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Exploring the adoption of as-a-Service business models: Opportunities, Challenges and Enablers

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Abstract

In today's dynamic economic landscape, companies are increasingly exploring "as-a-service" business models as a strategic response to intensifying competition, customers' focus on cash retention, and the growing relevance of digital technologies. This shift is particularly evident in the manufacturing sector, where the concept of servitization, the transformation from selling products to delivering integrated product-service solutions, is gaining momentum. Nowadays, similarly to what has happened in other sectors, manufacturers are increasingly interested in adopting "everything-as-a-service" business models, where the use or the function of a product is sold instead of the product itself. That enables companies to establish long-term, value-driven relationships with customers by offering continuous solutions in exchange for recurring payments. Beyond economic and strategic benefits, these models also hold significant potential for enhancing sustainability in manufacturing. By promoting product longevity, enabling predictive maintenance, and encouraging resource-efficient usage patterns, this approach fosters more circular and responsible production and consumption systems. Despite its potential to drive innovation, customer loyalty, and sustainable revenue streams, the practical adoption of "as-a-service" models in manufacturing remains limited, primarily due to a lack of operational and strategic clarity. To address this gap, this paper presents an empirical investigation involving four manufacturing companies that have experimented with and/or implemented the "as-a-service" business model to explore the opportunities, challenges, and enablers of this transformation. Among the most critical challenges, companies struggled to build an internal service-oriented culture and to overcome customer resistance to shifting from product ownership to service-based value recognition. The insights from this research thus shed light on the critical factors underpinning the servitization journey and provide manufacturing firms with practical guidelines for navigating the shift toward service-based business models.

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Keywords: Servitization; as-a-service; case studies; manufacturing; business models

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1. Introduction

In today's dynamic economic landscape, manufacturing companies face mounting pressure to adapt their business models in response to intensifying competition, digital transformation, and the demand for more flexible, cost-efficient solutions [1]. Many firms have begun to recognize the limitations of traditional product-centric models and are transitioning toward more resilient and value-driven approaches [2]. This shift has led to the emergence of integrated product-service systems (PSS) [3], in which companies combine physical products with advanced services. This evolution, known as servitization, represents a fundamental redefinition of how manufacturers create, deliver, and capture value [4]. Digital technologies such as the Internet of Things (IoT), cloud computing, embedded sensors, remote diagnostics, and real-time analytics play a key role in enabling this transition, supporting capabilities like usage monitoring, predictive maintenance, and outcome-based service agreements [5]. A prominent and expanding manifestation of this trend is Everything-as-a-Service (XaaS), a business model in which integrated, on-demand solutions are provided to customers with value-added features tailored to their specific needs [6]. By shifting ownership and responsibilities from customers to providers, XaaS promotes long-term, partnership-based relationships [7] and encourages environmentally sustainable practices such as lifecycle extension and waste reduction, in alignment with circular economy principles [8]. Despite its potential, the practical implementation of as-a-service models in manufacturing remains limited. The existing literature on XaaS is fragmented and terminologically inconsistent, making it difficult for practitioners to derive actionable guidance [9]. Companies often face challenges related to operational excellence, pricing and revenue model definition, risk management, and customer trust. These issues are exacerbated by the lack of structured tools, practical guidelines, and consolidated best practices to support decision-makers in designing and managing XaaS offerings [9].

This study addresses these gaps by providing empirical insights through case studies involving four manufacturing firms. The research investigates the strategic, organizational, and technological factors that influence the development and delivery of service-oriented value propositions. Specifically, it aims to identify common patterns, challenges, and best practices that can support other manufacturers in their transition toward service-based and more sustainable business models.

The paper is structured as follows: Section 2 provides the research background; Section 3 describes the methodology; Section 4 presents the case study results; Section 5 offers a discussion; and the final section outlines conclusions, limitations, and directions for future research.

2. Background

In recent years, manufacturing firms have increasingly recognized the strategic importance of services as a source of sustainable competitive advantage and long-term profitability. This shift has led to the progressive transformation of their business models from product-centric approaches toward integrated product-service systems, a phenomenon widely referred to as servitization [3]. Servitized business models, which emphasize the provision of solutions over time rather than one-off product transactions, are gaining traction in manufacturing due to their potential to foster closer, more durable customer relationships and generate stable, recurring revenue streams [10] [11].

Within both academic and managerial discourse, a multitude of terms has been used, often inconsistently, to describe these evolving models. Among these, the concept of Everything-as-a-Service has recently emerged as a unifying label, particularly in managerial practice. Originating from the domain of information technology and cloud computing, XaaS refers to a delivery model in which digitalized products, platforms, and services are accessed on demand via subscription or pay-per-use mechanisms [12]. Various industry-specific iterations of this model have since proliferated, such as Software-as-a-Service, Mobility-as-a-Service, and Heat-as-a-Service, highlighting the flexibility of the paradigm across sectors. Common to these models is the central enabling role played by digital technologies, particularly cloud infrastructures, embedded sensors, and remote monitoring tools, which support continuous service provision and performance-based contracting. In manufacturing, XaaS has been adapted to encompass models like pay-per-use, pay-per-outcome, Equipment-as-a-Service (EaaS), etc… where customers pay based on usage, performance, or results, rather than ownership [12] [13].

In such business models, the OEM retains ownership of the equipment and assumes full responsibility for ensuring its functionality across the product lifecycle. This includes activities such as maintenance, spare parts management,

consumable supply, and system optimization. From an environmental standpoint, when companies retain ownership of their assets and assume responsibility for their entire lifecycle, they are incentivized to adopt strategies that align with circular economy principles [8] and contribute to greater environmental sustainability [14]. The XaaS model, in particular, facilitates practices such as product return at the end of the contract, enabling refurbishment and redeployment in subsequent agreement, including those with shorter durations. As a result, XaaS supports the efficient use of resources and the extension of product value over time, ultimately reducing material consumption, minimizing waste, and lowering operational expenditures [13].

Although the underlying principles of XaaS are not entirely novel also for manufacturing, evident in early examples like Rolls-Royce's "power-by-the-hour" offering, the widespread implementation of such models remains limited. This slow adoption is due, in part, to the fragmented state of the literature and the lack of consolidated frameworks to support their operationalization. Existing models, such as the TOE framework [15] [16], used in the technology sector, mainly focus on technology adoption factors but overlook value creation mechanisms. Frameworks in manufacturing often address isolated aspects like revenue models [17] [18] or use adaptations of the Business Model Canvas [19], which neglect sustainability or do not take ecosystem dynamics into account [20]. Consequently, a holistic framework capturing the multiple dimensions of XaaS in manufacturing remains lacking.

On a practical level, the transition to as-a-service models introduces substantial challenges for manufacturers. Providers must take on risks traditionally borne by the customer, including financial exposure, operational uncertainties, and user behavior variability. Moreover, they must redesign their pricing strategies, revenue models, and internal capabilities to align with a service-dominant logic. Such transformation brings multiple organizational, cultural, and technological challenges. Internally, companies must cultivate a service-oriented culture, often hindered by resistance to change, especially within SMEs [21, 22]. Externally, customers may struggle to perceive the value of use over ownership, face concerns regarding long-term commitments, and show reluctance to share operational data [23, 24]. Moreover, a successful XaaS transition requires robust digital infrastructure [25, 26], clear data management strategies, and the development of new capabilities not traditionally found in product-focused firms [27].

Despite the promising benefits of XaaS in terms of economic resilience, customer retention, and sustainability, the path to successful implementation is fraught with ambiguity, underscoring the need for clearer tools, actionable guidelines, and empirically grounded best practices to guide manufacturing firms through this transformation.

3. Methodology

In alignment with the objectives of this study, a multiple case study research design was adopted to explore the adoption of Everything-as-a-Service (XaaS) models in the manufacturing sector, particularly in relation to servitization and its enabling factors. Case study research is well-suited for addressing "how" and "why" questions concerning contemporary phenomena within their real-life context, offering flexibility in design and allowing for the inclusion of a variable number of cases, as there is no strict minimum or maximum required [28]. This methodological choice is consistent with the need to investigate complex, evolving organizational practices and business model transformations in a context-dependent manner.

The multiple case study approach provides the opportunity to conduct a rich, in-depth analysis while allowing for comparison across diverse organizational settings [29]. In addition, it facilitates theoretical replication, whereby cases are expected to produce either similar results for predictable reasons or contrasting results for theoretical reasons. The methodology includes systematic phases of research design, case selection, data collection, and analysis, as detailed below.

3.1. Case Study Planning and Selection

A judgmental (purposive) sampling technique was employed to identify and select relevant case study companies. This approach is appropriate when cases are chosen based on their expected contribution to theory development and relevance to the research objectives [30]. The companies were drawn from the ASAP Service Management Forum (www.asapsmf.org), a research-practice community based in Italy that focuses on servitization and service management in manufacturing.

The following criteria were applied to select cases:

- The company operates in the B2B manufacturing sector;
- The company currently offers/is actively developing, or has tried to propose product or service solutions under an as-a-service business model;
- The company demonstrated openness to collaboration and relevance to the research focus.

Based on these criteria, four manufacturing companies were selected, representing a diverse range of industry segments and different stages of XaaS adoption. Each company was treated as a case following a replication logic, aimed at either confirming or contrasting findings across different contexts. Table 1 presents the selected cases along with a description of the respective choice motivations.

Table 1. Case studies description

Company	Description	Motivations
A	Italian subsidiary of a global provider of material handling solutions, including forklifts, automated systems, and warehouse equipment.	The company provides a rental of forklifts for over 20 years (successful case)
B	An Italian company specializing in laser machines and sheet metal processing systems for industrial applications.	The company has tried to offer pay-per-use on their standard machines (unsuccessful pilot case)
C	An Italian company providing equipment, solutions, and services for the construction, energy, and industrial sectors	The company provides construction machines in per-performance model (ongoing project with two clients)
D	A company specializing in sustainable building cooling systems through a 'Cooling as a Service' (CaaS) model, serving commercial and industrial sectors across Asia.	The company provides an established cooling-as-a-service offering (successful case)

3.2. Research Design and Protocol

To ensure construct validity and reliability, a detailed research protocol was developed and employed uniformly across all cases. Following established guidelines for case study research [28][29], this protocol included clearly defined research questions, data collection instruments, and procedures for data triangulation.

Two primary data collection instruments were utilized:

1. A preliminary structured questionnaire, distributed prior to interviews to gather background information about the company's organizational structure and the maturity of their as-a-service offering;
2. A semi-structured interview guide, comprising 20 open-ended questions, developed to explore key themes such as the motivations for adopting as-a-service models, implementation pathways, organizational challenges, strategic responses, and emerging outcomes.

The interview protocol has been designed to investigate the company value proposition, and in particular the company's offering, including physical products and services. The protocol continues with questions on customer perception, strategic partnerships, and internal organization. It also investigates service development processes, revenue models, cost structures, and risk management. Further, the protocol includes inquiries about enabling technologies and required competencies. Together, the questions aim to investigate the main challenges and difficulties that have emerged in adopting an as-a-service offering, as well as any best practices implemented by companies.

3.3. Data Collection

Data collection was conducted through on-site, face-to-face interviews, carried out by 3 researchers. Interviews lasted between two and four hours and were recorded, transcribed verbatim, and anonymized to ensure accuracy and maintain confidentiality. Respondents were selected based on their deep organizational knowledge and direct involvement in service strategy, operations, or digital transformation initiatives (Table 2).

To enhance data richness and triangulation, multiple data sources were consulted, including the preliminary questionnaire, internal reports, presentation materials, and other relevant company artifacts. A synthesis of the interview findings was shared with respondents for member checking, thereby strengthening data validity and reducing the risk of misinterpretation.

Table 2. Interview description

Company	Number of interviews	Respondents
A	3	Operations Director; Service Operation Manager
B	2	Chief Product and Sales Officer (CPSO); Chief After Sales Officer (CASO)
C	2	Marketing and Digital Business Development Director; Service Director
D	2	Director

3.4. Data Analysis

All collected data were organized using a case study database to maintain a clear chain of evidence and facilitate transparency in analysis. The analytical process followed a cross-case comparative approach, where each case was first analyzed independently and then examined in relation to others to identify common patterns, variations, and explanatory mechanisms. The analysis aimed to investigate the critical challenges encountered by companies in the implementation of as-a-service offerings and how they have overcome them by identifying the main best practices that emerged. These difficulties were compared with those identified by [31] in the context of developing service-oriented offerings and grouped into macro categories based on their subject matter. This resulted in five categories:

- **Strategic and Organizational Transformation** refers to the internal shifts required for a manufacturing company to successfully adopt an as-a-service model. This includes moving from a product-centric to a service-centric logic, which often requires redefining the company's value proposition. Additionally, this category encompasses the need to develop a service-oriented culture throughout the organization.
- **Customer-Centric Challenges** involve the reconfiguration of customer relationships and value perception. One major hurdle is shifting the customer mindset from product ownership to usage, which may encounter resistance, especially in traditional industries. Other challenges include capturing and integrating customer feedback into service development and encouraging customer participation in value co-creation.
- **Technological and Infrastructural Enablers** address the capabilities required to support digital services. Manufacturers often face difficulties in acquiring data or upgrading the technological infrastructure needed to deliver reliable and scalable services. In addition to technological tools, companies must also integrate digital and human competencies to co-develop and manage digital offerings. The definition of data governance frameworks, especially around ownership and usage agreements with customers, is also crucial in this domain.
- **Service Design and Delivery Complexity** focuses on the operational decisions involved in configuring and delivering service offerings. A critical aspect of this category is the definition of an appropriate pricing model. Pricing services is inherently more difficult than pricing tangible products, as it involves intangible value components, variable usage patterns, and long-term value delivery. For example, adopting outcome-based pricing or pay-per-use models requires a deep understanding of cost structures, usage scenarios, and risk-sharing mechanisms.
- **Ecosystem and Network Governance** refers to the coordination and collaboration dynamics that emerge when services are delivered within broader ecosystems. In as-a-service models, firms often rely on external partners (e.g., digital platform providers, logistics operators, or even competitors) to co-create and deliver value. Ensuring alignment of goals and incentives across actors becomes a challenge, as does maintaining a healthy balance between collaboration and competition.

Subsequently, the main challenges obtained were examined in depth to identify the best practices adopted by each company to effectively address them.

The main findings are summarized below.

4. Empirical findings

Company A has been offering forklift truck rental services for over 20 years. Rental accounts for 70% of its total turnover, compared to 30% for traditional sales. In particular, the company offers the product plus a package of services, including scheduled and breakdown maintenance, assistance, spare parts, fleet telemetry service, and a set of tires. The customer pays a fixed annual fee, with quarterly installments. To protect itself from financial risk, Company A relies on an internal finance company, while for operational risk, it monitors the use of the trucks to detect any misuse. Company A operates in a highly stratified market and has therefore developed a customer segmentation based on the needs of different types of customers in order to offer a service suited to the market. The company has attempted to implement a usage-based revenue model; however, it currently lacks the necessary technological infrastructure to effectively support this type of offering. Implementing a pay-per-use model requires not only the ability to systematically collect detailed usage data, essential for pricing calculations, but also to ensure that such data is accessible and analysable in a structured manner by all relevant organizational functions. As a result, the company is currently considering the adoption of a unified management system across the corporate group to address these limitations.

Company B manufactures and sells industrial production machinery (laser machines, bending machines, punching machines, etc.). The company tried to offer a pay-per-use model for the product but encountered several difficulties that led to the withdrawal of the project. There were several contributing factors, starting with the product itself, which has a very long useful life, which affects the cost-effectiveness of the offer in terms of total cost of ownership. As a result, the price of the offer was too low and uncompetitive, leading to the service being undervalued. Moreover, the long lifespan, the lack of need for technological upgrades, and the resulting aging of the machine fleet hinder monitoring, as most products are not connected. In addition, customers want to retain ownership of the asset and are reluctant to share data, as they often do not understand its importance. Lastly, limited resale opportunities for used equipment make these models less viable for the manufacturer. The company has also encountered internal problems, such as a lack of staff skilled in communicating the offer to customers, partly because this is linked to two distinct stages (sales and after-sales) carried out by different staff with different targets, and general resistance to change. Finally, the company has encountered difficulties in obtaining external financing.

Company C's offer is currently in the testing stage. The company offers machinery together with maintenance and monitoring services using a performance-based revenue mechanism, depending on the tons handled by the plant every hour. The company has an established service structure and a well-defined strategy for providing new services. Although efforts have been made, the company still encounters major challenges in training its sales force, since knowledge of the new model remains confined to a limited number of individuals. Furthermore, the pay-per-ton proposal necessitates the customer's collaboration, since they must overcome their reluctance to share data and allow the company to assess the current system for optimization purposes. The trust relationship between the company and the consumer is then essential, particularly when determining the initial pricing. The company has developed a pricing model based on preliminary data supplied by the customer concerning monthly production. Nonetheless, this information frequently undergoes revisions over time due to its inaccuracy. Lastly, Company C operates within a sector resistant to digitalization and the transfer of product ownership, and despite the company's successful initiatives, it faced some preliminary challenges.

Company D offers a cooling-as-a-service for commercial buildings, providing both the system and management and maintenance services through a pay-per-use contract based on an hourly rate agreed in advance, which protects the customer from fluctuations in the cost of electricity. The company mitigates financial risk by both using a financial institution and diversifying its asset portfolio. The company is also very attentive to sustainability, promoting the achievement of ESG objectives in its offering. On a technological level, the company offers numerous applications, including quick quote requests, but has difficulty attracting and retaining new talent. In addition, it initially had to overcome customer reluctance to the offer, as air conditioning is not a priority for the customer's business.

5. Discussion

Based on the cross-case analysis, several key challenges emerged across the companies under study. These challenges were subsequently grouped into the macro-categories introduced in the Methodology section to facilitate a more structured interpretation of the findings (Table 3).

Table 3. Case studies' main barriers and challenges

Barrier/Challenge category	Specific challenges	Company A	Company B	Company C	Company D
Strategic and Organizational Transformation	Internal resistance to change		x		
	Difficulties in training the sales force on new service-oriented logics		x	x	
	Knowledge of the new model limited to a small number of individuals			x	
	Lack of communication skills to convey the value of the offering across departments		x		
	Difficulties in attracting and retaining new talent				x
Customer-Centric Challenges	Customer reluctance to share data		x	x	
	Preference for asset ownership over usage-based models		x	x	
	Limited understanding of the value of data by customers		x		
	Service perceived as non-core or low priority by the customer				x
	Resistance to adopting pay-per-use or performance-based models		x	x	x
Technological and Infrastructural Enablers	Inadequate technological infrastructure to support pay-per-use models	x			
	Challenges in collecting and systematically analyzing usage data	x	x		
	Lack of connectivity in older machinery fleets		x		
	Inaccurate and frequently revised customer-provided production data			x	
	Operating in sectors with low levels of digitalization			x	
Service Design and Delivery Complexity	Complexity in designing sustainable and competitive pricing models		x	x	
	Service perceived as undervalued due to inadequate pricing		x		
	Initial pricing based on inaccurate customer data			x	
	Need to manage and mitigate operational risk	x			x
Ecosystem and Network Governance	Need to collaborate with financial partners to mitigate risk	x			x
	Dependence on customer-provided data to evaluate performance			x	
	Lack of structured coordination mechanisms across internal and external stakeholders (implied across cases)	x	x	x	x

Within the category of *Strategic and Organizational Transformation*, companies struggled to develop and foster a service-oriented culture internally. In the area of *Customer-Centric Challenges*, a recurring issue was the need to shift the customer perspective from product ownership to product usage. Under the category of *Technological and Infrastructural Enablers*, one of the most prominent concerns was the establishment of clear agreements with customers regarding data collection, management, and ownership. Within *Service Design and Delivery Complexity*, companies reported difficulties in defining appropriate pricing models for service-based offerings. In addition, the analysis also considered the category of *Ecosystem and Network Governance*, with the aim of understanding how companies structured their relationships with both internal and external partners. Lastly, a set of best practices adopted by the companies to address these challenges is discussed and summarized in Table 4.

Among the main critical issues that emerged from the case studies, the difficulty in establishing a service culture within the organization has been highlighted. Companies often struggle to train the staff responsible for communicating the offer to customers, as this involves instilling a change of perspective in people who have been focused on selling the product. This can represent a significant barrier to the adoption of an as-a-service offering, especially since clearly communicating the benefits of the offering to customers is a key requirement. Companies are addressing this issue by hiring external staff with specific skills and training their internal staff. In particular, in Company B, the offering is communicated at two distinct stages: initially during the sales process by the sales personnel, and subsequently during the post-sales phase by the dedicated after-sales team for existing customers. This fragmented communication approach has prompted the company to undertake initiatives aimed at improving internal coordination. Specifically, efforts are being made to train both teams and to establish a dedicated communication channel between the sales and after-sales functions.

Another critical aspect concerns the relationship with customers, who are often reluctant to transfer ownership of the asset. The mindset in the industrial sector is still too often focused on asset ownership, and there is a widespread difficulty in recognizing the value of offerings that include services, which are often not properly appreciated by customers. In this regard, companies have invested in promoting a culture of servitization towards their customers, to convey not only the advantages but also the value of the offer itself. For example, Company C involves its customers in the creation of the offering, making them both participants and aware of the associated benefits. This collaboration is also essential for the company itself, as it enables a bidirectional exchange of know-how between the company and the customer, an indispensable condition for achieving optimal system performance. In cases where the product is not part of the customer's core business, companies have been more successful in convincing customers to relinquish asset ownership, enabling them to focus on their primary activities.

Customer engagement, then, is one of the strategies that has also made it possible to address an additional critical issue, which is data sharing. Indeed, customers are often reluctant to grant companies access to their data, for fear of unauthorized disclosures and, in general, a lack of control. In this case, the analysed companies not only protect both parties through contractual clauses but also involve the customer in the data collection and transformation process (Company C), or employ technologies designed to enhance data privacy and security (e.g., SIM cards, cloud solutions) (Company A).

Correctly pricing the offer also represents a major critical issue. In this regard, some companies have relied on external consultants to develop appropriate pricing templates (Company C), while others are implementing internal IT systems to manage data flows and ensure accurate instalment calculation (Companies A and D).

Within the category of Ecosystem and Network Governance, it emerged that many of the analyzed companies are embedded in larger corporate groups, where key actors in the value chain, such as product suppliers, technology providers, and in some cases even financial service entities, are part of the same organizational ecosystem. This internal integration allows for tighter coordination and strategic alignment, facilitating the development and delivery of complex service-based offerings (Company A and Company D). From a governance perspective, these firms often pursue acquisitions of strategic technology providers, particularly those specializing in software and digital platforms, to internalize key capabilities and retain control over critical components of the service infrastructure (Company A). At the same time, external partnerships remain vital, especially for the provision of complementary components (e.g., sensors, embedded systems) and for after-sales support (Company A and Company D). To ensure proximity and responsiveness, companies frequently rely on third-party technicians located close to customers (Company B). However, the collaborative dynamics in these extended networks are governed by contractual agreements often based on time or volume (Company A), reflecting the need to balance flexibility with performance, and to safeguard against long-term dependency.

Table 4. Case studies' main suggestions

Barrier/Challenge category	Main suggestions
Strategic and Organizational Transformation	• Hiring external staff with service-specific expertise • Providing targeted training for internal staff, including joint programs for sales and after-sales teams. • Improving coordination between sales and after-sales functions
Customer-Centric Challenges	• Investing in customer education on servitization • Co-developing offerings with customers • Facilitating bidirectional knowledge exchange • Developing an aimed communication strategy for customers for whom the product is not core to their business
Technological and Infrastructural Enablers	• Including clear contractual clauses for data governance • Involving customers in the data collection and transformation process • Implementing privacy-enhancing technologies • Building trust through active customer engagement
Service Design and Delivery Complexity	• Collaborating with external consultants to design pricing templates • Implementing internal IT systems for data-driven pricing • Developing tools to calculate service installment plans
Ecosystem and Network Governance	• Internal Integration of Strategic Functions • Selective Acquisition of Critical Technological Capabilities

- Flexible and Targeted Partnership Agreements

6. Conclusion

Although as-a-Service business models are considered highly promising for the manufacturing sector, their diffusion remains limited due to several complex challenges that companies must address. This study contributes to narrowing this gap by identifying and discussing a set of practical actions that firms can adopt to overcome critical obstacles. The research tries to answer the question: "What are the strategic, organizational, and technological factors that most influence the design and delivery of service offerings in the manufacturing sector?". The findings indicate that, from a strategic perspective, a fundamental challenge lies in fostering a service-oriented culture within organizations and shifting the customer mindset from product ownership to usage. This requires strong leadership commitment and a clear vision focused on long-term value creation rather than short-term sales. Organizationally, effective management of data sharing and governance emerges as critical, necessitating robust contractual and technological safeguards to build trust and enable collaborative value creation with customers. Additionally, customer involvement through co-creation processes helps tailor offerings more closely to market needs, increasing acceptance and satisfaction. From a technological standpoint, companies must invest in digital infrastructures and develop pricing models that are both flexible and scalable, supporting efficient service delivery and adapting to evolving customer demands. Overall, the study reveals that companies are actively addressing these intertwined factors through a range of best practices, including targeted staff training programs, structured customer engagement, comprehensive data governance frameworks, and innovative pricing strategies. These insights provide actionable guidance for firms seeking to implement servitization strategies more effectively, ultimately facilitating a smoother and more sustainable transition to as-a-Service business models in manufacturing.

Like any research endeavor, this study has certain limitations. First, the findings are based on a limited number of interviews and case studies, which may constrain the generalizability of the results. Second, only a subset of the challenges associated with the adoption of as-a-Service business models was captured. Additional barriers may emerge when considering a broader range of firms with different levels of servitization maturity. Future research could address these limitations by expanding the sample to include a more diverse set of companies across industries and geographical contexts. Lastly, comparative studies involving organizations at different stages of their servitization journey would provide a more comprehensive understanding of the evolution of these challenges and the effectiveness of the adopted solutions.

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