment.

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Greening as a competitiveness optimizer of servitization

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Abstract

This study contrasts the disparities in business competitiveness across seven European and Latin American economies in order to evaluate how servitization strategies and green investments contribute to optimize competitive efficiency.

The study uses the non-parametric 'Benefit-of-the-Doubt' (BoD) method and a multilevel regression model to conduct an international comparison of the competitive efficiency of firms implementing servitized versus non-servitized strategies, and between firm with and without green investments. A multilevel regression model is applied as a robustness test to confirm country-specific effects.

Generally, it is found that firms implementing servitization strategies tend to experience significantly greater competitive efficiency as compared to those that do not (Vendrell-Herrero et al., 2021). Among servitized firms, those that declare green investments further improve their competitive efficiency (Opazo-Basáez et al., 2018). However, by separating those firms declaring green investments in each economy, it is found that the impact of green investments on the competitive efficiency of servitizing firms is heterogeneous across countries. Those national ecosystems where servitization least contribute to reaching optimal competitive

efficiency are those where most gains from green investments are found. The greening benefits for servitizing firms are much less significant in economies where the implementation of servitization strategies already have a high impact on competitive efficiency. Therefore, greening, as a catalyst of the competitiveness for servitization works best where the impact of servitization alone is less important, and least where servitization is already an effective optimizer of competitive efficiency. Furthermore, whereas national ecosystems are found to be significant differentiators of whether servitization contributes to competitive efficiency, the impact of green investment on competitiveness is consistent throughout all observed economies.

The configurational outputs of servitization and green investments that potentially contribute most to competitive efficiency are not necessarily ubiquitous.

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Examining sustainable manufacturing systems and intra-organizational factors

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Abstract

Companies' commitment is crucial when it comes to sustainable development. Indeed, due to resource constraints, manufacturers are increasingly offering green products and services in an attempt to preserve resources for future generations. In this transition towards more sustainable manufacturing, organizational insecurities and resistance can arise. Along these lines, servitization researchers are paying more attention to the organisational factors that favour companies' internal decisions towards more sustainable business models. Based on a qualitative case study method on an SME, this study identifies and analyses the key organisational factors that help in the transition towards more sustainable manufacturing.

Keywords: Sustainable manufacturing systems, organizational factors, case study, SME.

Sustainable manufacturing systems and organizational factors

The definition of 'sustainability' used in this paper is meeting the needs of people today without compromising the ability of future generations to meet their own needs (WCED, 1987). Sustainable development cannot be achieved without the commitment of the companies (Jabbour et al. 2008) and therefore, due to limited

resources, circular economy (Tukker, 2015; Spring and Araujo, 2017) and sustainable manufacturing is attracting manufacturers to offer green products and services (Opazo et al., 2018) that preserve resources for future generations (Bustinza, et al. 2017; Hojnik, 2018).

According to some studies, it is important to further investigate management methods and organizational factors that influence sustainable manufacturing systems. The transition to more sustainable companies along with innovation-based business models (Guimarães et al., 2021) with new products and services can create insecurity and resistance to change (Antioco, et al. 2008). In this regard, researchers in servitization are paying more attention to organizational factors (Dmitrijeva et al. 2020; Vendrell-Herrero et al., 2021) that favor the internal decisions of companies (Kumar et al. 2019). There are various factors that drive an organization to opt for sustainable manufacturing. Numerous organizations are opting for the full or partial strategy of sustainable manufacturing, however due to lack of enablers, competitors and the various objectives pursued by companies, organizations have challenges in implementing sustainable manufacturing (Hariyani and Mishra, 2022).

Based on this premises, this study aims at studying the key organizational factors that enable a transition to sustainable manufacturing SMEs along with more innovation-based business models that enhance competitiveness. Following Yin (2003) we conduct a qualitative case study analysis based on one sustainable manufacturing SME.

Our conclusions seek to contribute to the literature on sustainable manufacturing systems and organizational factors. As for the contribution to practitioners, the aim is to identify and understand the key organizational factors in the transition to sustainable companies in SMEs.

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Session 6
Applied economics

**Co-Chairs: Ferran Vendrell-Herrero &
Emanuel Gomes**

(Sala Forum)

Servitization in Germany – Establishing the context of servitization in manufacturing firms

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Abstract

Servitization has been a well-known topic in practice and research for over three decades now. While research has so far contributed to a more abstract understanding of the concept of servitization, it still lacks contributions that support manufacturing firms on their distinct servitization journey. Especially manufacturing firms that are still at the beginning of their servitization journey have difficulties to manage it. Scant attention has been paid to developing a contextual understanding of the servitization journey, which is necessary to empower firms on their journey. To address this problem, a better contextual understanding of servitization itself seems to be a fruitful starting point for scientific research. By analyzing annual reports of manufacturing firms, this paper enriches the contextual understanding of the servitization journey. Using a descriptive, multi-stage inductive coding approach, various key pivotal factors of the current servitization journey of manufacturing firms in Germany are derived. Among others, the findings show that frontstage key pivotal factors such as the market proposition and backstage key pivotal factors such as process excellence are in particular focus of servitization actions of manufacturing firms. This paper contributes to a more nuanced and contextualized understanding of servitization actions.

Keywords: Servitization, Manufacturing Industry, Digital Transformation.

Motivation

Specific understanding for the servitization journey has rarely been researched to date. There is “a lack of a comprehensive and methodical approach to understand the phenomenon of servitization” (Kamal, Sivarajah, Bigdeli, Missi & Koliouisis, 2020, p. 2). Scant consideration has been paid to, among others, a contextual understanding of the servitization journey and its linkage to different transformation phases (Baines, Bigdeli, Sousa & Schroeder, 2020). From a methodological perspective, scientific research has examined the servitization journey of manufacturing firms mainly by conducting case studies (Baines et al., 2020; Kowalkowski, Kindström, Alejandro, Brege & Biggemann, 2012; Rabetino, Kohtamäki & Gebauer, 2017) and interview studies (Lütjen, Tietze & Schultz, 2017; Martinez, Neely, Velu, Leinster-Evans & Bisessar, 2017). In this regard, a broad in-depth understanding of service innovation in manufacturing firms (Raddats, Naik & Bigdeli, 2022; Schüritz, Seebacher, Satzger & Schwarz, 2017), knowledge of advantages and disadvantages of product-service systems (Benedettini, Neely & Swink, 2015; Wolf, Franke, Bartelheimer & Beverungen, 2020), and a consideration of different phases of the servitization journey (Baines et al., 2020; Martinez et al., 2017) exists.

However, from a managerial perspective, transforming from being a purely product-oriented manufacturing firm to selling product-service systems consisting of bundles of smart products and services presents a challenge (Raddats, Kowalkowski, Benedettini, Burton & Gebauer, 2019; Vendrell-Herrero et al., 2021). Moreover, there is a lack of opportunities for manufacturing firms to independently determine their states of servitization and, based on this, make further servitization decisions (Alghisi & Saccani, 2015; Baines et al., 2009; Bustinza, Vendrell-Herrero & Baines, 2017; Lim & Maglio, 2019; Vendrell-Herrero & Wilson,

2017). A determination of the servitization status serves as a basis of the servitization journey for firms to prescriptively draw their transformation roadmap (Baines et al., 2020). In order to empower manufacturing firms to better understand and organize their servitization journey, academia may benefit from a depict knowledge about key pivotal factors in the servitization journey. Therefore, a deeper context understanding in terms of manufacturing firms and their service actions during their servitization journey is needed. Following, key pivotal factors can be derived, covering current business activities of firms and giving an indication of whether firms are carrying out activities with a view to becoming more service-oriented.

Subsequently, the better contextual understanding of the key pivotal factors enables an in-depth development of methods that support manufacturing firms to shape their servitization journey. Aptly, this paper aims to contextualize the servitization journey within German manufacturing firms. Specifically, this paper addresses the following research question: What are key pivotal factors that characterize the servitization journey of German manufacturing firms?

Research design

To develop a better contextual understanding of the servitization journey of German manufacturing firms, an investigation of current practices is needed. To extend the findings from case studies and interviews, a document analysis of annual reports is conducted to identify relevant key pivotal factors (Bowen, 2009; Braun & Clarke, 2006). Examining annual reports seemed to be a promising source of data, as firms present themselves to their stakeholders, promote innovations (Visnjic, Neely & Wiengarten, 2012), and are the most important source for fundamental analysis of firms

(Chang, Most & Brain Carlos W., 1983; Vergoossen, 1993). A descriptive multi-stage inductive coding approach was chosen to consolidate the firms' key pivotal factors concerning their servitization journey (Gioia, Corley & Hamilton, 2013; Strauss & Corbin, 1990). This approach helps to identify patterns in large complex data sets, effectively identify linkages within analytic themes, and pinpoint themes of overarching dimensions through a series of repetitions and comparisons (Sjödin, Kamalaldin, Parida & Islam, 2021).

Annual reports from 2017 – 2021 of 22 manufacturing firms listed in the “Verband Deutscher Maschinen- und Anlagenbau” (VDMA) were examined. In order to have a broad spectrum of different firms, the sample is composed of manufacturing firms from various VDMA divisions that regularly submit full annual reports, are headquartered in Germany, operate globally, and employ between 800 and 160,000 people. Not only firms listed on the stock exchange are members of the VDMA, but also small and medium-sized enterprises, family businesses and companies with other legal forms. In addition, they provide insight into current practices as firms present their current situation to their stakeholders. Focusing on the manufacturing firms listed in the VDMA appeared reasonable, as the VDMA is the largest and most important German and European network organization of the manufacturing sector with 3,400 affiliated firms (VDMA, 2022).

Initial results

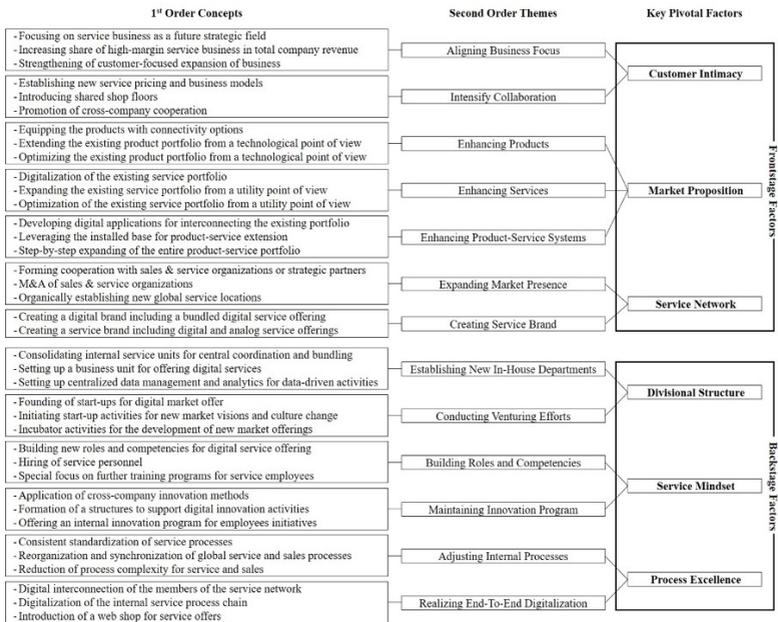


Figure 1. Key pivotal factors of servitization in German manufacturing firms

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(How) can KIBS foster the sustainability of manufacturing firms?

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Aim

Servitization is an opportunity to manufacturing sectors to transit into business models based on services complementing traditional product offerings (Vendrell-Herrero & Wilson, 2016). Besides, green services can facilitate the alignment of a company's operations with environmental requirements to ensure sustainability (Marić & Opazo-Basáez, 2019) in the transition process. Green servitization commits companies with a more green and sustainable economy. However, the implementation of new sustainability-oriented organizational practices, activities and processes requires the ability to develop specific competences and assets. Recent data provided from Eurobarometer survey states that about four in ten (39%) European SMEs rely on external support received from KIBS in their attempt to designing eco-efficient product and services. This paper aims to discuss the link between eco-efficiency actions and manufacturing sourcing of KIBS as providers of sustainability-oriented innovation.

RQ

Since the path from servitization to sustainability involves a range of business service expertise at different stages, the main

research question asks whether and how KIBS can foster the sustainability of manufacturing firms. As a second research question the research investigates whether the positive relationship between the use of KIBS and actions undertaken to be more resource efficient is equally significant across all manufacturing activity sectors. And last but not least the third research question tackles the policy environment assessing how the relationship varies by European country.

Theoretical background

With the aim of examining the performance of KIBS on the going green and resource efficient of manufacturing, we based our theory on two pillars. Firstly, the servitization literature strand illustrates the framework to understand how manufactures can reduce environmental loads since as service providers are able to determine when supplies are needed, to project a better and a more efficient production process or to remotely monitor the operational status of production machinery optimizing resource productivity. Secondly, though KIBS are highly associated with the creation and dissemination of knowledge (Muller & Doloreux, 2009, Doloreux et al., 2021), the role of KIBS in developing sustainability-oriented innovation on companies wanting to address environmental related initiatives is an emerging field (Xu & Ström, 2016). However, the evidence suggests that knowledge for environmental innovations is peculiar (De Marchi, 2012) and is “located in a technological frontier on which firms are still inexperienced” (De Marchi and Grandinetti, 2013). Thus, external partners are necessary cooperators when implementing environmental innovations (Pace & Miles, 2019; Cainelli et al, 2015; Del Río et al. 2015).

Methodology

The study follows a quantitative approach for the purpose of exploratory research and implements a model to examine the impact of the European manufacturing eco-efficiency actions on the propensity of KIBS service provision. Minimizing waste, saving energy, saving materials, saving water, recycling and selling the scrap material are taken as explanatory and categorical variable. Control variables include firm size, sector and country. The data used in this study comes from the Eurobarometer survey.

Findings

This paper is together with Majid et al. (2020) the scarce work that uses Flash Eurobarometer Datasets as a data source and allow to set which eco-efficient actions are more likely to implement with the support of KIBS. Further will permit to know the relationship between eco-friendly sectors and KIBS and also will reveal the diversity in the degree of sustainable territorial servitization in the European context.

Implications

This insight into how can KIBS foster sustainability can shed some light on the subject and help policy-makers design appropriately targeted industrial and innovation policies with a view to enhancing an environmentally sustainable European economy.

Keywords: KIBS, sustainability, innovation, servitization.

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Servitization and internationalization: An analysis in the Spanish industry

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Abstract

Companies try to strengthen their competitive position using various strategies. Two of the most used are the entry into foreign markets (internationalization) and the incorporation of services to a portfolio of goods (servitization). Both strategies fit within a long-term growth perspective, require organizational changes, and imply modifications to a firm's position in the value chain. The relationships between product innovation and internationalization have been extensively studied, while those between servitization and internationalization have been investigated to a lesser extent.

We formulate a series of hypotheses, which are tested by means of a sample of 27,700 Spanish companies. I.e., we examine the relationship between servitization and internationalization, while the capacity for innovation and specific contextual factors are studied as antecedents of servitization. We also investigate whether servitization acts as a mediator between innovation capacity and internationalization.

Keywords: servitization, internationalization, innovation capacity.

Introduction

Entering foreign markets is typically viewed as a sign of strength of domestic companies. Moreover, it is considered a basis for long-term economic growth, as it implies that firms are exposed to international competitors (Kraus et al., 2016). Nevertheless, the relationship between international product sales and servitization remains an area that has received little attention in the literature (Kamp, 2018), leaving multiple “gaps” to be analyzed (Kolagar et al., 2022).

Until date, most authors have chosen to perform internationalization-servitization analyses considering only export as a mode of entry to foreign markets (Juste et al., 2020; Vendrell-Herrero et al., 2021). While this is the main way of internationalization for companies, it is certainly not the only way to go abroad (Giacomozzi, 2005). Hence, our work aims to address the relationship between servitization and internationalization from a broader perspective.

Our research setting is formed by companies from Spain, a country that is witnessing growing levels of interest in servitization and internationalization among its companies (García-García et al., 2017; Gonzalo-Hevia y Martín Peña, 2021).

Background

Since multidimensional and multilevel models better explain innovation (Seclén, 2016; Martínez-Román et al., 2019), two composite variables are used to analyze servitization propensity: innovation capacity and control variables (see next figure).

For innovation capacity, we consider to sub-sets of variables: intangible capital (stock) and capacity-building based on external sources for innovation (Generalitat, 2022). The use of these variables follows from literature on servitization, which sees it as a

phenomenon that is related to a change in internal / external sourcing of resources by firms, and a growing use of (and collaboration with) external service input providers, such as KIBS in the realm of R&D, on the one hand, and professional services in the area of testing, engineering, audits, consultancy, on the other (Ayala et al. 2017) and with the deepening of intangible assets in companies, fundamentally the implementation of IT and digital technologies (Rabetino et al., 2017).

R&D departments with high innovative capacity can develop better products and processes (Kafouros et al., 2008) and it is known that the possession of innovation capacity through product and production process innovations for a manufacturing firm is critical to the success of servitization (Hwang & Hsu, 2019). Also, companies with greater innovative capacity show a greater internationalizing intensity (Azar & Drogendijk, 2014), if we consider that this innovative capacity allows them to enter psychically distant markets. Therefore, it is expected that companies that incorporate a higher innovative capacity will present a greater degree of internationalization.

As regards control variables, multiple variables can be studied. They are considered location (Seclén, 2016), age, size of the organization, and its membership in a business group (Vega-Jurado et al., 2008).

The link between technological innovation and the propensity to internationalize has been analyzed by multiple authors, considering that high levels of innovation encourage companies to internationalize (Martínez-Román et al., 2019) and servitize as a mode of innovation. Therefore, servitization could also cause companies to be more likely to internationalize, mainly in sectors with a high level of maturity (Tödtling & Trippel, 2005).

Methodology

The study uses a database extracted from SABI with 27,277 Spanish manufacturers for the year 2018, completed with data from the INE. Figure 1 is proposed as our framework for analysis.

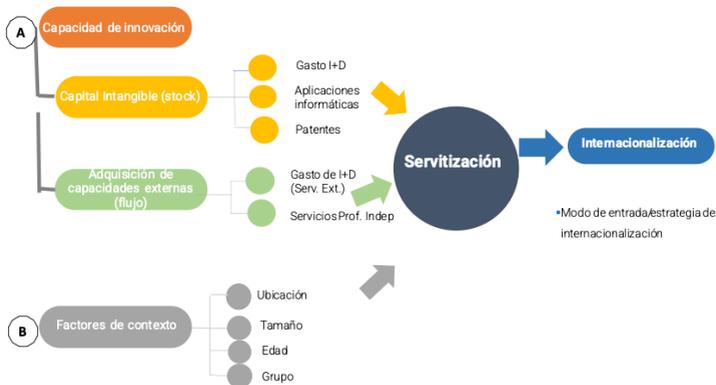


Figure 1. Analytical model

Direct relationships are established between innovation capacity and control variables with servitization, and between servitization and internationalization. In addition, we assess whether servitization acts as a mediator for the direct relationships of the model.

To examine the relationships, multiple linear regression models are applied. For the mediation check, we apply a Hayes model.

Results

The results will be discussed in the light of insights from previous publications (see works referred to under “Background” as well as further studies that relate expenditure on KIBS and

servitization premia, like Crozet and Milet (2017) and Castellón-Orozco et al. (2020).

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The role of merger & acquisition activities for service revenue growth in product companies

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Abstract

We found evidence that M&A activities play a key role in service revenue growth in product companies.

Our pre-study supports the important role of M&A activities when it comes to service revenue growth. Our main study supplements the existing literature on assuming that service revenue growth is mostly the result of internal growth. We provide evidence that both vertical and horizontal M&A activities strengthen service revenue growth. The hypotheses offer a fine-grained view on this important role of M&A activities. Interestingly, horizontal M&A activities have a short-term impact on both the growth rate of service revenue and the growth rate of share of service revenue. But this effect differs for the growth of service revenue and the growth of share of service revenue. While the positive impact on the growth of service revenue is quite rational, the negative impact on the growth of share of service revenue is surprising. If companies conduct horizontal M&A activities, the share of service revenue decreases. Vertical M&A activities strengthen both the growth of service revenue and the growth of share of service revenue.

Keywords: Mergers & acquisitions, service revenue, horizontal M&A activities, vertical M&A activities.

Introduction

Due to its practical relevance and theoretical advancement, the research domain on services in product companies (servitization) remains an important priority in service research, business-to-business marketing, and operation research. The practical relevance originates from the fact that in response to eroding product margin and stagnating product revenue, product companies have been argued to strengthen the service revenue growth. In a few, selected product manufacturing industries, service revenue growth have led to a situation that services contribute to up to 50 percent of the total revenue (e.g., Kone elevator industry, IBM and Cisco in the communication industry, or AtlasCopco in the construction industry).

Theoretically, this domain is concerned with product companies shifting from developing, manufacturing, and selling products to innovating, selling, and delivering services. As a result, products and an increasing number of services are bundled into customer-specific solutions. While this research domain on services in product companies has progressed theoretically, it is still important to continue to problematize the domain's key assumptions. One of these assumptions is that servitization encourages companies to develop the necessary capabilities for providing more services internally. It means that servitization literature tends to favor internal, organic, service revenue growth. The assumption neglects that companies could also rely on external service revenue growth such as mergers & acquisitions (M&As). Thus, we consider that M&A activities are interesting "anomalies" to the assumption on internal capability development for providing more services - driving service revenue growth, and the theoretical lenses and

methodologies from M&A literature could be used to question whether it may make economic sense to acquire service capabilities as a strategy for strengthening service revenue growth. Therefore, we focus on the following research question: How do internal service capability development and external capability development influence service revenue growth in product companies?

Research process

Our research process was divided into step phases: (i) pre-study and (ii) main study.

First, we conducted a series of 32 semi-structured interviews on the influence of M&A on service revenue growth. Second, we analyzed data about M&A activities in a panel data set of 52 companies between 2001 and 2021.

Research findings

Our pre-study reveals that M&As play a key role for the service revenue growth. For example, interview results suggest that the majority of the service revenue growth is actually attributable to acquiring service capabilities through M&As. These interviews suggest that two types of M&As: a) horizontal M&A activities, and b) vertical M&A activities. Horizontal M&A activities refers to acquisition of another product company with comparable products and services. For example, Bosch Packaging acquired Tector Machines and Systems. Besides packaging machines, both Bosch and Tector provide, engineering, modernization, maintenance, and field services. In case of vertical M&As activities, a product company acquires a pure service company specializing on service offerings downstream in the (vertical) value chain to strengthen their existing service offerings. For example, Voith, the equipment manufacturer acquired Helix System, a specialist for automation,

plant control and construction services for extending the service offerings. Additionally, our pre-study revealed that service revenue growth is composed of increasing the total service revenue and increasing the share of service revenue (service revenue growing faster than product revenue).

Our main study was used to test following four hypothesis.

- Hypothesis 1: Horizontal M&A activities are positively associated with the post-M&A growth of service revenue.
- Hypothesis 2: Horizontal M&A activities are positively associated with the post-M&A growth of share of service revenue.
- Hypothesis 3: Vertical M&A activities are positively associated with the post-M&A growth of service revenue.
- Hypothesis 4: Vertical M&A activities are positively associated with the post-M&A growth of share of service revenue.

We used a lagged variable for horizontal and vertical acquisitions conducted in t-1 years, which allowed us to provide more detailed view of the dynamics of acquisition effects. The results of the regression analysis are highlighted in the following Table.

Horizontal M&A activities in t-1 ($\beta_{Ht-1, SR}=0.28$) (H1) have a positive regression coefficient with service revenue growth and are statistically significant at the $p<0.01$ level. Therefore, we fail to reject H1. Horizontal M&A activities in t-1 ($\beta_{Ht-1, SSR}=-0.21$) (H2) have a negative, instead of a positive regression coefficient with share of service revenue growth and are statistically significant at the $p<0.01$ level. Hypotheses 2 has to be rejected. Vertical M&A activities in t-1 ($\beta_{Vt-1, SR}=0.29$) have a positive regression coefficient with service revenue growth and are statistically significant at the $p<0.01$ level. Therefore, we fail to reject hypotheses 3. Vertical M&A activities in t-1 ($\beta_{Vt-1, SSR}=0.45$) have a positive regression coefficient for share of service revenue growth (SSR) and are

statistically significant at the $p < 0.01$ level. Hypotheses 4 cannot be rejected.

	Dependent Variables			
	Model I: Growth of the service revenue		Model II: Growth of the share of service revenue	
Independent variables				
<i>Horizontal M&A activities</i>				
M&A activities in t-1	H1	0.28*** (0.007)	H2	-0.21*** (0.007)
<i>Vertical M&A activities</i>				
M&A activities in t-1	H3	0.29*** (0.006)	H4	0.46*** (0.006)
<i>Control variables</i>				
Total revenue		-0.04† (0.000)		-0.02† (0.000)
Employees		0.02† (0.000)		-0.01† (0.000)
R&D ratio		-0.03† (0.191)		0.06† (0.194)
R ²		218		224
R ² (corrected)		204		209
F		15.132		15.636
d.f.		7		7
p-value		<0.0001		<0.0001

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, † - not significant

Std. Error in parentheses

Table 1. Results for regression analysis

Digitalization in brick-and-mortar retailing: Can physical retail outcompete e-retailers in offering tailored services?

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Abstract

Brick-and-mortar business is quickly losing ground to e-commerce. One of the crucial elements that explains this phenomenon is the larger capability of e-retailers to gather data from clients and understand their purchase behaviour. However, digital transformation in the physical retail sector is gaining pace in search of improving its competitive position. The aim of this study is to investigate how digitalisation in physical stores may lessen the gap in data generation and customer knowledge between online and brick-and-mortar businesses. To do so, a comprehensive review of the literature is conducted, followed by the adoption of Interpretative Phenomenological Analysis (IPA) to capture individual-level understanding of the phenomenon from different experts in retail information technology. Our findings show the potential of digitisation of the physical store in data gathering, and outline the implementation of novel loyalty schemes as effective way to encourage customer to willingly share their data. In the discussion and conclusion derived from our findings, we elucidate how digital transformation of brick-and-mortar business has the potential of not only improving the competitiveness of the physical retail sector but improving the bottom line for retailers across all sales channels.

Keywords: Digitalization, Advanced Services, Datafication, Tailored Services.

Introduction

Customer purchase behavior has changed dramatically in the last decade due to the proliferation of new technologies and digital platforms. New techniques and logics have been adopted as a consequence of the growth and popularization of the internet, social media and other digital technologies, and researchers and practitioners alike have begun to pay more attention to the retail sector's digital transformation (Reinartz et al., 2019). The industry is already experiencing new purchasing behaviors while including new selling practices and value-added services due to digitalization (Hagberg et al., 2017; Sheth, 2021; Opazo-Basález et al., 2022). However, the focus of these innovations has mostly been on e-commerce, and consequently, literature has overlooked digital transformation in physical retailing.

E-commerce is undoubtedly expanding and has embraced both small and large shops by integrating platforms such as Amazon that significant impact the competitive landscape (Hagberg et al., 2017). Despite physical retail remaining the dominant sales channel, studies show that the increase in e-commerce sales is, in fact, largely at the expense of brick-and-mortar stores (Stieninger et al., 2021). In addition to that, the Covid-19 pandemic has severely hurt the physical retail market, while unleashing the growth of e-commerce (Nanda et al., 2021). As a result, countless physical stores are going out of business or are forced to invest heavily on an online strategy (Corkery, 2017).

One of the main reasons for such transformation is e-commerce's data-driven efficiency superiority (Al-Lami & Alnoor, 2021). One of the most critical aspects is to understand how physical retail can withstand the rise of online commerce by learning from its digital superiorities (Hagberg et al., 2017). The data potential of physical stores is larger than e-commerce, provided that a physical space can have substantially more data sources than what website cookies can

retrieve (Huré et al., 2017). The brick-and-mortar sector can learn several lessons from the recent success of e-commerce and take it one step further to create competitive advantages through digital services and loyalty initiatives (Turow et al., 2015).

While previous research has explored different technologies and loyalty practices that may proliferate data in the physical retail environment, few authors have concentrated on the adoption of such innovations and explore the potential in the offering of tailored services and customised offers. The physical retail sector contains unique industry dynamics that need to be explored, both theoretically and practically, in order to determine implications of adopting data-enabling technologies. As a result of the aforementioned, this study aims to understand to what extend datafication and the deployment of data-enabling digital technologies level the playing field for physical retail to better compete with e-commerce and offer value-added services.

Methodology

To achieve the described research aim, the attributes that make e-commerce surpass physical retail must first be identified by means of literature review, having an emphasis on embedded data collection mechanisms and its business implications. Similarly, the current state of the physical retail industry must be briefed, focusing on the facts that portray the sector's lag behind e-commerce. The ultimate purpose of this review is to determine the critical areas where physical retailing might improve to implement more competitive data strategies. Likewise, by analyzing core industry problems and linking them to the lack of data proliferation, the potential of a data-enriched physical retail sector will be explored through existing research. In a second step, insights from retail industry experts working at leading

technology firms will be gathered and analyzed by applying IPA (Smith Jonathan et al., 2009) to understand the true state and priorities of this industry and discuss the potential and effects of the adoption of data-enabling technologies. Loyalty programs and tailored services will also be examined, with a special emphasis on customer experience, intent of use, and data privacy.

Findings

Our preliminary findings shed new light on the topic of how digitization and data enabling technologies shape physical commerce competitiveness and allow firms the implementation of tailored services. The data potential of physical stores because to the access to physical spaces is larger than e-retailers. Furthermore, data proliferation was found to be a critical source of competitive advantage which leads to personalized offers and services. Finally, given the larger share of purchases being made offline and the higher number of potential touchpoints a brick-and-mortar setting provides, the physical retail market is poised to outperform e-commerce as more and more data-enabling technologies are deployed in physical stores.

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Session 7

Innovation and sustainability II

Co-Chairs: Lorea Narvaiza & Bart Kamp

(Sala Forum)

Innovation and competitive strategy: The role of the paradox of openness

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Abstract

Differentiating through innovation can be a source of competitive advantage. Though the extant literature has acknowledged the role and importance of collaboration through open innovation, some scholars argue that the relationship between internal and external stakeholders can introduce organizational tensions. This study investigates the relationship between strategy intent and outcome, and the role that external sources of innovation play in influencing this relationship. Using data from the community innovation survey, this study applies a logit regression to a sample of 1419 Portuguese firms. The results indicate that the relationship between differentiation intent and outcome is contingent upon the moderating effect of the open innovation breadth. This study contributes to the theory that the negative influence of different sources of innovation can be solved by looking at it through a paradox lens. As implications for managers, this research demonstrates that by simultaneously engaging in a differentiation strategy and collaborating with external partners, can compromise a firm's ability to differentiate its product offer.

Keywords: Competitive strategy, Differentiation strategy, Open innovation, Paradox of openness.

Introduction

Due to market dynamics, organizations are required to leverage innovation strategically to gain an edge over competition or to simply stay in business (Amit & Schoemaker, 1993; Hamel & Prahalad, 1990). However, several scholars have argued that the accelerated pace of innovation and the ruthless proliferation of knowledge, have forced firms to view innovation in light of their broader competitive strategies and develop it mostly in collaboration with external players (Dobni, 2010). Additionally, some studies have indicated that despite the various potential benefits, innovation achieved through external collaboration can raise important concerns and tensions for firms (Smith & Lewis, 2011; Lauritzen & Karafyllia, 2019). This study seeks to understand the impact of a firm's deliberate competitive strategy on product differentiation, and the paradoxical tensions resulting from open innovation processes. Some studies have explored the dynamics behind the strategic intention to pursue a differentiation strategy through a deliberate and emergent approach (Mintzberg & Waters, 1985), others have identified product differentiation as an outcome of a deliberate firm-level competitive differentiation strategy (Hambrick, 1983; Dickson & Ginter, 1987; Porter, 1997; Swink & Hegarty, 1998). However, even though several studies have sought to investigate the strategy intention and the outcome of strategy intention separately, little is known about the relationship between the intention to differentiate and the outcome emerging from the differentiation strategy. Moreover, and although several articles have considered the importance of different sources of open innovation in a firm's performance (Chesbrough, 2003; Laursen & Salter, 2006; Laursen & Salter, 2014; Mina et al., 2014; Vendrell-Herrero et al., 2022), little emphasis has been given to the influence that external sources of open innovation have on the differentiation intention and outcome, and the role that a paradoxical perspective can play in managing

tensions that may emerge from these relationships. It is also worth mentioning our contribution herein in terms of intention measurement. By operationalizing Porters' (1997) generics strategies, we contribute to a definition of a measure that evaluates firms' competitive strategy intention. Therefore, this study seeks to understand, first, if intention leads to the planned outcome (H1); second, to highlight the influence that external sources of knowledge have on the desired outcome (H2), providing evidence that the theory of paradoxes can resolve the tensions associated with value creation and value capture; and third, to contribute with empirical evidence that helps build a measure of firms' competitive strategy intention.

Methodology

Using data from the community innovation survey, this study applies a logit regression to a sample of 1419 Portuguese firms. The Logit regression, a discrete choice regression, is the most suitable method to measure product differentiation as it is measured by a binary variable. With this a certain firm has a propensity to innovate y_i , linearly related to a vector of observable variables x_i , and errors, ε_i (non-observable elements).

$$y_i^* = \beta_{x_i} + \varepsilon_i \quad (1)$$

Firms innovate when y is greater than 0. Product differentiation cannot be observed, only their actual decision, y_i (0 if firms do not innovate, 1 otherwise). The probability that $y_i = 1$ is specified by equation (2) and presents β as the vector of the coefficients to be estimated, which is also used to accept or reject hypotheses based on their size:

$$P(y_i = 1 | x_i) = \exp(x_i\beta) / (1 + \exp(x_i\beta)) \quad (2)$$

A marginal effect is used to quantify the effect of each variable (Greene, 2011). For empirical purpose the following model was considered:

$$\text{Product differentiation} = \alpha + \beta_1 \text{CSD}_i + \beta_2 \text{OPB}_i + \beta_3 \text{CSD}_i * \text{OPB}_i + \varepsilon_i \quad (3)$$

where $\beta_1 \text{CSD}_i$ represents the deliberate competitive strategy (differentiation intent), $\beta_2 \text{OPB}_i$ represents the open innovation breadth, and $\beta_3 \text{CSD}_i * \text{OPB}_i$ represents the interaction. In order for H1 to be supported, $\beta_1 > 0$, and in order for H2 to be supported, $\beta_1 > 0$, $\beta_2 > 0$, and $\beta_3 < 0$.

Results and discussion

H1 suggests that a differentiation competitive strategy intention will lead to a higher likelihood of product differentiation, as a differentiation outcome, validated when β_1 is positive. As reported by Table 1 column 2, the marginal effect indicates that an increase of 1 % in differentiation or open innovation breadth, *et ceteris paribus*, leads to an increase of 0.092 and 0.065 percentage points, respectively, in the probability that product innovation occurs ($p\text{-val} < 0.01$). Consistent with prior research (Amit & Schoemaker, 1993; Laursen & Salter, 2006; Swink & Hegarty, 1998; Danneels, 2002; Dickson & Ginter, 1987), our findings corroborate that open innovation and the intention to implement a differentiation competitive strategy independently would enhance the probability to innovate. However, the moderation effect presented by H2 proposes that there is a negative effect of the open innovation breadth and differentiation competitive strategy intention interaction in

increasing firms' probability to innovate, which implies that β_1 and β_2 have a positive influence, and β_3 (the interaction) has a negative influence. As reported in column 4, an increase of 1 % of the interaction between differentiation and open innovation will lead to a decrease of 0.035 percentage points in the probability that product innovation occurs.

	M1: Baseline model		M2: Interaction	
	Coefficient (Std. error)	Marginal effect (std. error)	Coefficient (Std. error)	Marginal effect (std. error)
Open Innovation breadth	0.280*** (0.099)	0.065*** (0.024)	1.548** (0.671)	0.359** (0.157)
Differentiation	0.392*** (0.058)	0.092*** (0.013)	0.443*** (0.063)	0.103*** (0.014)
Differentiation * Open Innovation breadth			-0.149** (0.074)	-0.035** (0.017)
Funding sources: One external source	1.247*** (0.159)	0.299*** (0.037)	1.243*** (0.159)	0.297*** (0.037)
Funding sources: Two external sources	1.912*** (0.279)	0.439*** (0.051)	1.927*** (0.279)	0.443*** (0.051)
Funding sources: Three external sources	1.066 (0.802)	0.260 (0.187)	1.090 (0.785)	0.266 (0.183)
Knowledge and technology acquisition	0.471*** (0.145)	0.110*** (0.034)	0.457*** (0.145)	0.106*** (0.034)
Co-creation	1.281*** (0.149)	0.304*** (0.034)	1.272*** (0.149)	0.301*** (0.034)
Business Group: Domestic	0.466** (0.237)	0.112* (0.059)	0.460* (0.235)	0.110* (0.058)
Business Group: International	0.912*** (0.224)	0.223*** (0.054)	0.882*** (0.226)	0.215*** (0.055)
Higher education	0.163*** (0.055)	0.038*** (0.013)	0.163*** (0.055)	0.038*** (0.013)
Constant	-5.563*** (0.485)		-5.978*** (0.532)	
N	1,419		1,419	
Pseudo R2	0.309		0.312	
Wald Chi2	372.46		377.49	
Prob > Chi2	0.0000		0.0000	
Correctly predicted (cut off = 39.89%)				
Product Innovators	74.73%		74.38%	
Non-Product Innovators	76.55%		77.02%	
Overall	75.83%		75.97%	

Table 1. Product differentiation regression: Logit model

This trade-off in which firms find themselves when sharing critical knowledge will increase organizational tensions. Our results indicate that the relationship between strategy intent and outcome is contingent upon the moderating effect of the open innovation

breadth. By revisiting the paradox of openness this study contributes to the theory that the negative influence of different sources of innovation can be solved by looking at it through a paradox lens. Additionally, the ability to measure intent will help to assess firms' strategy plans rather than strategy outcome, thereby contributing to the deliberate and emergent literature. This study provides two main observations for managers: first this study demonstrates that if leadership endorses a differentiation competitive strategy, it will end in a differentiation outcome. Second, we demonstrate that managers will benefit from the best of both approaches if engaged separately. This study relies on a thorough cross-section of Portuguese manufacturing firms' innovative capabilities and activities. With this, it is difficult to guarantee concrete evidence in causality. Nevertheless, access to panel data could help to mitigate this problem.

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Collaborative performance management, digital strategy, and sustainability performance

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Abstract

This study examines the relationships between collaborative performance management, digital strategy, and sustainability performance in construction industries. Collaborative performance management is one of the means that can enhance sustainability by providing information to manage the relationships with partners. However, the mechanisms through which collaborative performance management contribute to sustainability performance are empirically under-researched. An enhanced understanding of the direct and indirect influences of collaborative performance management and digital strategy will assist in forming a solid picture of sustainable relationship management. The quantitative data were gathered from construction companies operating in Finland. The proposed theoretical model was tested with structural equation modelling. The findings suggest that construction companies should enhance collaborative performance management with suppliers if they want to facilitate sustainability performance. Also, digital strategies are beneficial in sustainable relationships management because they allow targeting of customer collaboration, and in turn, lead to enhanced sustainability performance.

Keywords: Collaborative performance management, digital strategy, sustainability performance.

Introduction

An increasing emphasis on sustainability engagement has led companies to collaborate externally (Walker et al., 2014; Jazairy et al., 2021). The level of collaboration is beneficial for the company as it enhances companies' sustainable production, which makes external collaboration worth investing (Blome et al., 2014). Companies engage in supply- and demand-side collaboration to benefit from enhanced sustainability and strategic performance (Blome et al., 2014). These collaborations are the key for attaining competitiveness for many firms as they enable value creation via additional resources and capabilities from external parties (Dyer and Singh, 1998). The management of these inter-organizational partnerships are conceptualized as collaborative performance management, i.e. sharing of and collaborating with inter-organizational information with the goal of gaining higher performance (Busi and Bititci, 2006; Dekker et al., 2016). Although managing these collaborations are important forming the sustainability performance, also other relevant methods facilitate collaboration-sustainability linkage. Digital technology is a significant facilitator for collaboration (Verdecho et al., 2009), but it also critical for a successful implementation of collaborative performance management (Franco-Santos et al., 2012; Maestrini et al., 2018). The utilization of digital technology requires technological knowledge, resources, and investments to meet the company specialties (Maestrini et al., 2018; Opazo-Basáez et al., 2022), which emphasizes the strategic approach of managing collaboration. Hence, it is crucial to understand how digital strategy can support performance outcomes in collaborative relationships.

This study empirically examines the relation between collaborative performance management and sustainability performance and the role of digital strategy in the relation between collaborative performance management and sustainability performance. An

enhanced understanding of the direct and indirect influences of collaborative performance management and digital strategy will aid the development of a more complete picture of managing sustainability performance. In this paper, we test a model which postulates whether it is the collaborative performance management or rather the mediating effect of digital strategy, which is crucial to sustainability performance.

Research methodology

We gathered data from construction companies using a quantitative survey to test the research model. The measurement items were derived from the literature and were pre-tested. The survey targeted companies that operate mainly in Finland, but some of the companies do business also in Scandinavia and Europe. Primarily, the survey targeted companies engaged in construction collaborations, as they are likely to have sufficient knowledge to answer survey items. The survey was distributed to circa 1400 randomly selected construction companies. After follow-up contacts 135 completed responses were received (response rate of 9.6 %). The collected data was analyzed with structural equation modelling.

Results

The results show a significant direct relationship between collaborative performance management with suppliers and sustainability performance, but a non-significant direct relationship between collaborative performance management with customers and sustainability performance. Further, the results show the role of digital strategy as a mediator between collaborative performance management with customers and sustainability performance. Digital technologies did not possess a similar mediating role in the

relationship between collaborative performance management with suppliers and sustainability performance.

Conclusions

Theoretically, the study contributes to the extant research by showing that companies can benefit from supply-side collaboration and demand-side collaboration in different ways. The results show that supply side collaboration directly contributes to sustainability performance, but companies are required to utilize digital strategy in order to be in a position to gain sustainability from demand-side collaboration. Our contribution will help to reveal how collaborative performance management can be used to enhance sustainability performance. Thus, collaborative performance management has to be viewed holistically considering both supply-side collaboration and demand-side collaboration as both will directly or indirectly result in increased sustainability performance.

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The impact of circular strategies on the triple bottom line: An analysis of enablers and actors

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Abstract

Sustainability affects many stakeholders: customers, shareholders, and regulators. Meso- and macro-level stakeholder interrelationships form habitats, accentuating bilateral and multilateral influences. The manufacturing industry is a leading actor in exploitation, constantly consuming finite resources, while the extraction of raw materials pollutes the environment (Young et al., 1997). According to the theory of industrial ecology, the manufacturing industry resembles biological ecosystems in many respects (West et al., 2018). The service science approach builds upon this ecosystem theory (Frost et al., 2019), describing how different actors interact and combine resources to co-create value. Habitats formed by the actors dynamically evolve according to individual interrelated strategic decision-making. Manufacturers are unknown to the state of value co-/creation in their habitats. A lacking understanding of efficient

interrelationships among the actors exhibits a deficiency to capture and deliver created value.

Keywords: Circular strategies, ecosystem actors, lifecycle, triple bottom line.

Actors enabling circular strategies along the triple bottom line

The Ellen McArthur Foundation has used an analogy between the manufacturing industry and ecology to demonstrate that proper management of resources in both systems can create a recurring cycle. Along the lifecycle of products, manufacturing companies apply the four core R-principles “reuse”, “refurbish”, “remanufacture”, and “recycle” (Wang, Kara & Hauschild, 2018). The model exemplifies the coherent structure of these core principles, however there are up to ten R-principles in the industry, e.g., Kirzherr et al. (2017), with several promising activities merely introduced into manufacturing. While the core principles find frequent use in service systems, other principles seem not sufficiently promising to be implemented. It is not a lack of knowledge that is considered a barrier but rather the unknown state of value co-/creation within a company’s habitat. Strategy depends on the company's ability to efficiently incorporate R-principles into its business model. The type of R-principle applied determines the positioning in the lifecycle. According to Menon et al. (2019), the phases are "beginning of life" (BOL), "middle of life" (MOL), and finally, "end-of-life" (EOL). Compared to the short BOL of a capital product, the elongated life span of operation exhibits recurring opportunities along the timeline to prolong the lifecycle. The EOL opens additional chances to exploit the asset, e.g., reapplication/reuse or recycling converts materials back to raw materials (Khan et al., 2022). For example, R-principles at the BOL (Menon et al., 2019), seem easier to implement –e.g., design for

disassembly– compared to at the EOL since there are external factors to negotiate, e.g., asset ownership or product condition. The lifecycle exhibits recurring patterns such that aggregated knowledge of principles applied at the (pre-)manufacturing stage can influence those at the terminal utilization of capital products and vice versa. The potential value is not created and therefore cannot be captured.

Manufacturing companies can draw upon about ten different R-principles (Figure 1), whereas most principles apply to the MOL stage. The application of R-principles is unstructured, and the mode of operation and context (e.g., self-execution, collaboration, ecosystem, interrelationships, etc.) is dissociated. Often equipment manufacturers remain focused on BOL and early MOL (Khan et al., 2020) and ignore the late MOL and EOL opportunities, normally due to a lack of influence at this stage in the lifecycle (e.g., the product is not trackable and given the initial sales are long gone). Building on the basis that a manufacturing firm's business model is primarily focused on design, manufacture of new products as well as product performance. Asset management during the MOL phase focuses on the minimization of maintenance spending while maximizing production efficiency. Current manufacturers exhibit low interest in operationalizing the EOL phase, which is left to the asset owner. Commonly, businesses operate locally to dispose of the equipment, neglecting potentially valuable alternatives. This circumstance underlines the complexity and needs to develop a coherent approach to integrate the R-Principles with a solid understanding of the different actors' motivations to participate in the habitats and when they dominate.

Matching the interests and motivations of ecosystem actors created complex challenges over the lifecycle and it may be better to highlight the key R-principles within the three phases. Without systematically mobilizing the R-principles in a structured way along the whole lifecycle the reductions targets concerning the

Beginning of Life			Middle of Life					End-of-Life	
Direct the use of resources in the (pre-) manufacturing stage for efficiency throughout the lifecycle.			Extend the product's lifespan of operations.					Process product materials after operations.	
R1 Refuse	R2 Rethink	R3 Reduce	R4 Reuse	R5 Repair	R6 Refurbish	R7 Remanufacture	R8 Repurpose	R9 Recycle	R10 Recover
Abandon or unify the functionality of products to decrease resource intensity.	Increase use intensity of products.	Consume fewer resources in product manufacture.	Reuse product functions in alternative scenarios.	Repair defective products to sustain functionality.	Restore and update a product to improve functions. The value of the product increases.	Build discarded product parts into a new product. The value of the product stays similar.	Build discarded product parts into a new product with different functionality.	Mechanically and chemically process residual materials of products into raw materials.	Obtain energy recovery with incineration of materials.

Figure 1. Collection of R-principles in manufacturing

environmental impact will not be achievable. This work also considers ecosystem services and institutional arrangements that may be missing in a particular habitat, which may inhibit the operationalization of circular strategies.

Developing a research question

Focusing on the factors influencing circular strategies along with the lifecycle, the research questions are:

RQ1: Which actors are available to enable circular strategies along the triple bottom line?

RQ2: What resources are needed to operationalize circular strategies?

We emphasize the actors' interplays to convey circular strategies and encounter that today circular strategies are unstructured and scattered. Disorganization of interdependencies among the actors lead to inefficiencies in terms of economic, environmental, and social value responsibilities, e.g., lack of data transparency, strain on logistic networks, etc. Mapping the strategies with a set of actors yields a higher operationalization potential due to increased and aligned practical relevance as well as motivation for each individual actor. In sum, an efficient allocation and execution of circular

strategies among ecosystems, considering the meso- and macro-level, support and increase the value co-creation, value delivery, and value capture while addressing the triple bottom line.

Findings

We argue that the inherently sustainable orientation of R-principles, foundational enablers and strategies, and operational-level actions can positively impact the triple bottom line. Analyzing at the meso- and macro-level, the former level refers to the investigation of ecosystems created by executing circular strategies by an array of actors linked to the manufacturing industry. A specific set of actors, connecting dyadic, triadic, and multilateral relationships to deliver circular strategies. Value streams flow within these connections as reciprocal exchanges. Optimizing the value creation potential of these value streams hence benefits the participating actors and the influence on the triple bottom line. The macro level describes drivers (e.g., regulatory frameworks) that can accelerate the transition towards sustainability, or by introducing technologies that reduce the information and knowledge gaps that influence the value creation, delivery, and capture of circular strategies. Together, the meso- and macro-levels highlight the interdependences of actors in an ecosystem approach. This work investigates the interplay between actors, rather than the capabilities of individual actors. Nonetheless, understanding the integration mechanisms of actors' business models and the continued exchange of value propositions within ecosystems builds a fundamental part of the holistic ecosystem approach and should be kept in mind while reading this work.

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Knowledge transfer through services: Consumer attraction, retention or satisfaction?

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Abstract

This research draws a close relationship between the servitization and the Knowledge-Based views theories. We focus on the firms' tacit and explicit knowledge-sharing processes and employ three applicable values generated through services: consumer rotation, retention, and satisfaction. By implementing this process, we conclude that the evidence established close relations between knowledge and servitization efforts in the business strategies. Furthermore, the proposed model suggests that certain types of knowledge sharing can be an effective and efficient means of successful servitization efforts.

Keywords: Knowledge-based view, Tacit Knowledge, Explicit Knowledge, Servitization.

Resume

Among the several tangible and intangible resources an organization possesses, knowledge is considered one of the most critical resources to promote a sustainable and competitive edge (Bustinza et al., 2018; Opazo-Basález et al., 2021; Vendrell-Herrero

et al., 2021a). Furthermore, successful knowledge-sharing processes enable firms to expand their tacit and explicit knowledge capital to exploit and convert all available resources into dynamic competencies (Hadjimichael & Tsoukas, 2019; Lei, Ha et al., 2020; Rosellini & Hawamdeh, 2020) To date, there is not a substantial amount of theoretical studies that combine Knowledge-based view and servitization (e.g., Valtakowski), and lack on an empirical basis that complements the studies.

The knowledge-sharing process relies on tools, tasks, and people to stimulate knowledge through the organization. However, the competitive advantage of Tacit and Explicit knowledge is principally focused on human capital (Lei, Ha et al., 2020) and how this knowledge sharing and development can benefit the company's innovation and business ecosystem (Lei, Gui et al., 2020).

This research endeavours to discover how tacit and explicit knowledge can influence a company's degree of servitization. In particular, this research attempts to create a connection between three indicators related to the success of service implementation in businesses: 1) service rotation, or how the company struggle with non-frequent customers, 2) service retention, or the strategies for creating loyalty, and 3) service satisfaction, or how the company meets the customer expectation (Cenamor et al., 2017; Qi et al., 2020; Rabetino et al., 2017; Vendrell-Herrero et al., 2021b).

Primary data is being captured, and to date, 166 valid responses have been obtained from manufacturing companies whose domestic market is in Spain. Although the goal is to reach 300 observations, we have used the available data to obtain preliminary results. The results confirm the influence of tacit and explicit knowledge on a company's degree of servitization, according to the hypotheses raised around the variables of rotation, retention, and satisfaction associated with the value generated through services.

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Leading as a complementor: Exploring the evolution of corporate ecosystem leader's role

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Abstract

Incumbent firms are increasingly developing corporate ecosystems to improve their competitive position and reach different markets. This emergent form of the ecosystem requires a profound, yet little understood, systemic change in how incumbent firms co-develop and envision ecosystem-based value propositions. More specifically, the literature provides few insights into how a corporate ecosystem leader can effectively participate in multiple innovation ecosystems by exploring both passive and active roles in establishing emerging innovation ecosystems. To address the research gap, this in-depth case study explores the evolution of a world-leading network equipment provider (NEP) from an orchestrator role, to a complementor role, to a 'leading as complementor' role in order to maximize the innovation potential of 5G connectivity solutions and support 5G industry adoption. The study unpacks the characteristics of each role as well as unfolds the associated dynamics in relation to

envisioning solutions and ecosystem participation. Our study extends the literature on ecosystem roles, corporate ecosystems, and innovation ecosystem emergence.

Keywords: Corporate ecosystems, innovation ecosystems, formation mechanisms, 5G connectivity solutions.

Introduction

The telecom industry plays a specific role in digital transformation by providing the mobile broadband infrastructure necessary for various digitally-enabled connectivity solutions across industry verticals (Ericsson, 2021). In particular, network equipment providers (NEPs) (e.g., Ericsson, Huawei, Nokia), carry the backbone of the digital transformation since their competencies in 3G/4G/5G technology are frequently embedded in the Internet of Things (IoT) solutions (Ceipek et al., 2021) that are driving digital transformation across various industries (Hsuan et al., 2021; Leminen et al., 2020; Paiola et al., 2021). Estimates show that the total number of IoT connections will reach 30.2 billion by 2027 with 13% CAGR (Ericsson, 2021). Recently, NEPs have introduced the concept of a high-speed 5G network (Shrama et al., 2020) that holds the promise to disrupt various vertical industries, from manufacturing (Jovanovic et al., 2021; Nasiri et al., 2020; Schroeder et al., 2020) to retail (Jocevski, 2020) and logistics (Cichosz et al., 2020; Jovanovic et al., 2022). For instance, 5G networks provide at least 20 times faster transmissions that can support over 100 more devices per meter of coverage, lower latency of transmissions, and about 90 percent more energy efficient operations than 4G networks (Nahum et al., 2020). However, the enormous industrial potential of 5G connectivity solutions involves undergoing systemic changes to the long-standing position of NEPs in the telecom industry and how they approach the digitalization market – for

example, Ericsson and Huawei (Dasí et al., 2017; Volberda et al., 2021).

First, to grow the number of 5G devices embedded in connectivity solutions across several distinct industrial verticals, NEPs need the support of a broader range of partners (Furr & Shipilov, 2018; Saadatmand et al., 2019; Williamson & De Meyer, 2012). More specifically, NEPs need to guide and train partners to integrate 5G components into their 5G connectivity solutions to address specific use cases (Nahum et al., 2020). Moreover, NEPs need to collaborate with partners to deliver different 5G connectivity solutions that may bear no relation to the prior experience and knowledge base of NEPs (Cyert & March, 1963; March & Simon, 1958). The backward position of NEPs in the value chain reduces their visibility and interaction with other partners and end customers (Yoffie & Kwak, 2006), making it difficult for NEPs to envision all possible value propositions enabled by core 5G devices (Dattée et al., 2018). Therefore, to push industry-wide 5G adoption and support their survival and future growth, NEPs are building corporate ecosystems (e.g., Amazon, IBM, and Microsoft). However, the literature on corporate ecosystems (cf., Burgelman, Snihur & Thomas, 2021; Hou, Cui & Shi, 2020) has won only limited attention.

Second, apart from establishing a wide portfolio of potential partners, such as OEMs, software and device vendors, and consulting firms, the primary goal of NEPs is to facilitate deployment of 5G connectivity solutions to multiple industries. This requires the formation of multiple innovation ecosystems, which may create several challenges for technology providers such as NEP (Wareham et al., 2014). Consequently, an active role may be preferred – for example, pursuing the orchestrator role that promises a lion's share of future ecosystem profit (Adner & Kapoor, 2010). However, orchestrating and deploying 5G

connectivity solutions to different industries may be challenging and resource demanding (Dedehayir et al., 2018; Jacobides et al., 2018; Lingens et al., 2021). Moreover, recent studies argue that small companies or consulting firms (e.g., BCG, Accenture, and Capgemini) may be more successful with the orchestrator role (Lingens et al., 2021). Therefore, NEPs may favor a passive role in the formation of such innovation ecosystems rather than occupying an active orchestration role (Autio, 2021; Hou et al., 2020). However, the literature lacks comprehensive insights on how an incumbent firm can facilitate multiple innovation ecosystem formations that promote industry-wide technology adoption.

Considering the aforementioned gaps, the study draws on rich data from a world-leading network equipment provider, which we label Epsilon. Epsilon is a research-oriented provider of cellular technology components with associated software and services for 5G connectivity solutions for both for public and private sectors. First, our findings presents that initial Epsilon's role characterizes full accountability for the orchestration of the innovation ecosystem. This stage embodies modular 5G solution with possibility to unlock a wide range of alternative application, low clarity of control points and inter-dependences among the ecosystem participants that does not allow the solution scaling and effective participation in multiple innovation ecosystems. Second, Epsilon subsequently opted for a delineated complementor role where solution were preconfigured with a selected complementors, narrower range of alternative solutions and more clarity about the control points and inter-dependencies in emerging innovation ecosystem. Finally, Epsilon transitioned to a "leading as complementor" with pre-designed control points and high clarity of inter-dependencies that allowed full scaling of 5G connectivity solution across industry verticals. The study positions contributions

within the literature on ecosystem roles, corporate ecosystems, and innovation ecosystems emergence.

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This book of abstracts summarizes the proceedings of the **9th International Conference on Business Servitization (ICBS 2022)**, held at the Hotel Ilunion, Malaga, Spain. On this edition, the conference places a special emphasis on the focal theme: **Servitization as a springboard for enhancing Sustainable manufacturing**.

This year's edition of the International Conference on Business Servitization (ICBS) aims at debating and shaping such critical questions for the future development of the field. Accordingly, the focus of this year is on environmental sustainability. This year's conference aims to discuss what the challenges in implementing environmental-friendly production are, and how can the servitization community contribute to this domain.

ICBS is a conference traditionally targeted to business professionals, policymakers and researchers. While the focus of this year's conference will be "Servitization as a springboard for enhancing Sustainable manufacturing systems", as in previous editions the organizers also endeavor 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 emerging 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 to the researchers and practitioners from both academia as well as industry to meet & share the cutting-edge developments in the field of servitization.

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