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Driving Sustainability: Insights from a Multiple Case Study on B2C Product-Service-Systems

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Abstract

The current linear economic model is exacerbating environmental challenges, which has led to the transition to the circular economy and the adoption of circular business models by organizations. One of these models are product-service systems (PSS), which have shown to have a high potential to promote sustainability, however, their implementation presents numerous challenges. For instance, configurations of PSS' capabilities are different than from traditional business models, and they operate under settings oriented towards linear production and consumption systems. Through a multiple case study approach, drawing insights from the resource-based view, dynamic capabilities theory, and contingency theory this research explores the dynamic nature of PSS business models. It illustrates how organizations adeptly respond to various challenges and seize opportunities, while contributing to sustainable development.

Keywords

product-service-system (PSS), circular business model (CBM), sustainable development, multiple case study

Introduction

The prevailing linear economic model is driving emissions, biodiversity loss, pollution, and the depletion of non-renewable resources (Teigiserova et al., 2023). A promising alternative to this unsustainable model is the circular economy (CE), which is a transformative economic system that renders the concept of "end-of-life" obsolete, and aims to reduce material consumption and resource extraction, extend product lifecycles, and foster sustainable development through the circular strategies such as reuse, repair, refurbishment, or recycling (Geissdoerfer et al., 2017; Kirchherr et al., 2023; Mhatre et al., 2021). Despite an increasing number of businesses adopting circular strategies through the development and implementation of circular business models (CBM), recent studies reveal that not all CBMs necessarily yield positive environmental impacts. Consequently, CBMs and their role in promoting sustainability need to be examined comprehensively (Bocken et al., 2023).

Among the various CBMs, product-service system (PSS) business models (BMs) stand out for their potential to drive the CE transition towards sustainable environmental and social development while also ensuring economic profitability (Fargnoli et al., 2022; Sarasini and Linder, 2018; Teigiserova et al., 2023; Widmer et al., 2018). PSS refer to businesses that produce offerings which combine physical products with complementary services, thereby providing customers with comprehensive solutions that are tailored to their needs. Depending on the degree of service integration, PSSs are generally divided into three categories: product-oriented, use-oriented, and result-oriented (Tukker, 2004). While product-oriented PSS, still might drive extensive resource consumption, use- and result-oriented PSS businesses have particularly demonstrated to have an advanced potential for generating positive sustainability outcomes due to their emphasis on access and outcomes over product ownership. Thus, the adoption of PSS models by organizations could lead to a reduction in resource demand, the extension of products' lifespans, the minimization of waste, and the promotion of environmental efficiency (Sarasini and Linder, 2018; Tukker, 2015).

However, there is no singular optimal approach as studies have indicated that businesses need to implement a combination of strategies that are tailored to their specific contexts

to ensure both profitability for the businesses and the positive environmental impact of PSS (Lahti et al., 2018). Consequently, a thorough exploration of PSS is necessary to provide an understanding of how different combinations of resources and capabilities can lead to various sustainability outcomes. Additionally, due to businesses not following the traditional, known, and tested BM configurations, there is an increasing amount of uncertainty among PSS businesses regarding the impact of different organizational activities and practices (Hofmann and zu Knyphausen-Aufseß, 2022). Thus, PSS face numerous additional challenges, ranging from high initial investments, insufficient legal or regulatory support, pricing complexities, and consumer resistance to consumption without possession, the constant need to reconsider processes, and the adoption of fitting strategies (Gebauer et al., 2005; Koide et al., 2022; Martinez et al., 2010; Moro et al., 2020; van Loon et al., 2022). Therefore, it is important to understand how PSS businesses form internally, to operate under settings dominantly oriented towards linear production and consumption systems. (Hofmann and zu Knyphausen-Aufseß, 2022). Accordingly, this research investigates how organizations can overcome the various challenges by analyzing the transformational processes the development of capabilities and adaptive skills to align with their specific operating contexts (García-Quevedo et al., 2020; van Loon et al., 2022). Moreover, given the need to examine PSS according to these various circumstances, researchers should prioritize comparative case studies of the different strategies that have been implemented across diverse PSS categories (Koide et al., 2022).

To summarize, this explorative study's purpose is to gain a deeper understanding of how sustainable PSS models develop and change organizational activities and processes in a way that allows them to not only remain competitive but also align their practices with their sustainability performance and environmental commitments. By conducting a multiple case study and drawing insights from the resource-based view (RBV) framework, the dynamic capabilities (DC) theory, and the contingency theory (CT), this study will identify the competencies that PSS businesses need to obtain in specific contexts, how they can develop necessary capabilities to align with their contexts, and the role that external factors play in this process. This will result in the development of a comprehensive framework that will be derived from in-depth analyses of practical cases which will be combined with previous PSS and CE frameworks as well as classification systems. The case studies will offer

valuable insights into the risk mitigation, scalability, and strategies of PSS businesses. By exploring practical challenges and drawing upon context-dependent, evidence-based theories, this research will bridge the gap between academic conceptualizations and real-world practices to determine how CBMs, particularly PSS BMs, can ensure businesses' economic feasibility while they transition to environmentally friendly practices (van Loon et al., 2022; Van Wassenhove, 2019).

Theoretical Perspective

The concept of capabilities that is used in the field of management and organizational research is founded in the RBV. This view posits that a company can be seen as a collection of diverse resources, with the uniqueness of each firm being explained by the differences in each one's configuration (Barney, 1991; Hofmann and zu Knyphausen-Aufseß, 2022). Organizational resources encompass the tangible or intangible assets that are crucial for producing the outputs that an organization develops, owns, controls, or accesses, while organizational capabilities denote the firm's ability to use these resources to collectively coordinate in ways that achieve specific purposes (Helfat and Peteraf, 2003). Based on the insights of the RBV, the DC theory was developed and expanded the theory on how strategic organizational change can be implemented while maintaining evolutionary fitness (Hofmann and zu Knyphausen-Aufseß, 2022). Through the DC lens, researchers have explored organizations' capacities to sense, shape, and seize opportunities as well as maintain their competitiveness by enhancing, combining, protecting, and reconfiguring their tangible and intangible assets (Teece, 2007). The goal of this endeavor is not to gain immediate profits but, rather, to ensure organizations' long-term adaptability and survival in uncertain environments through activities such as designing new products or services, innovating technologies, and implementing new BMs. The DC theory, therefore, complements RBV, in that RBV focuses on organizations' current configurations, while DC examines organizations' adaptive, absorptive, innovative, and networking abilities through their responses to environmental changes over time. Accordingly, both the RBV and DC models have been applied in the analyses of sustainable BM and CBM innovation (Bocken & Geradts, 2020; Khan et al., 2020; Teece, 2007).

Similarly, the CT broadens the scope of the RBV and DC theory by considering the influence of external factors. This approach emphasizes that there is no one-size-fits-all approach to organizational management as the effectiveness of organizational practices is contingent upon the fit between these practices and the specific context in which they are implemented (Li et al., 2022). Indeed, the CT maintains that environmental factors and changes therein create a need for organizations to adapt structurally to realign with and fit into their environments (Donaldson, 2001). This emphasis draws attention to how environmental conditions influence organizational strategies, structures, and processes: Management and organizations must create or enhance value by (re)configuring their new or existing resources according to external factors, such as market conditions and consumer readiness to adopt PSS models. In this view, some contingencies can positively influence PSS BMs and their sustainability impacts (e.g., policy frameworks for eco-innovation and waste management), while others hinder the establishment of PSS (e.g., lack of funding opportunities and suitable accounting systems).

Therefore, the combination of the RBV, DC theory, and CT allows for the determination of PSS organizations' internal structures, operational developments, and the factors that influence these developments, respectively. Concurrently, the RBV is used to identify organizations' key capabilities, the DC theory is employed to trace their evolution, and the CT is implemented to highlight the external influences on organizational changes and analyze whether these influences support or hinder organizations' sustainable practices.

Using these three theoretical lenses, this study will create a comprehensive guiding framework for organizational management and strategy. The multiple case study approach will also offer unique insights into different aspects of organizational operations by identifying the resources and capabilities acquired by organizations at different stages and in diverse markets. Moreover, by describing PSS organizations' challenges and strategies, this study will explore how these firms effectively balance their economic and environmental sustainability by adjusting their capabilities and resources according to their context. To develop this framework, this study is informed by the following research question and the two related sub-research questions:

How do product-service-system (PSS) organizations strategically adjust their resources and capabilities to fit their operating contexts in a way that allows them to achieve economic and environmental sustainability?

Research Design and Methods

This research adopts a multiple case study approach, to allow for an in-depth exploration of practical cases (Eisenhardt, 2021, 1989). This approach highlights the importance of careful case selection, theoretical sampling, constant comparison, replication logic, and cross-case analysis. By examining polar opposite cases and revealing the differences that exist between organizations' resources, processes, and outcomes, this study will refine the existing theoretical models and identify their practical implications.

Case Selection and Theoretical Sampling

Comparing multiple case studies allows for a validation of their results and generalizations of their conclusions (Eisenhardt, 2021, 1989). To ensure that the selected cases meaningfully contribute to theory building, theoretical sampling is crucial. The sampling includes cases for each type of CBM innovation identified in literature: CBM transformation, circular start-up, CBM diversification and CBM acquisition (Geissdoerfer et al., 2020, 2018b, 2018a). Additionally cases include either use- or result oriented PSS, given their transformative potential in regard to sustainability (Tukker, 2015).

Prior to the study, a market scan has resulted in the identification of over 90 Austrian businesses that had some sort of PSS offering (e.g., selling products as well as renting them) as well as a stated commitment to ensuring sustainability. These businesses operate in multiple sectors (e.g., electronics, textiles, fast-moving consumer goods, plastics), differ in their business maturity (incubator firms, startups, mature businesses), size, and comprise one or various combinations of the PSS categories. This study aims to include at least eight cases, each consisting of different PSS types, sectors, and PSS offerings (e.g., lease, rent, subscription) and degrees of servitization (e.g. only operating with PSS ("full PSS") or additionally selling products and services separately ("partial PSS")). The degree of servitization will be categorized by Geissdoerfer et al.'s (2020) types of circular business model innovation (Geissdoerfer et al., 2020). The final number of cases is determined at a

later stage of the research process. For interviewees key actors are selected, who can provide insights into their organizations' operations, sustainability strategies and customer relations.

Given the significant influence of contextual factors on PSS models, the sample only includes cases that meet certain boundary conditions: organizations operating in the B2C/C2C sector and businesses in Austria, which allows for the differentiation between the contingent factors of interest (e.g., consumer readiness to rent some products over others, funding opportunities) and other factors such as regulatory frameworks and overall market characteristics. Importantly, while this study centers around PSS models in the Austrian context, the resulting framework is adaptable to other settings.

Data Collection and Analysis

The data is collected through semi-structured interviews, secondary document analyses, market reports, and on-site observations from company visits. The multiple investigator approach ensures the attainment of diverse perspectives and a multifaceted understanding (Eisenhardt, 2021). The analysis includes a comparison of the cases to identify the patterns, similarities, and differences between them. The data is analyzed as it is collected, which allows for adjustments of the research design and methods according to the insights that emerge. Ultimately, the resultant framework extends existing research, frameworks and categorization methodologies and enables comparisons of various different cases. Included frameworks and measures support evaluating PSS' sustainability performance (e.g. narrow-slow-close-regenerate structure (Bocken et al., 2016; Konietzko et al., 2020), 10 Rs framework (Potting et al., 2017)) as well as BM aspects (e.g. PSS typology (Tukker, 2015, 2004); value creation, value proposition, value capture, and value delivery based on the (sustainable) BM canvas (Bocken et al., 2018; Osterwalder et al., 2015; Richardson, 2005)).

The development of the questionnaire for the semi-structured interviews has begun with drafting questions grounded in literature to align closely with the research question. This initial version has been reviewed an iterative process with the research team, focusing on ensuring the questions are sufficiently open-ended to facilitate narrative responses and identifying necessary specific inquiries. A professor in qualitative methods, subsequently

has reviewed the questionnaire to provide additional insights. To further refine the interview script, two pilot interviews were conducted.

For the coding process, two researchers have independently coded two interviews to generate initial codes. These preliminary codes have then been reviewed and discussed collaboratively by the entire research team, allowing for the incorporation of diverse perspectives. Through this discussion, the codes have been merged and refined. Ultimately a final coding system has been established.

Expected Results and Preliminary Conclusions

The study is ongoing. One of its key goals is to identify the capabilities and resources that are essential for ensuring sustainable PSS businesses' success by examining and comparing various cases. Expected results include gaining deeper insights into the strategic tailoring of PSS business models to specific contexts as well as the development and implementation of sustainable practices and processes. This research will provide a deeper understanding of strategies developed to adapt to external factors such as market conditions, consumer behaviors, and regulatory frameworks and further identify key internal resources and capabilities uncover vital competencies and assets. Furthermore, the results are expected to offer insights into the dynamic nature of PSS business models, illustrating how organizations adeptly respond to various challenges and seize opportunities, while contributing to sustainable development. The study is also intended to combine the advantages of the RBV, the CD theory, and the CT into a practical and comprehensive framework that will allow for a nuanced and insightful understanding of sustainable PSS BMs. It will drive future research through the introduction of this new framework that can be used to examine PSS practices in different contexts and guide businesses in effectively adopting sustainable PSS practices. In Table 1 you can find an outline of one of the cases.

Case: [redacted] (full PSS, founded in 2020, 3 employees; category: startup)			
Description	**Key Resources & Capabilities (RBV)**	**Sensing, Seizing, Transforming Capabilities (DCT)**	**Contingency Factors (CT)**
Value Proposition: > Platform for renting high-end fashion to reduce purchases and promote sustainability. > Empowering users to monetize worn clothing without parting with it permanently. **Business Model**: > Operates as a two-sided marketplace connecting lenders and renters of high-quality fashion. >Revenue generated through a service fee on each transaction, varying between 25-50% of the total rental price. **Logistics and Operations**: > Primarily managed by the users themselves; some items are handled via a concierge service.	**Key Resources**: > Proprietary platform technology enabling efficient user interactions and transactions. >Brand partnerships enhancing the supply and variety of fashion items available for rent. **Capabilities**: > Ability to adapt and scale the business model across different geographical markets. > Development of a unique tech solution tailored to the needs of the rental business model.	**Sensing Capabilities**: > Identifying and capitalizing on the shift towards sustainable fashion and the rental economy. > Continuous market and consumer trend analysis to adapt the business strategy. **Seizing Capabilities**: > Launching and scaling the marketplace at a time when sustainability is becoming a critical consumer preference. > Leveraging brand collaborations to build trust and expand offerings. **Transforming Capabilities**: > Navigating through funding challenges and market fluctuations by adjusting business operations and focus. > Technological advancements in the platform to accommodate growth and enhance user experience.	**Environmental Factors**: > Market acceptance of rental business models in the textile sector. **Organizational Response**: > Agile adaptation to changes, such as shifting from a city-centric model to a broader geographical model due to COVID-19 impacts. > Strategic partnerships with brands to enhance inventory and credibility.
Challenges	**Overcoming Challenges**	**Sustainability Measures & Efforts**	
Financial *1.* Securing appropriate funding without relying solely on personal finances, navigating through grants, and innovation programs to structure the business model. 2. Closing financing rounds due to a lack of enthusiasm among investors. ***IT and Software*** *1.* Difficulty in developing a stable and functional prototype due to limitations of existing shop systems which requires heavy customization. ***Logistics and Operational*** 1. Managing logistics relies on users self-organizing, with only a minor portion managed through a Concierge Service, which limits control over the quality and efficiency of the service. 2. Transitioning from a city-based model to a broader online format to facilitate country-wide and eventually Europe-wide rentals 3. Lack of suitable infrastructure. ***Market Adoption and User Engagement*** 1. Educating users about the benefits of renting over buying new (shift from conventional consumer behavior). ***Sustainability*** 1. Addressing sustainable practices within the cleaning and maintenance of rented garments, which involved seeking out environmentally and socially responsible cleaning services. ***Partnership and Collaboration*** 1. Establishing partnerships with brands and designers 2. Transitioning partnerships and maintaining relationships with brands during economic hardships which affected the broader fashion industry.	***Financial*** 1. Leveraged grants and innovation programs for initial funding. Utilization of resources available through programs like those offered by the Wirtschaftsagentur and various entrepreneurship grants. 2. Focus on aligning with investors who share a vision for sustainable fashion. ***IT and Software*** 1. Hiring Chief Technology Officer (CTO) and rebuilt the system from scratch to provide a robust, scalable, and flexible platform that could handle the specific needs of a rental business model. ***Logistics and Operational*** 1. Plans to partner with logistics companies familiar with the rental and fashion industry to scale operations and enhance service quality. 2. Expansion into new markets with localized hubs to reduce logistics costs and environmental impact. 3. Innovated within the existing infrastructure limits. ***Market Adoption and User Engagement*** 1. Extensive marketing efforts focused on educating consumers about the benefits of renting, using social media campaigns, and success stories to shift consumer behavior. ***Sustainability*** 1. Partnered with environmentally responsible cleaning services to ensure that the maintenance of garments aligns with their sustainability standards. ***Partnership and Collaboration*** 1. Forged partnerships with fashion brands and designers, focusing on those that share a vision for sustainability, adapting these partnerships to withstand economic fluctuations.	***Replacement of New Purchases and Product Lifespan Extension*** > Tracking whether rentals replace new purchases, which directly correlates to reduced production demands and associated environmental impacts. This metric helps quantify how much the platform contributes to decreasing the fashion industry's overall carbon footprint. ***CO2 Emissions Tracking*** > Measurement of CO2 emissions associated with shipping and logistics. By calculating the distance items travel and the mode of transportation used, they assess the carbon impact of each rental transaction. ***Education and Awareness*** > Focus on educating consumers about sustainable fashion practices. ***Partnerships for Repair and Care*** > Collaborations with repair services ensure that items are maintained and repaired, rather than discarded.	

Table 1: Outline of use-oriented full PSS Case Study Case 1

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