

# Value Leakage in Product–Service System Provision: A Business Model Alignment Perspective

Wiebke Reim , Sambit Lenka, Vinit Parida , and Johan Frishammar 

**Abstract**—To stay competitive, manufacturing companies offer product–service systems (PSS) to avoid commoditization of their products. The potential to create value through PSS offerings lies in a company’s ability to successfully implement the PSS business model. However, many companies are unable to realize the benefits because PSS represents significant changes to all the business model elements, which comprise value creation, value delivery, and value capture. This leads to misalignment among the business model elements, which is a topic of interest within PSS and business model literatures. This article aims to provide empirical insights into the business-model-element alignment problems and conceptualize their consequences, which manufacturing companies face during PSS implementation. This article utilizes an abductive multicase study of three Swedish manufacturing companies with long-term experience of PSS provision to provide novel insights by identifying six alignment problems that companies face as a consequence of the interaction among the three business model elements. Furthermore, we contribute to both the PSS and business model literature by conceptualizing the consequences of business model element alignment problems, explaining the three value leakages that occur as a result of inappropriate resource and capability utilization, unattractive offer configurations, and inefficient service network processes in PSS provision.

**Index Terms**—Advanced services, alignment, business model, product–service systems (PSS), servitization, value destruction, value leakage.

## I. INTRODUCTION

NUMEROUS manufacturing companies are increasingly differentiating their offerings and attempting to generate new revenue streams through integrating product and service components, often referred to as product–service systems (PSS) [1], [2]. More specifically, PSS is defined as the combination of products and services that delivers value to its customers [3], [4]. However, offering PSS is inherently challenging for organizations because provider companies must transform their

focus from selling physical products to providing performance and outcome guarantees by increasing the content of services [5]–[7]. Prior article suggests that offering PSS represents a significant transformation of the business model of manufacturing companies [1], [8]. Moreover, most companies fail to achieve the desired benefits from such a transformation [9]–[11].

A business model describes how companies create, deliver, and capture value (i.e., through the three business model elements). Researchers have used a business model perspective [8], [12], [13] to create an understanding about successful provision of PSS [14]–[16]. Consequently, prior literature has proposed various activities to support the provision of PSS by employing the concept of a business model [17], [18]. These articles reveal insights into how to manage specific activities by focusing on certain tools that can assist in addressing specific problems concerning PSS [19], [20]. However, many questions about how a company creates, delivers, and captures value remain unclear because business model elements have been discussed in isolation or sequentially rather than in relation to each other. This is surprising given that most articles argue that an alignment of business model elements is critical for successful PSS provision [7], [11], [21].

Furthermore, few articles provide an empirically grounded and comprehensive description of all three business model elements—value creation, value delivery, and value capture—in the provision of PSS and their alignment [5], [8], [22]. In essence, alignment concerns the “appropriateness” of the various elements (that is to say, creation, delivery, and capture) in relation to one another [23]. It is a concept that is often mentioned in business model innovation research [24], [25] but seldom unpacked systematically. Article thus far has focused on conceptual- or element-level descriptions of a PSS-based business model [22], [26] or function-based challenges during implementation [5], [27], providing only limited insights into the construction of PSS-based business models [1], [19]. Thus, it is argued that taking an element-level alignment analysis of a PSS business model is highly pertinent in generating more detailed insights into PSS provision.

In particular, two research gaps related to PSS business models are addressed in this article. First, the literature on strategic and innovation management argues for the need to align business model elements as required so that value from business model innovation is realized [22], [28], [29]. In a similar vein, the PSS literature recognizes the importance of the alignment perspective for business model elements to achieve both an internal and an external fit with a company’s PSS strategy [8], [17], [30].

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However, in practice, this is much more difficult. Companies often end up with business models that are loosely coupled, where business model elements are developed in isolation and are not properly aligned to maximize value for the customer. This results in business model-provision problems arising from misalignment, which is marked by the failure to effectively create, deliver, and capture the results or functions that were intended. For example, Reim *et al.* [31] discuss how the delivery network can be unprepared to create and capture value from the newly launched PSS business model. Similarly, Parida *et al.* [32] highlight how capturing value through results-oriented PSS offerings can be challenging, even though the value-creation and value-delivery logics are clearly thought out due to a change in customer behavior when using the PSS solution. Thus, existing research on PSS provision has largely overlooked the discussion on why business model problems occur when a manufacturing company attempts to align value-creation, value-delivery, and value-capture activities.

Second, the negative consequences of PSS-based business model implementation are only vaguely considered in the PSS literature, and a deeper understanding has yet to develop [33], [34]. In general, the extant research primarily focuses on the positive outcomes of PSS provision for manufacturing companies [35], [36]. However, in the literature, it is also argued that the inability to successfully offer PSS will likely lead to negative effects [19], [38]. This article argues that these negative consequences are a result of the misalignment of the business model elements that can significantly impair the performance expected from implementing a PSS strategy. For example, a manufacturing company may experience deteriorating profitability [39] when it is unable to capture the value it generates, and so it engages in resource-intensive delivery or offers low value-added services. Consequently, when the potential to create, deliver, and capture value in PSS provision is restricted in the manner outlined, being able to define and conceptualize such “value leakage” in the PSS literature can sensitize companies to the importance of achieving alignment of its business model elements.

In the context of this research background, our article’s purpose is to provide empirical insights into business model-element alignment problems and their consequences when manufacturing companies implement PSS. This article offers a theoretical contribution to the literature on PSS principally, but it also contributes to the business model literature [8], [40] by describing business model alignment, identifying business model alignment problems, and conceptualizing value leakage resulting from these alignment problems. In practice, the article offers insights that allow companies to overcome the challenges they face when seeking to exploit the full potential of value creation and capture during the implementation of a PSS-based business model.

## II. THEORETICAL BACKGROUND

### A. PSS Business Model

Servitization, by offering PSS, has become an increasingly relevant approach that manufacturing companies can employ to

obtain economic, social, and environmental benefits [1], [35], [37]. The initial studies defined the PSS concept as a marketable combination of products and services that, together, fulfill customer needs economically and sustainably [41]. Servitization is concerned with transitioning from the long-established practice of selling products and basic support services to providing advanced combinations of products and services so that greater value is procured for customers by, for example, providing availability [6].

The research on PSS is also closely related to the literature on business-to-business (B2B) marketing and solution business models, which also highlight the implementation of service components and digital technology as a promising way to develop business opportunities [6], [18], [42].

However, implementing PSS has not been as widespread as expected. Offering functions and results-oriented PSS has involved even greater challenges and risks, making the provision of PSS more difficult for incumbent companies [38]. The challenges that inhibit the successful provision of PSS are usually concerned with the transformation process required in the implementation phase [34] as well as strategic alignment within the company and its relation to the market offerings [43]. In the PSS literature, various articles describe specific tools that are designed to surmount these challenges [44], [45]. Furthermore, various researchers have acknowledged that the problems companies face when offering PSS negatively affect the company’s performance [33], [34]. To manage these challenges, some articles have suggested that a fully developed business model would foster a better approach to providing PSS [3], [14]. In particular, this approach would fuel the performance of companies aiming to operate a more advanced PSS that is oriented toward results [34], [46].

The management literature has increasingly used the concept of a business model to capture the essence of the relationship between an organization’s customers and how it makes its money [22], [47], [48]. Although various definitions have been used to describe a business model [49], [50], scholars are increasingly coalescing around an understanding of the business model, expressed in terms of the company’s architecture in how it creates, delivers, and captures value [12], [51]. Prior research on PSS business models has focused on categorizing different types of PSS, such as product-oriented, use-oriented, and results-oriented [11], [52]. In the current literature, we find a stronger shift toward using the business model concept to explain demonstrated success in implementation of PSS [8], [11], [53]. However, in the literature on PSS business models, the focus has concentrated mainly on frameworks that are developed around specific facets of the business model [1], [7] and holistic explanations are rare.

The literature frequently makes reference to various aspects that comprise the business model elements and the challenges outlined above. Value in PSS is usually found to be created by assuming responsibility for tasks formerly undertaken by customers and accomplishing them with greater efficiency. Consequently, the relationship with the customer is intensified, with an expectation of enhanced loyalty [20], [44], [51]. Missing the opportunity to obtain insights into customers’ knowledge and to utilize knowledge about customers hinders high value creation

in PSS [11], [43]. Customers opposed to ownerless consumption are commonly cited as an obstacle to successful PSS provision [41]. For effective value delivery, great skill, competency, and experience are essential if the entire PSS process is to be aptly coordinated [31]. Furthermore, new partners and new organizational structures have to be established to provide effective PSS. Therefore, challenges exist in process development, staff education, and stakeholder integration into the PSS organization [54]. To capture value, PSS must be developed in such a way that customers recognize the additional value and are prepared to pay a higher price for it [30]. Simultaneously, costs have to be handled efficiently and risks managed. Furthermore, because cash flows are uncertain and savings are problematic to quantify, it is difficult to demonstrate the profitability of PSS [3], [33]. A major problem that PSS providers must deal with when seeking to earn money from PSS is the identification and management of risks [34]. Even though the business model concept is frequently mentioned in PSS, studies that exemplify how to work with business model elements and their alignment so that PSS can be developed and implemented are very rare [1], [21].

### B. Consequences of PSS Business Model Alignment

The increased complexity and shift of logic concerning how a company creates, delivers, and captures value in PSS gives rise to contradictions [55], paradoxes [33], [56], and dilemmas [57] within a company during the implementation process. Coping with such contradictory and opposing elements during the implementation of a business model has proved to be one of the most challenging aspects of PSS provision [58]. Successful PSS implementation depends on how well a company is able to link its activities and align them with its business logic of creating, delivering, and capturing value in PSS provision.

In the existing literature, alignment has been defined as arranging an object in relation to other objects in such a manner that results are optimized [59]. This is particularly relevant for business model implementation because all the elements need to be adapted and aligned to each other to maximize the potential benefits from PSS implementation. Following the line of discussion pursued in the literature, alignment would ensure synergistic maximization of realized potential of the business model through the interaction of its elements—that is to say value creation, value delivery, and value capture interacting with each other [23], [25]. Therefore, to achieve optimal PSS performance, adjustment of the business model elements is essential in PSS provision [49]. The reason for this is that value creation, delivery, and capture in PSS are substantially different from how they are constructed in a normal product-oriented business model. The current literature reveals how contradictions, paradoxes, and dilemmas arise which results in suboptimal implementation of PSS [40], [55], [57]. However, little is understood about how a company can redesign its activities during PSS provision so that the way value is created, delivered, and captured is aligned with the overall business logic, leading to maximization of the value-creation, value-delivery, and value-capture potential and minimizing the possible “value leakages” during provision.

Value leakage as a concept has not been widely used in the extant management literature or in the literature on PSS and on business models. In this article, we use the term to mean a dissipation of the value expected. Wei and Clegg [60] define value leakage as the suboptimal realization or failure to realize the full estimated value available. However, Wei and Clegg [60] used the term, “value leakage,” in the context of mergers and acquisitions but their conceptualization is also useful in the context of PSS business model implementation. The conceptualization of value leakage is somewhat different from the terms “value destruction” and “value codestruction” used mainly in the literature related to marketing [61]–[63] wherein “destruction” has been used as a term to mean some irreparable loss resulting from an active action. Furthermore, the term “diminished value” has been used to describe outcomes that are caused by resource deficiencies and resource misuse [64].

Few scholars have placed emphasis on the need to align the PSS business model elements so that the full potential for value creation, value delivery, and value capture that a PSS offer is obtained [8], [30]. Nor have they provided a thorough understanding of the problems when the activities related to value creation, delivery, and capture are not aligned and the eventual effects in terms of value leakage, for instance. Thus, we lack insights into the underlying cause–effect of how and why value leakages frequently occur in the PSS provision process. In consequence, companies report under-achievement of the promises that PSS holds. Therefore, significant opportunities are available to the research community to untangle the underlying dimensions of the alignment of activities relating to value creation, delivery, and capture that commonly exist during PSS provision and to determine the effects of such alignment problems. This should help to create a deeper understanding of the underlying causes of suboptimal value creation, delivery, and capture through PSS-based business models. Such a view would be a first step in addressing the challenges and moving toward improved performance in PSS implementation.

In sum, prior literature has described the business model elements of value creation, capture, and delivery, underscored the positive effects of alignment among these, and suggested some of the alignment problems that might surface in a PSS/servitization context. However, very few articles have exemplified these alignment problems in the context of PSS implementation and showcased the resultant value leakages that could provide a suitable explanation to the suboptimal performance in PSS implementation. We therefore use the business model elements in combination with alignment and value leakage as sensitizing concepts to guide our multiple case study. This is described in the following section.

## III. RESEARCH METHOD

### A. Research Approach

The phenomenon under consideration is complex. Therefore, we use an abductive multiple-case study to better understand how the processes actually occurred [65]. In doing so, we followed Yin’s [66] case-study methodology combined with the principles of systematic combining [67]. The first step was to

TABLE I  
DATA COLLECTION AND CASE-STUDY COMPANY DETAILS

Company and Industry	Turnover (EUR) and Employees	Example of advanced PSS offering	Interviewees and nature of role in organization	
			Strategic role	Operational role
<b>Company 1</b> Heavy machinery	1.4 Bn 13,000	<i>Company 1 offers availability of construction equipment to its customers which assures its customers of the equipment's operational readiness without the hassles of ownership</i>	<ol style="list-style-type: none"> <li>1. Director Technology Planning and Public Funding</li> <li>2. Soft Product Planning -Portfolio Manager</li> <li>3. Global Director Attachments and Customer Solution</li> <li>4. Global Director Portfolio Management</li> <li>5. Global Range Leader - Global Product &amp; Segment Management</li> <li>6. Global Product Manager – Extended Coverage</li> <li>7. Global Pricing Manager</li> </ol>	<ol style="list-style-type: none"> <li>8. Technology Planning Manager</li> <li>9. Team Leader-Machine Data Platform</li> <li>10. Business Planner</li> <li>11. Emerging Technologies Manager</li> <li>12. Technology Planning Manager</li> <li>13. Project Manager</li> </ol>
<b>Company 2</b> Telecommunications infrastructure	23 Bn 116,507	<i>Company 2 offers a life-cycle management of telecommunication network infrastructure and functionality for its customers, thereby relieving them of the hassles of operations, migration and upgradation of their service delivery network</i>	<ol style="list-style-type: none"> <li>1. Manager- Service System Research</li> <li>2. BUGS- Global Service Organisation</li> <li>3. Change Manager</li> </ol>	<ol style="list-style-type: none"> <li>4. Project Manage</li> <li>5. Solutions Architect</li> <li>6. Service Researcher</li> <li>7. Research Manager</li> <li>8. Master Researcher</li> <li>9. Master Researcher</li> </ol>
<b>Company 3</b> Machine tools	6.5 Bn 1,860	<i>Company 3 offers productivity enhancement of the customer's machining output that its tools and their expertise can help to deliver. This ensures that its customers enjoys risk-free and assured improvement of their productivity</i>	<ol style="list-style-type: none"> <li>1. Senior Manager</li> <li>2. Global Service Driver</li> <li>3. Senior Manager IT &amp; Business Architecture</li> <li>4. Service Portfolio Manager</li> </ol>	<ol style="list-style-type: none"> <li>5. Project Manager</li> <li>6. Senior Project Manager</li> <li>7. Service Manager</li> </ol>

perform a literature review on PSS business models and their alignment. The literature review resulted in a clearer understanding of the research gaps, and the establishment of business model elements, alignment, and misalignment as sensitizing concepts. A sensitizing concept proposes directions to pursue in data analysis—in other words, where to look for patterns in the data [68].

Afterwards, we selected cases for this article. We chose three large Swedish manufacturing companies from different industries that have not only introduced PSS to the marketplace but also have continued to work on the development of new PSS offers at a higher level. Large global companies have been chosen because they exhibit the greatest need to redefine their business models. They operate a huge number of business functions that work in parallel with activities to create, deliver, and capture value from PSS. The manufacturers were selected in order to gain insights from different industries and provide greater variation in PSS offerings.

From our initial discussion with the case companies, it was clear that the process of introducing PSS offerings generated many challenges. During our study period, the companies introduced new PSS offerings and had begun to obtain positive returns from their initiatives. Hence, we could access real examples that showed how these companies managed to achieve this difficult transition. We also obtained unique insights from the continuous development of their PSS business models. Furthermore, we had the opportunity to analyze potential challenges and problems along with the approaches adopted to manage them. Table I shows information on the case companies and their business models. When studying our case companies, we focused on the higher level PSS offerings, such as use-oriented and results-oriented PSS [52]. For example, Company 1, a construction equipment provider, offers availability-based contracts to global markets. Here, it was vital to make certain that the equipment offered complied with the level that was agreed. In order to minimize the potential for equipment stoppage time, the

company needed to analyze sensor data rigorously. Otherwise, extra equipment would need to be brought into play to fulfill its contractual obligations to the customer in terms of equipment availability.

### B. Data Collection

Data collection was accomplished, in the main, through semi-structured interviews following the interview guide developed from the literature review. These interviews were conducted with Swedish-based interview partners using various interview approaches—namely, face to face, by phone, and by video. An interview lasted 1 h on average. For the interviews, we selected respondents from various functional units that were directly involved in PSS development or provision. We made sure to include respondents from both the strategic level and the operational level in each company. At the end of each interview, the respondents were invited to name other individuals who might usefully contribute further insights. Thus, our respondents were chosen sequentially and purposefully, so that the data collected possessed variety and nuance [69]. We conducted 29 interviews across the three case companies. Besides the interviews, our article was triangulated with secondary data, such as internal documents received from the companies, published news, and information from their webpage. Hence, the use of different types of data collection allowed us to incorporate the full details of each case and achieve data triangulation [70].

### C. Data Analysis

We applied the principles of systematic combining [67]—that is to say, the key sensitizing concepts of business model elements, alignment, and misalignment were matched with empirical observations [69]. Thus, we moved back and forth between theoretical concepts and empirical observations in a nonlinear process until saturation was reached [71]. Three authors independently developed the coding scheme. In cases where

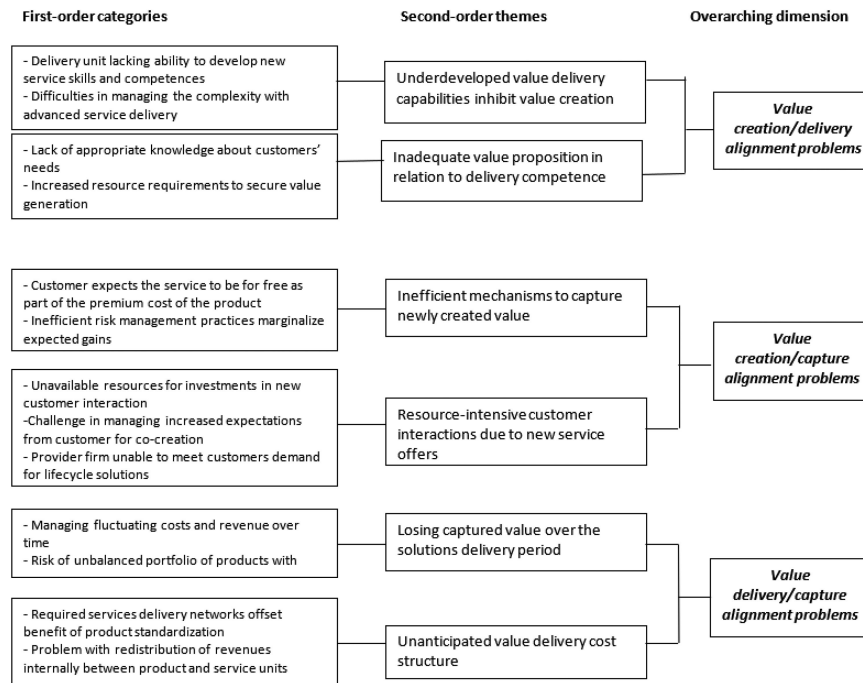


Fig. 1. Data structure.

there was disagreement, the coding scheme was discussed and modified until a consensus was reached. This process secures rigor and confidence in the analysis and provides independent verification of the trustworthiness of the coding schemes [72]. We began formal coding by inductively shaping first-order categories, striving to remain open to what the data could reveal in this first step. The outcome was delivered through the description of problems related to PSS development. Second, patterns and relationships within these first-order codes were identified and further collapsed into theoretically distinct groupings by mobilizing the sensitizing concepts, thus forming second-order themes. Third, the themes were combined into overarching dimensions of alignment problems between two business model elements [73]. The three steps were repeated multiple times until saturation was reached [71] with the sensitizing concepts providing direction to the analysis but with the empirical insights still being allowed to emerge bottom up.

#### IV. FINDINGS

In our discussions, respondents made it clear that, in their efforts to provide advanced PSS to customers, they faced a myriad of difficult challenges. Despite embarking on a range of activities to profitably put a PSS business model into service, they were not able to secure the gains they sought. A technology planning director from Company 1 explained:

We have initiated a lot of change in regard to the way we develop our products. However, the other departments will also have to equally change the way they operate so that these new services can be effectively employed...Now it's a lot of struggle, especially in how we work together.

Analyzing both primary and secondary data, we pinpointed six underlying problem themes (second-order themes) that underpin the implementation of PSS business models. These problem themes corresponded to alignment problems between two business model elements (creation, delivery, and capture of value) in providing PSS (overarching dimensions). In this section, we detail the findings from our case study (see Fig. 1), where the overarching dimensions and subsequent second-order themes provide the structure.

##### A. Value Creation/Delivery Alignment Problems

1) *Underdeveloped Value Delivery Capabilities Inhibit Value Creation*: A common challenge is that the value created through the PSS offering cannot be effectively delivered to the customer. To offer PSS, the provider needs to develop the capabilities and delivery competence of its entire network. We noted that developing external networks was extremely important for case companies when launching PSS, especially when operating globally. However, we experienced several cases where the *delivery unit was lacking the ability to develop new service skills and competences*. Commonly, delivery partners possess only the technical- and product-related delivery and support skills. However, vital skills relating to service provision and customer interaction were frequently lacking, as a head of technology planning from the heavy machinery provider in the current study intimated:

As I see it, the skills are a challenge...How are dealers able to sell the services [PSS], and do they have an understanding of how to get paid when they are used to selling the yellow machines and getting paid on delivery?

In addition, combining a range of discrete elements into a cohesive entity when setting up PSS is far from simple. Existing structures and systems were often developed by splitting the value delivery process into less-complex elements. Hence, for PSS delivery, a new organization for delivery needs to be created to solve the *difficulties in managing the complexity with advanced service delivery*. However, it is not possible to divide the whole PSS process into smaller elements because integration is of major importance. From the cases we studied, it was evident that the components of PSS were arranged to work in close proximity without being amalgamated into an integrated whole from the beginning. As a global portfolio management director from Company 1 remarked:

That interaction from the beginning, if we look at the AE [PSS offering] portfolio, it prioritizes cross functionality and an understanding of where the connection points are. So, you can then say that initiatives 1, 8, 5 [PSS components] need to be combined and executed together. From an early standpoint, you may not know exactly which one of them makes it but, once you have reached the point of readiness, then you decide on which items are needed to be combined and go together to delivery.

*2) Inadequate Value Proposition in Relation to Delivery Competence:* When the PSS provider has the skills and competence to deliver its offering but still fails to create value for the customer, there is clearly an alignment problem. When offering PSS, the closeness of the interaction with customers often determines the total benefit for the providers. *Lack of appropriate knowledge and competence to manage customer processes* is therefore a major challenge for companies in order to customize functions and integrate PSS into customer processes effectively. Since the job of the PSS provider is to supply the functional benefit, the efficacy of that provision will depend on how well the output processes of the provider are integrated into the business processes of the customer. A solutions architect from Company 2 in our article observed:

[When] you sell something specified [solutions], you need to understand the customers' business processes well.

When the provider gets to know progressively more about the customer's business processes, he exhibits a greater chance of making a positive contribution to the customer's operations.

It is vitally important for providers to properly manage resources when providing PSS because increased resource utilization is key to realizing several benefits through PSS provision. However, we observed several examples of *increased resource requirements to secure value generation*, offsetting the benefits of increased resource utilization. When providing solutions, normal practice is that the provider company takes responsibility for output. Therefore, it follows that there is no special requirement for products and physical assets to be housed with the customer. The provider company is then in a position to make maximum use of a product, benefitting many customers. However, this is only possible in situations where value creation and value delivery are highly aligned.

## B. Value Creation/Capture Alignment Problems

*1) Inefficient Mechanisms to Capture Newly Created Value:* For the PSS provider, it is essential that the value created through the PSS can also be captured. However, one key problem is that often the *customer expects the service to be free as an integral part of the cost of the product*. Most commonly, PSS requires the provider companies to restructure their revenue model to capture the *value in use* generated in the context of PSS. However, we observed that, in ongoing interactions with customers, changing the revenue model contributes significantly to instability in the relationships. In these cases, a way to preserve the basic revenue logic but still capture the additional benefits of PSS is to charge a premium price based on the total value of the product and services delivered. As a service portfolio manager from Company 3 intimated:

We do not charge for the services to our customers. But, because we help them with services, we are able to command a premium price for our products [compared to the] competition. This is how we are able to charge for the total value we provide to them.

Another reason for deficient value capture from the PSS provided is when *inefficient risk management practices marginalize expected gains*: PSS leads to increased risks because the provider company now has closer relational interactions with its customers over a longer time, is answerable for new operational tasks, and consents to deliver benefits oriented toward outcomes and use. If the company is to become a successful PSS provider, it must manage the risks identified with exactitude. Managing the operational risks effectively is critical to avoid negative effects that can result from PSS provision. When the provider has the responsibility for the operation of the PSS-covered products and services, the company bears the risks of technical malfunction and adverse customer behavior. Technical failure is a real hazard but it can be forestalled by maintaining the system through proactive engagement. However, harmful customer conduct—namely, overuse and negligent use of products—is often countered by contracts where the risks are shared. As a global pricing manager from Company 1 indicated:

There are actually quite hard terms and conditions. Nowadays, we can say that the customer service agreement is only valid in normal conditions of use. So, if there is any evidence of abnormal usage, the customer service agreement can be cancelled.

Such risk-management mechanisms are essential if companies are to curtail losses and capitalize on gains accruing from their PSS provision.

*2) Resource-Intensive Customer Interactions Due to New Service Offers:* Commonly, companies underrate the need for activities that inform customers about the value of the PSS offering implemented and that results in a situation of *unavailable resources for investments in new customer interaction*. Companies need to calculate the resources needed to educate customers but also to build relationships that usually are much closer compared to traditional product sales. In addition, many customers value PSS and its benefits, which are expressed in a heightened willingness to pay for the PSS offer but also in increased expectations of the level of service covered by the offering. In these cases,

the *challenge in managing increased requirements for customer cocreation* can lead to a situation where the provider is not able to adapt its offer to customer requirements. Usually, when the customer is involved in developing the PSS offering, the result is a more efficient and effective development process. However, increased customer involvement can lead to changes that make the provider's processes much less predictable. Furthermore, expectations could well rise to a level that the provider cannot fulfill.

A main argument for providing PSS is that the provider takes over responsibilities that customers previously handled. For example, complete life-cycle solutions can be offered, where providers assume responsibility for the solution beginning with installation and going on to ensure proper functioning throughout its life time of use. By doing this, the customers no longer have the responsibility to maintain and service the product. However, this can lead to a situation where the *provider company is unable to meet customer expectations over the life-cycle*. Certain aspects of life-cycle management are difficult to manage. Thus, it may not be appropriate for the provider to assume responsibility for them, even though the customer may be willing to pay the extra expense.

### C. Value Delivery/Capture Alignment Problems

1) *Losing Captured Value Over the Solutions Delivery Period*: PSS provision commonly involves long-term contracts, and the costs of delivery over time need to be aligned with the corresponding revenues captured. For instance, when provider companies promise to supply a certain benefit or result rather than a direct product, customers are hesitant to make a financial commitment because they have difficulty judging the merits of the services they are being offered. Profit-sharing revenue models are often used to instill greater confidence. But, in these revenue models, *managing fluctuating costs and revenue over time* is a common challenge. Profits are usually shared periodically—for example, every year—but costs are not evenly distributed over time because repairs and replacements occur much more frequently in the later stage of the life-cycle.

Another problem is that the provider faces the *risk of an unbalanced portfolio of products with a service agreement*: This adverse selection occurs when customers choose from a set of PSS offerings to contract those products that exhibit a high potential for asset failure. In these cases, the hardware manufacturer may end up with a portfolio of bad PSS agreements that incur high costs over the agreement period. A manager overseeing extended coverage at Company 1 expressed the risk of unbalanced portfolios as follows:

You never know if you have a correct price. When you enter a gold contract [a PSS offering] and you promise, 'We are going to take care of all repairs,' some machines do quite well and cost less than expected. But more often, something happens and the cost is out of control and, when you have a small portfolio, you cannot balance the risk, and the risk is greater.

2) *Unanticipated Value Delivery Cost Structure*: High value capture is only possible when the value delivery is conducted

in an efficient way. However, PSS commonly requires the erection of local structures to provide support services, which is important for monitoring and supporting the products installed as well as for customer interaction. This change in value-delivery structures contrasts with the long-established centralized support operations that often produce longer response times and losses for provider companies through increased downtimes. As a global product manager from the heavy machinery provider in this current article remarked:

If the customer is very far from the dealers, then it is hard to have [a] customer service agreement. It is not worth it to travel so far to visit often enough to maintain the machine. Then you can also get high costs.

But the *required services delivery networks offset the benefit of product standardization*: Having personnel close at hand and ensuring that spare parts and other solution-related components are readily available are vital elements in the process of localization, but they are also expensive.

In addition, manufacturing companies have established ways of working and creating organizational structure. In other words, sequencing and coordinating actions and areas of responsibility can assist in the delivery of products to customers. When changing to PSS, providers need to develop new structures and capabilities that allow PSS to be delivered. In the cases in this article, we observed several reorganizations related to PSS provision, and we found that it was of key importance to deal with the *problem of the redistribution of revenues internally between product and service units*. The key performance indicators (KPIs) are usually derived from the functional business units based on the traditional product-delivery setup. However, when providing PSS, it is necessary to reorganize structures, skills, and KPIs across the product, services, support, and customer interfaces. As a service researcher from Company 2 put it:

You have the product organization that has its own orchestrator; they have a responsible product manager. Sometimes several product managers. There is a strategic product manager responsible for a portfolio of products. Might be in the case of (name of PSS offering) as there are more products involved. So, there is a conductor there ...for the service part ...and there is a conductor for the region who is responsible for the customer engagement process.

This is a challenging task and, even if the PSS offer generates considerable revenue, the *need for orchestration across business units in order to divide the profits equitably* is no less pressing. For example, increased revenue from spare parts resulting from the PSS offering might find its way into the pocket of the product division rather than the service department that generated those returns.

### D. Value Leakage From PSS Business Model Alignment Problems

Our empirical findings reveal numerous alignment problems among business model elements—namely, creating, delivering, and capturing value in PSS provision. In the present article, besides identification of the underlying alignment problems of each business model element, the value leakage resulting from business model alignment problems has been analyzed.

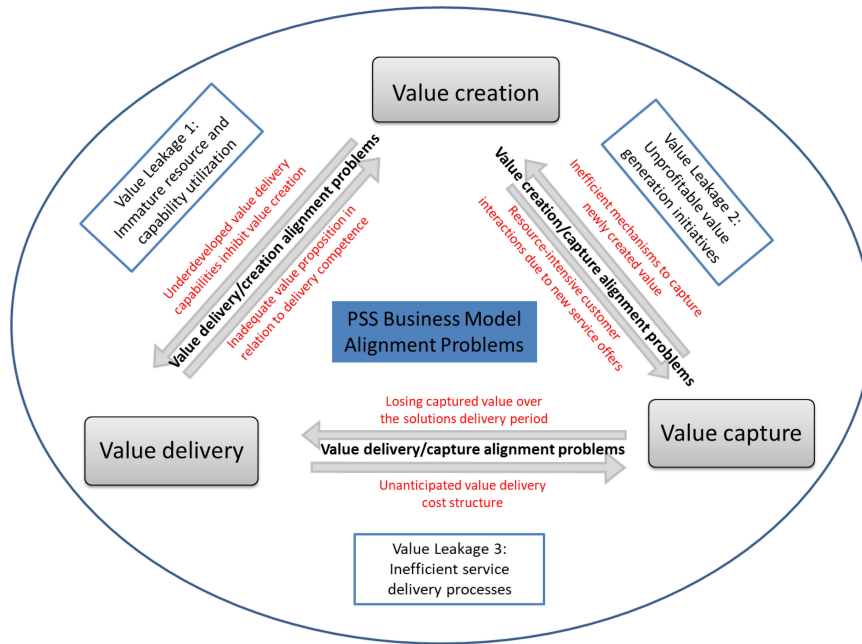


Fig. 2. Value leakage resulting from PSS business model alignment problems.

Fig. 2 shows three value-leakage consequences that occur when two of the business model elements are not aligned. The misalignment between two business model elements can usually occur in two directions, emanating from one element that is performing well and moving toward the less-well performing element, whose deficiencies tend to constrain the otherwise positive results generated by the first element. In the previous sections, we described examples of these two directional alignment problems for each of the elements. The overarching alignment-problem dimension between two elements will lead to specific negative consequences. The consequences identified go beyond the financial failures usually discussed into lost value on the level of the business model element. All such negative effects are not necessarily emergent at the same time. But we do find various examples where the business model is unable to achieve the potential gains associated with successful PSS provision. By focusing on identifying and conceptualizing value leakage from the PSS business model, we are able to shed light on what drives unsuccessful PSS provision at the organizational level. In this section, three consequences of value leakage are discussed because effective PSS can only be provided when sufficient alignment is achieved.

1) *Immature Resource and Capability Utilization*: Alignment problems between value creation and value delivery can occur either when value-creation opportunities are lost during the delivery process or when the limited value-delivery capabilities have a negative effect on value creation. For example, in certain infrastructure management solutions offered by Company 2, centralized business units were responsible for developing solutions and support, whereas the global units were responsible for delivering the solution. In this situation, the global units needed to possess the ability to reconfigure the solutions so that they could be customized according to local regulations and market

demands. Often, external local partners were enmeshed in this delivery process. This made the solutions increasingly complex overall, with many third-party components being incorporated. The centralized solutions development teams were not able to use these solutions to industrialize the offerings for other markets because they lacked the processes to integrate the knowledge and capabilities needed to operate third-party components. This resulted in Company 2 struggling to industrialize these solutions, thus losing the opportunity to deliver value to its customers internationally. Overall, the value leakage resulting from misaligned value creation and value delivery means that the resource and capability utilization is inefficient, and the potential value of one element is offset by the deficiency in the other.

2) *Unprofitable Value Generation Initiatives*: Alignment problems between value creation and value capture can either arise when the mechanisms to capture the created value are inefficient or lacking, or when the captured revenues include a redirection toward value-creation costs, which are related to resource-intensive customer interactions. In order to provide efficient PSS, it is imperative to capture the value thus created. However, this is especially challenging when the willingness of the customer to pay for the service is low. For example, Company 3 offered customers free consulting services along with tools to improve overall productivity. It tried to compensate for the cost of its services by charging premium pricing for its tools (i.e., products). Because competition has become increasingly more intensive in this industry given that product differentiation is more difficult to sustain, there is intense pressure to reduce product margins. Any attempt to begin to levy charges for services was faced with stiff resistance from the company's customers who were now accustomed to considering the services as part of Company 3's overall value offering. Therefore, in the absence of any value-capturing mechanism, they were losing out



on the opportunity to capitalize on the value created through their productivity improvement services. The value leakage resulting from the misalignment of value creation and value capture makes the value proposition unattractive because it is either too highly priced for the customer or it places too demanding requirements on the provider who will earn little or nothing from it.

3) *Inefficient Service Delivery Processes*: Alignment problems between value delivery and value capture appear either when there is a leakage of captured value due to inefficient delivery, with expenditure and revenues becoming unbalanced over time, or when organizational delivery requirements increase, where the captured value is redistributed. At Company 1, a centralized monitoring unit in Sweden tracks all the faults and breakdowns across its globally dispersed installed bases. When any error report is generated by the centralized tracking platform, the service personnel are dispatched from the local regions and dealerships to service the asset. Company 1, however, was having problems with the quality of its software platform and intelligent sensors on board its machines, which meant that faulty error reports were generated. This deficiency in value delivery invariably leads to unnecessary resource wastage from deploying service personnel as well as related travel and time expenses incurred in servicing the installed bases. This has proven to be a huge drain on the revenue generated from the company's contracts with a consequent reduction in the value captured. The value leakage resulting from these alignment problems is generated by inefficiencies in the service network arrangements.

## V. CONCLUSION

The present article provides insights into business model alignment problems and their consequences, which are manifested through value leakages as manufacturing companies in B2B settings make the transformation to PSS provision [37], [40]. The business model concept provides a strategic framework for explaining how companies can create, deliver, and capture value [25]. However, detailed empirical insights into the activities at the level of business model elements have so far not been thoroughly understood in PSS context [7], [11]. In addition, prior articles provide limited insights into the negative consequences and effects of PSS business model implementation [5], [19]. Our article addresses these gaps and is particularly relevant to manufacturing companies that intend to provide advanced services and solutions rather than products to embark on a servitization journey and to engage in a process of changing their business models away from a "value-in-transaction" to a "value-in-use" logic [74]. Below, we outline the implications of our article in theoretical and practical terms, assess its limitations, and offer suggestions for future research.

### A. Theoretical Implications

The present article brings to the forefront several theoretical implications that are relevant to the PSS and business model literatures, and specifically to the B2B context. First, we contribute by *highlighting the need to better understand the alignment of business model elements for successful PSS implementation.*

Although several prior articles provide descriptive insights into activities that are critical for PSS-based business model innovation [17], [18], [58], they fail to advance knowledge on how to ensure alignment across business model elements. This is particularly relevant for manufacturing firms operating in B2B contexts that intend undertaking a major transformation from being a product provider to become result or outcome provider because this entails changes in two or more elements of their business models. Specifically, the business model innovation literature [50] illuminates about this innovation challenge, which we find evidence for in our three cases. Thus, our article provides a unique framing by identifying and coding business model alignment in each element and thereby attempts to untangle the challenges inherent in PSS business model provision. For example, the value-capturing elements relate to revenue models, agreements, and cost structures, and their alignment with value creation and value delivery. These complexities reside in the relationships within and across business model elements. They are seldom discussed. Our article, however, facilitates accounts of PSS business model alignment that encapsulates the three elements of a business model—value creation, delivery, and capture—and their interactions. Thus, the PSS transformation of manufacturing firms provides relevant empirical grounds for making a contribution to the business model innovation literature.

Second, we contribute by developing a framework for showcasing the interactive nature of business model elements and provide guidance on how to maximize the potential that comes with designing a fully aligned PSS business model. The framework identifies six alignment problems that are multifaceted but share a common trait that they stem from the misalignment of two elements of the business model—namely, between value creation/delivery, value creation/capture, and value delivery/capture. These PSS business model alignment problems occur in an interactive manner rather than sequentially as proposed by the prior literature [44], [75]. The notion of interaction at the level of the business model element is new because it explains that solely focusing on value creation, value delivery, and value capture is not sufficient for successful PSS provision. Thus, manufacturing firms need to allocate resources and effort in developing a more holistic understanding and recognize that each decision taken at the individual element level may spill over to other elements. For example, higher value can be created for customers through an availability contract, but the provider needs to be able to deliver this offering while, at the same time, ensuring that the appropriate value-capture and delivery mechanisms to make this a successful PSS offer are in place. Thus, we concur with the PSS business model literature that has called for fit- or alignment-based perspectives [75] in order to explain business model innovation process.

Third, our article shows the importance of aligning value-delivery activities with value-creation and value-capture activities for PSS business model implementation in a B2B context. Industrial manufacturing firms operating in traditional B2B industries are often faced with greater challenges over PSS business model innovation because they need to closely define their value-creation and value-capture activities in collaboration

with customers and other value delivery partners [14], [40]. Increasingly, servitization research recognizes that firms need to look beyond the purely internal view of business models to meet the undoubted challenge that experimenting with advanced PSS offerings presents. However, we find a tendency in PSS literature toward emphasizing value delivery activities. For example, Sjödin *et al.* [76] investigated outcome-based contracts which can be regarded as most advanced form of PSS offering. Concurring with current article, they also propose for alignment between value creation and value capture across different stages of business model design, development, and implementation but overlook value delivery element. We argue that the role of value delivery business model element is particularly important for PSS provider in B2B context, as the delivery phase for PSS solution can extend over multiple years. This puts high demands on considering value delivery cost and resources comments in alignment with value creation and value capture activities. According to Reim *et al.* [31], the capabilities and incentive models of delivery network partners are important for successful PSS business model implementation. Thus, aligning all three elements of business model innovation is needed for successful PSS provision.

Fourth, by identifying three kinds of value leakage, we conceptualize and communicate the negative consequences of PSS business model alignment problems. Much of the existing discussion on PSS effects or outcomes is directed toward capturing empirical evidence of performance effects. These articles attest to a complicated relationship between PSS provision and performance, one that is nonlinear and mediated by an assortment of factors [16], [55]. Other articles suggest that inferior business models lead to negative organizational effects [46]. However, there has been limited discussion of how these effects manifest themselves. By focusing on PSS business models as a theoretical lens, it is possible to identify three negative consequences that we term, “value leakages”—namely, immature resource and capability utilization, unprofitable value generation initiatives, and inefficient service delivery processes. In contrast to value destruction, which denotes an irreparable loss resulting from an active action [61], [63], value leakage represents the inability of manufacturing companies to utilize the business model elements of value advantageously. Thus, we argue that identifying and conceptualizing value leakage at the level of the business model element is novel in the PSS literature. This augments the current PSS literature because it acknowledges the importance of not only revising PSS business model elements but also aligning these elements to maximize PSS benefits. Moreover, by presenting consequences at the PSS business model level, this article provides a detailed explanation of the challenges that inhibit PSS business model implementation and the achievement of the full potential of value creation, value delivery, and value capture.

In conclusion, the present article offers numerous insights into PSS business model elements, business model alignment problems, and their consequences. Hence, this article improves our understanding of the business model concept and, in particular, its use as an organizing device when undertaking analysis of fundamental issues that need to be resolved if the potential gains from PSS provision are to be successfully harnessed

[34], [37]. By thinking of business model elements as part of an interrelated system instead of analyzing them individually, chances are increased that value to customers and the providing company can be maximized, delivered, and captured. Effecting changes in isolation will not lead to successful PSS provision because of the inherent complexity and the need to build on each element progressively.

### B. Managerial Implications

This article carries managerial implications for senior managers responsible for business development and driving their organization’s transformation toward PSS. First, organizing business model activities around value creation, value delivery, and value capture helps to achieve an understanding of the various activities involved in PSS provision and to emphasize the importance of taking a holistic view of all business model elements required to implement PSS. Therefore, it is important to remaining cognizant of how each business model activity independently and interactively makes a discrete contribution to the business model.

Second, the PSS business model value-leakage framework can be used as a guidance and evaluation tool to facilitate and optimize the PSS implementation process. The proposed framework can help company managers to design mitigation activities that support the effective coordination and integration of various business model elements and, more importantly, to identify actions that lead to alignment between activities and to take remedial steps if necessary.

Third, it is important for managers to recognize the need for a cross-functional approach to PSS business model development. Our article shows that business model development is not an activity based on a single unit but one that requires the active involvement of diverse units, such as R&D, service organization, and sales and distribution. In particular, global companies need to focus on the alignment of business model elements because they face a more diverse customer base and experience greater regional diversity in their operational environment.

Finally, this article highlights the need to focus on continuous realignment of and improvement in business model activities for successful PSS business model implementation. As most manufacturing firms are exposed to changing customer and market conditions, we recognize the need to continuously work on assessing and ensuring alignment issues. Thus, we argue business models are not static and an evolutionary approach is needed for successful adaptation and implementation.

### C. Limitations and Avenues for Future Research

Although this article makes a valuable contribution to the PSS literature, it has, nonetheless, certain limitations that should be weighed in the balance when assessing the results. These limitations could be addressed in interesting avenues for future article. First, our article identifies a list of PSS business model alignment problems. This list may be incomplete, and it would be interesting to discover what other alignment problems can occur during a company’s implementation of PSS. Further article could take our findings a stage further along this road. Second, the

alignment problems of business model elements are, in this case, analyzed from the perspective of one element, well designed, compared to the other, poorly designed. However, in some cases, the alignment problem results from two business model elements that are both well executed but, nevertheless, do not fit together. Therefore, it should be of interest to future researchers to analyze the relationships in different elements and how they affect a company's implementation of a PSS business model. Third, this article focuses on the alignment problems across business model elements. However, alignment problems are possible both within and across the various business model elements. Articles that can bring to light the moderating variables that align business model elements and company performance would blaze a trail for further article into PSS provision, both quantitatively and qualitatively. Finally, this article was based on large, global manufacturing companies. The results, therefore, may well differ in other settings of, for example, small local actors. Future article should ascertain whether this article's results are replicated under different conditions.

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