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Research paper

Enhancing sales performance of product-service systems: The role of value-based selling, price bundling, and value tools☆

Edwin J. Nijssen [a], Harri Terho [b], Joona Keränen [c,d,*], Michel van der Borgh [e]

[a] Eindhoven University of Technology, Department of Industrial Engineering & Innovation Sciences, P.O. Box 513, 5600, MB, Eindhoven, the Netherlands
[b] University of Turku, Turku School of Economics, Rehtorinpellonkatu 3, 20500 Turku, Finland
[c] RMIT University, School of Economics, Finance, and Marketing, 445 Swanston St, Melbourne, VIC 3000, Australia
[d] LUT University, Business School, P.O. Box 20, FI-53851 Lappeenranta, Finland
[e] Copenhagen Business School, Department of Marketing, Solbjerg Plads 3, 2000 Frederiksberg, Denmark

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ABSTRACT

Many industrial firms struggle to sell their product-service systems (PSS) and solution offerings profitably. While prior research has underscored the role of value-based selling (VBS) in selling PSS, it has provided little insight into pricing in this context. This study examines the interplay between VBS, price bundling, and value tools when selling PSS and solutions. Building on signaling theory, we argue that VBS acts as a signal that helps customers accept a solution price bundle by focusing their attention to the total value-in-use of the bundled solution rather than its individual components. This, in turn, drives service ratio and customer growth performance. Value tools facilitate this process. To test our research hypotheses, we conduct a multi-industry survey and use a mediation-moderation model to analyze the data. Our findings show that price bundling mediates the relationship between VBS and service ratio, and that value tools boost the final step of this link. In turn, VBS and value tools directly affect customer growth performance. This study advances VBS research by explaining how VBS and organizational value assessment tools enable effective use of price bundling as a pricing mechanism to drive PSS sales performance in B2B markets.

1. Introduction

The transition toward commercializing product-service systems (PSS) and customer solutions is a well-documented trend in contemporary business-to-business (B2B) markets (Baines et al., 2024; Tuli et al., 2007; Ulaga & Reinartz, 2011). This involves industrial manufacturers bundling standalone products with services, software, and data, and selling performance outcomes instead of individual products or services (Raddats et al., 2019; Ulaga & Kowalkowski, 2022). Typical examples of PSS include Hilti's tool fleet management, which combines tools, maintenance, and usage analytics into a single service contract, and John Deere's farm management systems, which integrate machinery, precision farming software, and agronomic data to optimize yield and efficiency. However, despite the strategic opportunities that PSS offer, making them a profitable business has been notoriously difficult for many suppliers (Fang et al., 2008; Ulaga & Loveland, 2014; Worm et al., 2017).

Successfully commercializing PSS requires not only creating superior value but also convincingly communicating the PSS's value to customers through selling activities and capturing a fair share of it through pricing activities. Although these two activities—PSS selling and PSS pricing—are interdependent, the literature has largely treated them separately. The literature stream on PSS-selling activities has focused on the importance of value-based selling (VBS), a sales approach that emphasizes the total monetary worth of a supplier's offering rather than relying on low-price or feature-driven messaging (Terho et al., 2012). Research has demonstrated that VBS plays a pivotal role in suppliers' transition to PSS (Salonen, Terho, et al., 2021; Raja et al., 2020). VBS enables suppliers to highlight the value-in-use customers gain and the performance enhancements they are likely to realize (Keränen et al., 2020; Storbacka, 2011; Terho et al., 2017), thereby helping to reduce value ambiguity and alleviate perceived risks (Anderson & Wynstra, 2010; Nijssen et al., 2022). Studies further stress that VBS should not be viewed solely as an

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* Corresponding author at: RMIT University, School of Economics, Finance, and Marketing, 445 Swanston St, Melbourne, VIC 3000, Australia.
E-mail addresses: E.J.Nijssen@tue.nl (E.J. Nijssen), harri.terho@utu.fi (H. Terho), joona.keranen@rmit.edu.au, joona.keranen@lut.fi (J. Keränen), mvdb.marktg@cbs.dk (M. van der Borgh).

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individual salesperson-level approach, as its adoption and effectiveness also depend heavily on organizational factors, including value tools that support VBS activities (e.g., Terho et al., 2017).

The literature stream on PSS pricing has examined how suppliers capture value from PSS through pricing decisions and mechanisms, such as price bundling, performance-based contracts, or subscription models (e.g., Steiner et al., 2016; Storbacka et al., 2013). It shows that a key challenge for suppliers is how to price PSS using appropriate pricing mechanisms that generate higher margins that offset their greater development and delivery costs, while communicating their added value to customers (Sharma & Iyer, 2011; Steiner et al., 2016; Keränen, Kienzler, et al., 2023). Because PSS are inherently bundles of product and service components, price bundling is a particularly relevant pricing mechanism, yet prior research reports mixed evidence regarding its effectiveness. Some studies suggest that integrated solutions are best compensated through a single price that reflects the customer's total value-in-use (Storbacka, 2011), while other research indicates that customers may pay less for bundled service packages (Steiner et al., 2016).

Although both streams provide useful insights, attention for the joint examination of the two concepts remains under-researched. To address this unresolved issue, we examine *the interplay between VBS, price bundling, and value* tools in the context of PSS commercialization. The objective is to better understand and help resolve the difficulties firms experience while introducing and commercializing PSS.

Building on signaling theory (Spence, 1973, 2002), which explains how actors use signals to convey information about themselves to other parties in decision situations to resolve information asymmetry, we argue that VBS is a powerful signal that can shift the focus away from the price of the offer's components to the value of its outcome and the appropriate price in the light of the reduction in total cost of ownership accomplished (Keränen et al., 2021; Terho et al., 2012). In contrast to many discounting-focused price bundling studies (Guiltinan, 1987; Johnson et al., 1999; Steiner et al., 2016), we argue that, when selling PSS, VBS helps customers accept the price bundle by shifting their attention from the solution's components price to the business outcome level (Sharma & Iyer, 2011; Storbacka et al., 2013). Following this logic, we propose that price bundling is a central pricing mechanism that mediates the relationship between VBS and the PSS performance, and we will test this idea empirically.

We also explore the role of organizational value assessment tools in facilitating the use of price bundling in the sales process in general and VBS in particular. Organizational value assessment tools, hereafter *value tools*, should help frontline employees communicate the financial impact of configuring solutions for customers based on a PSS design. Such tools can boost the effectiveness of VBS and price bundling by making it easier to persuade customers with clearly assessed, quantified, and communicated value arguments (Keränen & Jalkala, 2013; Storbacka, 2011). However, empirical support for value tools remains ambiguous. For example, Pöyry et al. (2021) show that value tools may negatively affect sales outcomes. Given the substantial investments firms make in developing value tools, it is essential to understand how value tools impact VBS and suppliers' PSS performance.

Our study extends contemporary VBS research in three important ways. First, we respond to recent calls for more theory-driven empirical VBS studies (Keränen, Totzek, et al., 2023) by applying signaling theory to examine the role of price bundling in the context of VBS and PSS. Much of the existing VBS literature is grounded in qualitative research and anecdotal accounts of its use to justify and defend premium pricing, offering limited empirical evidence on how VBS interacts with specific pricing mechanisms (Raja et al., 2020; Sharma & Iyer, 2011; Storbacka, 2011). Our empirical findings show that VBS represents a powerful signal that allows customers to shift their focus from assessing the price of individual components of an offer to the overall financial benefits of the bundled solution, thereby fostering acceptance of the PSS's price bundle. As part of our theorizing, we distinguish between two performance outcomes: (i) PSS service ratio performance, i.e., the sales growth of the installed base, and (ii) PSS customer growth performance, i.e., growth due to increased share of wallet and cross-selling for an account and argue that these outcomes may be subject to distinct underlying mechanisms and effects.

Second, we provide novel insights into the role of price bundling in the context of VBS and PSS. Prior work on VBS has predominantly concentrated on value communication, leaving the strategic role of specific pricing mechanisms largely underexplored (for an exception, see Keränen, Kienzler, et al., 2023). Research on pricing has indicated that price bundling can be a suboptimal strategy in B2B markets (Steiner et al., 2016). Bridging these two streams, our findings demonstrate that price bundling can be an effective pricing mechanism in the PSS context when it is coupled with VBS.

Third, we extend prior work on value tools. While anecdotal evidence supports the use of value tools in VBS and solution selling (Keränen & Jalkala, 2013; Storbacka, 2011), empirical insights have been mixed (Pöyry et al., 2021). Our results show that value tools directly drive service ratio and customer growth performance, and enhance the effectiveness of price bundling, thereby reinforcing the notion that they serve as significant drivers of salesforce-driven VBS in a PSS context (see Terho et al., 2017).

The rest of this paper is organized as follows. First, we explain our conceptual background and develop our hypotheses. Then, we describe our research design and report the empirical results. Finally, we discuss the implications for theory and practice and highlight potential limitations and avenues for future research.

2. Conceptual background

Selling PSS is an important yet also highly challenging strategy for companies competing in mature, commoditized B2B markets (Baines et al., 2024; Ulaga & Reinartz, 2011). Many studies suggest that the high investments required to develop and deliver PSS make it difficult to achieve profitability. It can take quite some time before a critical mass of the installed base is reached (Gebauer et al., 2005; Fang et al., 2008). Other studies indicate that while PSS may boost supplier revenues, they do not always translate into higher profits and, in some cases, even lead to financial losses (Johansson et al., 2003; Stanley & Wojcik, 2005; Eggert et al., 2014). A key difficulty is effectively communicating the added value of PSS and persuading customers to accept a premium price for the integrated, customized solution (Anderson & Wynstra, 2010; Raja et al., 2020; Storbacka, 2011). Recent studies have indicated that strong VBS capabilities (Keränen et al., 2021; Ulaga & Reinartz, 2011; Worm et al., 2017) and appropriate pricing approaches, such as price bundling (Steiner et al., 2016), are critical for enhancing the profitability of PSS and solution offerings. We describe the main concepts of our study next.

2.1. PSS and sales outcomes

In this study, we distinguish two key sales outcomes that feature prominently in sales organizations with a focus on selling PSS offerings: (i) hunting for new PSS customers and thus increasing the firm's PSS service ratio by increasing the installed base and (ii) farming, i.e., growing existing customers via increasing the share of wallet and leveraging cross-selling opportunities (Van der Borgh et al., 2023). Both are relevant because when B2B firms succeed in the solution business, the ratio of PSS offerings as part of total sales should increase, allowing them to grow the share of wallet of existing customers.

After developing its PSS, a central sales objective is to increase the *PSS service ratio* to establish a sufficiently large installed base and ensure the profitability of the solution business, given its numerous strategic and financial benefits (Fang et al., 2008). A larger installed base generates economies of scale and enhances cost-efficiency by reducing the average cost per customer for maintaining, upgrading, or enhancing the solution (Neely, 2008; Oliva & Kallenberg, 2003). It also facilitates the

introduction of complementary products and services by providing a ready market of customers already familiar with the supplier's offerings (Matthyssens & Vandenbempt, 2008; Salonen, 2011). Spreading the costs of developing and introducing such new modules and features across a broader customer base reduces financial risks and enhances the overall profitability of the PSS business model (Baines et al., 2024; Tukker, 2004). The process benefits from the increased switching costs associated with the PSS platform, thereby further enhancing cross-selling and up-selling opportunities (Van der Borgh et al., 2023). Indeed, PSS has notable potential to grow business with the existing customer base. Post-deployment support, in which sales further assist in optimizing the customer's business processes, is a key task of solution selling (Tuli et al., 2007) and has the potential to drive *PSS customer growth performance.* It often enables sales to identify new opportunities to deepen customer relationships, either through additional valuable offerings or by increasing the share of wallet. Therefore, PSS service ratio performance and PSS customer growth performance represent two key aspects of PSS performance.

2.2. PSS and pricing logic

Pricing plays a central role in the commercialization of PSS, as suppliers must translate the value created by integrated offerings into acceptable and profitable prices. When companies shift toward PSS selling, pricing decisions become increasingly complex and challenging and must be embedded in a strategically sound business model and mission (Barquet et al., 2013; Kowalkowski & Ulaga, 2024a). Prior research distinguishes between pricing strategies and revenue models in PSS, including cost-based, value-based, and volume-based pricing, as well as subscription models (e.g., Kowalkowski & Ulaga, 2024a, 2024b). The focus is on how prices are structured at the firm, portfolio, business model, or customer-segment level, often over extended contractual time horizons. In contrast, the present study focuses on pricing mechanisms *at the offer level*. Specifically, it focuses on the use of price bundling. Price bundling refers to presenting an integrated solution as a single offer with one overall price (Stremersch & Tellis, 2002), thereby shifting customer evaluation from individual components to the solution as a whole. Importantly, even within the same firm, salespeople may employ different pricing mechanisms across customers, solution configurations, and sales situations. As Kowalkowski and Ulaga (2024a) clearly explain, product life cycle services (PLS) may be priced using (a combination of) volume-based, cost-plus, fixed-price, or "all-inclusive" pricing. Similarly, asset productivity services (ASP) may be sold separately from a supplier's core offering or bundled into one package deal. In this study, we conceptualize price bundling as the extent to which it is systematically used across PSS sales activities, rather than as specific contractual arrangements or revenue models. Accordingly, our focus is not on comparing alternative pricing strategies, revenue models, or long-term pricing mechanisms within and across firms, but on understanding how the extent to which firms use price bundling affects their PSS performance outcomes.

2.3. The role of VBS and Price bundling in the PSS business context

Prior research has highlighted the importance of VBS as a key driver for successfully selling PSS-based offerings (Storbacka, 2011; Raja et al., 2020; Salonen, Terho, et al., 2021). This rests on the idea that VBS helps suppliers transparently demonstrate how integrating different products and services into solution offerings will add value to the customers' business (Anderson et al., 2006; Terho et al., 2012). By offering this information in the sales process, suppliers should be able to reduce customers' price sensitivity, risk perceptions, and potential fairness concerns (Keränen et al., 2020; Nijssen et al., 2022; Ulaga & Kohli, 2018), thus increasing their willingness to pay a higher price (Anderson & Wynstra, 2010).

Extant research refers to solutions as "individualized offers for complex customer problems that are interactively designed and whose components offer an integrative added value by combining products and services so that the value is *more than the sum* of the components (Evanschitzky et al., 2011, p. 657; Sawhney, 2006). This definition implies that PSS should be priced "based on the value created to the customers, not based on the costs incurred by delivery" (Storbacka, 2011, p. 705). An important premise of this integratedness is that components of the solution cannot be easily unbundled and purchased separately (Sharma & Iyer, 2011; Storbacka et al., 2013). Consequently, price bundling should be viewed not merely as a pricing option but as a deliberate strategic choice for PSS offerings.

Yet, in the extant B2B pricing literature, an alternative and fundamentally conflicting view of price bundling continues to prevail. In this context, bundling is typically framed as a discount mechanism, in which buyers expect price reductions when purchasing multiple items together. Several studies have further shown that customers' willingness to pay may decrease when providers offer products as a bundle at a single, overall price rather than pricing them individually (Guiltinan, 1987; Johnson et al., 1999). For instance, Steiner et al. (2016) found that bundles were associated with prices approximately 5% lower than the sum of individual components. Contrary to this dominating view in the price bundling literature, our study investigates the potential for a positive, rather than negative, effect of bundling strategies when integrated with value-based selling in the PSS context.

We propose that the perceived value of price bundling depends on the nature and context of use. Specifically, we argue that the widely documented negative effect of price bundling occurs when firms sell unintegrated and non-idiosyncratic offerings, a practice referred to as *product price bundling* by Stremersch and Tellis (2002). In contrast, when a provider delivers an integrated solution tailored to a customer's business processes, the synergistic combination of components can enhance business outcomes. Accordingly, customer acceptance of solution price bundling should depend on the provider's ability to convincingly communicate and demonstrate the monetary worth of the solution's seamless integration and its value-in-use, for example, through total cost of ownership.

VBS is particularly well-suited to this task, as it emphasizes "crafting market offerings in such a way that benefits are translated into monetary terms, based on an in-depth understanding of the customer's business model, thereby convincingly demonstrating their contribution to customers' profitability" (p.178). In other words, VBS efforts help make the value-in-use of the integrated PSS offerings tangible, thereby enabling providers to justify fair compensation for the value they deliver (Nijssen et al., 2022). Building on this logic, we expect that VBS serves as a central enabler of effective solution price bundling in the PSS context. We expect that VBS drives solution price bundling and contributes to improved firm performance outcomes, both in terms of hunting-related PSS service ratio performance and farming-related PSS customer growth performance. Drawing on signaling theory (Spence, 1973, 2002), we consider VBS as a high-credibility signal that fosters intersubjectivity and resolves information asymmetry between buyer and seller. Signaling theory posits that one party (the seller) sends signals to another (the buyer) to convey qualities that are not directly observable (e.g., the ability to deliver value-in-use through PSS), thereby reducing uncertainty and building trust.

2.4. The role of organizational value tools for price bundling and value-based selling

Previous research suggests that organizational capabilities are required for VBS to be effective at the operational level (Storbacka, 2011; Salonen, Terho, et al., 2021; Töytäri & Rajala, 2015). VBS is a highly demanding sales approach that is likely to fail if understood solely as an individual salesperson-focused concept (Terho et al., 2017). A central factor in organizational VBS implementation is the creation and use of value tools. Such tools serve as organizational support

mechanisms, helping assess, quantify, and communicate value to customers systematically (Anderson et al., 2007; Hinterhuber, 2017; Keränen & Jalkala, 2013).

Value tools can take multiple forms, such as customer value calculators, value case histories, total cost of ownership analyses, and customer value models (Anderson et al., 2006; Pöyry et al., 2021; Terho et al., 2017). These tools help sales organizations design effective, tailored solutions, quantify the economic impact of offerings, and signal prior customers' satisfaction. For example, value calculators simulate the expected financial outcomes of a proposed solution — such as cost savings or revenue gains — to demonstrate the supplier's ability and willingness to deliver the promised value (Terho et al., 2012). In contrast, value case histories document realized benefits from comparable customer engagements, serving as signals of past success and future commitment that help reduce perceived risk and value ambiguity (Anderson & Wynstra, 2010).

While research suggests that value tools can facilitate the use and effectiveness of VBS, empirical support for this relationship is mixed. Terho et al. (2017) empirically demonstrated that value tools play a central role in broader, salesforce-wide adoption of VBS by helping less learning-oriented "average" salespersons implement VBS. Similarly, Hinterhuber (2017) found that firms using tools such as value calculators and ROI models achieved superior pricing outcomes and sales performance. In contrast, Pöyry et al. (2021), in a mixed-method study with B2B service and technology providers, found that the use of value tools did not automatically improve sales outcomes. Their findings revealed no significant effect on sales conversion rates or process duration, and in some cases even indicated lower deal prices. They identified several contextual barriers, such as insufficient training, poor alignment with customer needs, and low salesperson commitment, that undermined the tools' effectiveness. Yet, from a signaling theory perspective, the organizational value tools constitute an additional high-credibility signal beyond frontline VBS, which should exert a direct positive influence on PSS performance and positively moderate the relationship between VBS-enabled price bundling and performance outcomes.

3. Research framework and hypotheses

As mentioned, we build on signaling theory to argue for the relationships among VBS, organizational value tools, price bundling, and PSS sales performance. In this section, we propose a theoretical framework and develop hypotheses. Fig. 1 illustrates the signaling theory-based moderated mediation model. The model posits that price bundling serves as a central mediator in the relationship between VBS and PSS sales performance, as it represents a central mechanism through which VBS drives outcomes in the context of PSS and solution selling. Value tools are conceptualized as both a central antecedent of VBS and a moderator of the mediated relationship between VBS, price bundling, and PSS selling performance.

3.1. Signaling theory

Signaling theory (Spence, 1973, 2002) explains how actors, such as sellers, can use signals to convey information about themselves to an external party, such as a buyer, in a decision situation in which the other party has less information. It refers to situations of information asymmetry, where the customer generally has less information about the solution than the seller, which is typically the case in solution selling (Zimmer et al., 2020). The theory posits that the more knowledgeable party can use quality signals to help the less knowledgeable party make better decisions. Signal quality is critical because effective signals are difficult for the sender to produce yet offer meaningful information to the receiver. As a consequence, such high-quality signals are perceived as credible and help reduce the receiver's decision uncertainty (Connelly et al., 2011; Kirmani & Rao, 2000).

3.2. Hypotheses of VBS, price bundling, and PSS selling performance relationships

The complexity and customization of solutions make the buying decision highly challenging for the buyer. Especially, requirement definition and seamless integration of products and services are difficult to determine in the early stages of solution buying (Tuli et al., 2007) and involve significant perceived risk for buyers (Paluch & Wunderlich, 2016). Not surprisingly, buyers are often overwhelmed and find identifying and assessing an integrated, tailored solution that supports their business outcomes challenging and risky (Aarikka-Stenroos & Jaakkola, 2012; Töllner et al., 2011). Therefore, a salesperson's key task is to guide the buyer through this uncertain buying process and build trust (Ulaga & Kohli, 2018).

Drawing on signaling theory, we posit that VBS represents a high-credibility signal. VBS is observable and informative (i.e., it explicitly helps link solution characteristics to financial performance) for customers when sourcing an integrated, customized solution (c.f., Keränen, Totzek, et al., 2023). Yet, it remains difficult and costly for other parties to replicate (e.g., customers and low-quality suppliers). Three facets of VBS stand out and add to its signal quality. First, VBS demands deep customer insight and advanced consultative capabilities from the supplier. In executing VBS, the salesperson must navigate the internal organization and coordinate with internal and external stakeholders (Salonen, Terho, et al., 2021), making the approach complex and challenging to master. Second, VBS shifts the focus toward developing a customer-specific solution that generates synergy and delivers value beyond the aggregated price of individual product and service components. Achieving this requires substantial time, effort, and expertise from both the supplier and the customer, including the challenging task of building a deep understanding of the customer's usage context (Terho et al., 2012). Finally, VBS makes the value of the offering transparent and measurable through customer-specific metrics, such as ROI, cost savings, efficiency, and total cost of ownership (Keränen & Jalkala, 2013). In particular, the latter two facets make VBS a powerful credibility signal by providing customer-specific information that reduces uncertainty and enables more informed, less risky decision-making.

If VBS functions as a high-credibility signal, then price bundling serves as a logically aligned complementary signal that reinforces the provider's value proposition. Price bundling highlights that the integrated solution offers greater value than the sum of its individual components, making the offering's complexity and synergies more tangible to the customer. It underscores the supplier's PSS expertise and integration capabilities, thereby enhancing perceptions of reliability (Sirdeshmukh et al., 2002). Moreover, bundling shifts the customer's attention from evaluating individual component prices to assessing the overall value and total price of the solution, thereby mitigating perceived operational risks associated with sourcing from multiple suppliers. Thus, it shifts attention from price comparisons per product and service component to the negotiation of an overall price relative to the total value received. Therefore, we propose that price bundling is a central mechanism through which suppliers operationalize and communicate their VBS efforts.

Building on the above, we posit that solution price bundling for PSS offerings serves as a central theoretical mediator that explains how VBS drives solution selling performance. The use of the VBS approach generates high-credibility signals that help resolve information asymmetry and foster customer trust in the synergistic value of PSS offerings, thereby increasing acceptance of solution price bundling and PSS sales performance. We account for two types of PSS performance outcomes. First, we expect VBS and price bundling to drive greater customer acceptance of solutions, leading to higher PSS service ratio performance. Second, VBS and price bundling should improve PSS customer growth performance because solutions provide a route to increase customer share of wallet and sell new offerings in long-term relationships. While VBS is expected to drive both outcomes through its credibility signals,

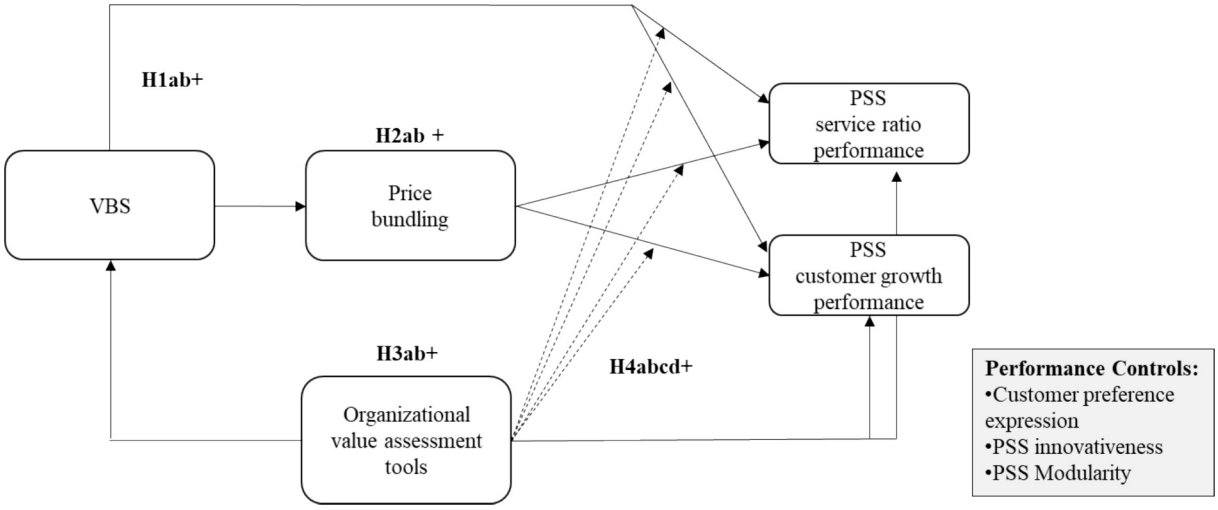

Fig. 1. The moderated-mediation Model of VBS, Price bundling, and Value tools in Manufacturers' PSS Strategy.

we posit that price bundling functions as an additional signal that mediates these relationships. Accordingly, we hypothesize:

H1. *VBS has a positive relationship with the use of solution price bundling.*

H2. *VBS has a positive relationship with a) PSS service ratio performance, and b) PSS customer growth performance, which is (partially) mediated by solution price bundling.*

3.3. Value tools as drivers and a reinforcing force

Organizational value tools can facilitate the implementation of VBS by helping configure customer-specific solutions, quantifying value-in-use, and providing tangible evidence of value delivery (Anderson et al., 2007; Hinterhuber, 2017; Keränen & Jalkala, 2013), thereby offering multiple pathways to enhance product-service system performance. Specifically, we propose a twofold impact of value tools on PSS sales performance. First, they may indirectly improve PSS performance by functioning as job resources that support salespeople in the effective adoption and execution of VBS practices (Bakker & Demerouti, 2007). Second, value tools can enhance PSS performance by acting as additional signals that strengthen the perceived credibility and effectiveness of the salesperson's VBS efforts (Spence, 1973, 2002), as elaborated below.

The Job Demands-Resources model (Bakker & Demerouti, 2007) is a motivational theory that argues that a balance between resources and challenges motivates people. Prior research confirms that value tools serve as frontline salesperson resources, enabling them to effectively perform their tasks and organize work for value communication with prospects or customers. First, value tools reduce the cognitive and operational effort needed to implement VBS by offering a structured framework for value quantification and presentation (Storbacka, 2011; Töytäri & Rajala, 2015; Töytäri, Keränen and Rajala, 2017). This increased ease of use makes VBS more actionable and attractive to individual salespeople (Terho et al., 2017). Second, these tools also help shift salespersons' focus from products to customer-specific value-in-use. Hence, we expect that value tools, as a resource, stimulate the use of VBS and, consequently, improve PSS performance. This will be true for selling in and selling out (Van der Borgh et al., 2023).

H3. *Value tools have a positive relationship to a) PSS service ratio performance, and b) PSS customer growth performance, which is mediated by VBS.*

Beyond their functional role, value tools can also be interpreted through the lens of signaling theory (Spence, 1973, 2002). Customers seeking PSS solutions typically face information asymmetries regarding the provider's actual capability to deliver solution value. In this context, value tools serve as high-credibility signals by offering transparent and verifiable information, often demonstrating performance gains relative to the customer's current situation and, in many cases, compared with competing alternatives in the marketplace. This signaling function reinforces the broader VBS message and amplifies the perceived credibility of the provider's price bundling strategy, thereby strengthening the relationship between VBS and performance. Whereas VBS communicated by individual salespeople may be interpreted as situational or salesperson-dependent, value tools signal a broader organizational investment in value delivery (Ahmad & Arshad, 2014; Oh & Pinsonneault, 2007), thereby increasing customer trust in the price bundling when buying PSS offerings and deepening their relationship with the supplier. Hence, we hypothesize that value tools positively moderate the relationship between value-based selling VBS and price bundling strategies on PSS sales performance.

H4. *Value tools strengthen the relationship between VBS and **a)** PSS service ratio performance and **b)** PSS customer growth performance, as well as the use of Price bundling and **c)** PSS service ratio performance and **d)** PSS customer growth performance.*

4. Methodology

4.1. Institutional context and data collection

We collected data from U.S. firms across various industries to test our model using an online survey. Such a cross-sectional design is well suited for this objective because the included concepts and practices concern relatively stable organizational routines and selling logics that develop over time, rather than short-term tactical or deal-specific pricing decisions. This design helps capture systematic differences in how firms organize and deploy these selling mechanisms when commercializing product–service systems.

The data was collected from a professional data collection agency panel. We focused on a sample of U.S. firms because the country has the highest percentage (58%) of firms that combine manufacturing and service (Neely, 2008). Only firms with more than 15 employees and at least a 10% share of PSS in their sales were included. The aim of a fixed sample of 250 was achieved with 471 firms contacted, offering a net response rate of just over 53%. Table 1 summarizes the sample details.

As our unit of analysis, we examined the firm level or, where applicable, the business unit within a firm. Our focus was on assessing the overall configuration of the firm's PSS business rather than analyzing any specific buyer–seller relationship or individual sales episode. From a

Table 1
Sample demographics.

Respondent	%	Firm size	%	Industry	%
Sales manager	38.4	15 ≤ 50	15.6	Software and Services	13.2
Marketing manager	30	50 ≤ 250	13.6	Banking and Financials	10.8
Chief Sales Officer	12.4	250 ≤ 500	8.4	Commercial and Professional Services	10.4
Chief Marketing Officer	7.6	500 ≤ 1000	20	Telecommunication and Media	9.6
Other, e.g. service manager	11.6	1000 ≤ 5000	19.6	Retailing	8
		> 5000	17.6	Food, Beverage, and Tobacco	8
		unknown	5.2	Consumer products and services	8
				Transportation, Automobiles, and Components	7.2
				Health Care and Pharmaceuticals	7.2
				Materials and Energy	5.6
				Capital Goods and Real Estate	4
				Other	8
	100		100		100

signaling-theory perspective, the credibility of a signal depends on its systematic, observable, and hard-to-imitate nature. This implies that the effectiveness of practices such as VBS and price bundling arises not from isolated, contract-specific instances but from their consistent and institutionalized deployment across sales interactions. Consequently, a firm-level analytical design is theoretically appropriate because it captures the extent to which these practices are embedded within the sales organization rather than contingent on particular deals or customers.

To assess this organizational embedding, we relied on firm-level perceptions of their customer base, drawing on sales, marketing, and service managers as key informants. They can be considered the most qualified to answer questions on PSS and sales. These managers logically know about the firm's PSS offerings, its customers, the use of performance contracts, and the firm's performance. Firms also typically act on such general beliefs in their marketing approach (Rosa et al., 1999). To ensure consistent answers and prevent ambiguity, we instructed respondents to focus on the firm's most recently introduced PSS and its related target customers. The above-mentioned screening question regarding a minimum of 10% share of PSS in the firm's sales helped to ensure situational relevance.

We checked respondent versus non-respondent firms (Hulland et al., 2018). We found no significant differences in revenue and percentage sales of performance contracts in total turnover ($F = 1.26$, $p = .27$; $F = 1.36$, $p = .25$), suggesting that non-response bias is not a serious concern when interpreting the data.

4.2. Measurement

Because common method bias (CMB) is a concern when using a survey instrument to measure both independent and dependent variables, we followed the procedures outlined by Podsakoff et al. (2003) to minimize CMB. We assured respondents of complete confidentiality for candid responses, varied scale formats to keep attention, and separated predictor and criterion variables to prevent halo effects. We followed Hulland et al.'s (2018) best practices for marketing survey research in survey instrument design. We further pretested the instrument with four managers from firms selling PSS to ensure proper flow and clarity of the questions. Based on the feedback, only minor changes were implemented before the survey was launched online.

4.3. Construct measurements

We operationalized our key constructs using multi-item measures borrowed or adapted from previous studies. We shortly summarize the study measures below and provide the full details of all study constructs, their measurement items, and sources in Appendix A.

VBS of the salesforce was measured using four core items from Terho et al. (2017). It measures the degree to which salespeople collaborate with the customer to develop an offering, making benefits clear in monetary terms and convincingly demonstrating the provider's solution's contribution to customer profitability (Terho et al., 2017, 2012). In turn, the measure of *value tools* was adapted based on prior research on value-based selling and solution business (Storbacka et al., 2011; Terho et al., 2017). The measure focuses on the organizational salesforce VBS support in terms of solution configuration, value quantification, and the presentation of customer value evidence.

Price bundling is conceptualized as the systematic use of a single, bundled price for integrated PSS offerings across sales activities, rather than as a multidimensional construct capturing contractual complexity. Following Bergkvist and Rossiter (2007), a single-item measure is appropriate because the construct refers to a concrete attribute (bundled vs. itemized pricing) of a clearly defined object (the firm's PSS offering). Using multiple items would not increase construct validity, but risk conflating pricing mechanisms with broader pricing strategies or revenue models, which are explicitly outside the scope of this study.

The study includes two solution business performance measures. First, we measured the *PSS service ratio performance* based on Antioco et al. (2008) and Hünerberg and Hüttmann (2003). The measure has three related items to capture the firm's PSS involvement: the percentage of PSS in the firm's total turnover over the last 12 months, the financial returns from PSS, and the share of performance contracts in all new contractual arrangements. Second, we measured *PSS customer growth performance* with three items of Van der Borgh et al. (2023) drawn from Schmitz et al.'s (2014) work. The measure focuses on the degree to which PSS solutions have helped the firm sell additional services, increase customer share of wallet over time, and gain insights into how to offer additional offerings to customers.

Finally, we included several *control variables* that could affect our model and outcomes. It helps ensure the correct estimation of our model and its relationships. At the firm level, we included the provider's PSS innovativeness and modularity. These factors may affect rent earning capabilities and the ability to cross-sell, respectively. We also account for customers' ability to express their preferences. This may create a more natural fit between customers and offerings, making selling easier. Except for PSS innovativeness, multiple-item measures were used (see Appendix A for details).

4.4. Measurement quality, common method bias, and analytical procedure

We used SPSS 29 and Smart PLS-PROCESS to analyze the data in three principal stages. First, we evaluated descriptive statistics, conducted exploratory factor analyses, and computed internal consistency estimates to assess the properties of our constructs (Fornell & Larcker, 1981). All reliabilities exceed Nunnally's (1978) guideline of 0.70 or higher (see Appendix B), with the lowest being 0.734 for the PSS service ratio performance. Convergent validity requirements were also met, with all average variance extracted (AVE)-scores exceeding 0.50 (Fornell & Larcker, 1981). Here, cross-selling, with an AVE of 0.527, has the lowest value. The measures also exhibited adequate discriminant

validity because the average variance extracted from each construct is larger than its shared variance (squared intercorrelation) with other constructs in the research. These results suggest the measures are valid and acceptable. Finally, Appendix B presents the correlation matrix and provides all descriptive statistics for the study constructs.

Second, using a full collinearity test, we followed Kock (2015) to check common method bias and assess vertical and lateral collinearity. If all variance inflation factors (VIFs) generated for all latent variables in a model are equal to or lower than 3, a model can be considered free of common method bias. In our case, all VIF values range between 1.00 and 2.293, suggesting that multicollinearity is not a problem in our data.

In the third stage, we estimated the model and tested the hypotheses using Smart PLS4-PROCESS (Ringle et al., 2024). We chose PROCESS because it specifically estimates moderated-mediation effects and provides detailed reports on the shapes of the direct and indirect effects at different levels of the moderator. Two alternative models were estimated. First, a baseline with only the simple mediation effect. Second, a model in which value tools were added as the moderator of the relationships between price bundling and our sales outcomes. Analyses were run at $p < .10$ level using bootstrap 5000.

Model Specification.

The full model (see Fig. 1) is specified with the following four equations:

$$\text{PRICEBUNDL}_i = b_0 + b_1\text{VBS}_i + \text{Control Variables} + \varepsilon_i \quad (1)$$

$$\text{SERVRATIO}_i = b_0 + b_1\text{VBS}_i + b\beta_2\text{PRICE BUNDL}_i + b_3\text{VAT}_i + b_4(\text{PRICE BUNDL}_i \times \text{VAT}_i) + \text{Control Variables} + \varepsilon_i \quad (2)$$

$$\text{CUSTGROWTH}_i = b_0 + b_1\text{VBS}_i + b\beta_2\text{PRICE BUNDL}_i + b_3\text{VAT}_i + b_4(\text{PRICE BUNDL}_i \times \text{VAT}_i) + \text{Control Variables} + \varepsilon_i \quad (3)$$

where PRICEBUNDL = price bundling, VAT = value tools, SERVRATIO = PSS service ratio performance, CUSTGROWTH = PSS customer growth performance, and VBS = value-based selling of the salesforce.

Overall, this approach explains how organizational selling practices influence PSS performance outcomes. The next section presents the findings on the role of value-based selling, price bundling, and value tools as firm-level selling mechanisms.

5. Findings

We estimated the research model in two steps, starting with a baseline mediation model and continuing with a full model with additional moderating effects of the value tools. Table 2 presents the PLS-PROCESS results for the baseline and full model tests of moderated mediation. The results between the two models are equal, as the full model replicates all significant relationships of the baseline model. Hence, we discuss the results based on the relationships of the full model.

The results from both models indicate adequate specification and fit. All R^2s reported at the bottom of Table 2 are substantial and significant. Value tools (VAT) explain 37.7% of the variance of VBS, VBS explains 8.6% of the variance of price bundling, and VBS, price bundling, and controls explain 29.5% of PSS service ratio performance and 54% of PSS customer growth performance.

A look at the direct relationships in the model shows that the findings (see Table 2) confirm that VBS significantly drives price bundling (B = 0.293, $p < .01$). This result confirms H1. Second, VBS significantly and directly impacts PSS customer growth performance (B = 0.229, $p < .01$) but not PSS service ratio performance (B = −0.021, *n.s.*). Further, as hypothesized, price bundling positively drives both PSS customer growth performance (B = 0.103, $p < .10$) and PSS service ratio performance (B = 0.152, $p < .05$). Together, this provides preliminary support for H2a, while no support is observed for H2b prior to conducting the mediation analysis. Third, value tools are a strong driver of value-based selling in the salesforce (0.614, $p < .01$). The value tools also directly affect PSS customer growth performance (B = 0.167, $p < .05$), but not PSS service ratio performance (B = 0.092, *n.s.*). This finding offers partial support for H3b, while no support is observed for H3a prior to conducting the mediation analysis. Finally, all but one of the control variables has a significant effect on our sales outcomes.

The PLS-PROCESS results of the full model tested four additional

Table 2
PLS PROCESS results of the Base and Full model.

	Base model				Full model			
Independent variables:	B	STDEV	T-value	*P*-value	B	STDEV	T-value	P-value
VBS - > Price bundling	0.293	0.068	4.304	0.000 **	0.293	0.068	4.304	0.000 **
VBS - > PSS customer growth performance	0.206	0.074	2.781	0.005 **	0.229	0.076	3.004	0.003 **
VBS - > PSS service ratio performance	0.002	0.069	0.023	0.982	−0.021	0.074	0.279	0.780
Price bundling - > PSS customer growth performance	0.109	0.060	1.798	0.072 †	0.103	0.061	1.680	0.093 †
Price bundling - > PSS service ratio performance	0.129	0.062	2.089	0.037 *	0.152	0.062	2.459	0.014 *
Value tools - > VBS	0.614	0.055	11.119	0.000 **	0.614	0.055	11.119	0.000 **
Value tools - > PSS customer growth performance	0.152	0.076	2.018	0.044 *	0.167	0.078	2.149	0.032 *
Value tools - > PSS service ratio performance	0.054	0.096	0.566	0.571	0.092	0.102	0.897	0.370
Interaction effects:								
Value tools x VBS - > PSS customer growth performance					0.047	0.036	1.310	0.190
Value tools x VBS - > PSS service ratio performance					−0.041	0.040	1.034	0.301
Value tools x Price bundling - > PSS customer growth performance					−0.016	0.051	0.310	0.757
Value tools x Price bundling - > PSS service ratio performance					0.126	0.045	2.776	0.006 **
Controls:								
Modular - > PSS customer growth performance	0.259	0.069	3.744	0.000 **	0.251	0.071	3.543	0.000 **
Modular - > PSS service ratio performance	0.195	0.088	2.223	0.026 *	0.205	0.089	2.313	0.021 *
Preference voicing - > PSS customer growth performance	0.135	0.064	2.124	0.034 *	0.132	0.066	2.003	0.045 *
Preference voicing - > PSS service ratio performance	0.196	0.082	2.396	0.017 *	0.173	0.085	2.040	0.041 *
PSS innovativeness - > PSS customer growth performance	0.121	0.066	1.825	0.068 †	0.119	0.068	1.753	0.080 †
PSS innovativeness - > PSS service ratio performance	0.127	0.068	1.866	0.062 †	0.103	0.068	1.526	0.127
Adj R^2	VBS R^2 = 0.377; Price bundling R^2 = 0.08; PSS customer growth performance R^2 = 0.536; PSS service ratio performance R^2 = 0.273				VBS R^2 = 0.377; Price bundling R^2 = 0.086; PSS service ratio performance R^2 = 0.295. ΔR^2 = 0.02, p = .01; PSS customer growth R^2 = 0.540, ΔR^2 = 0.00 n.s.			

Notes: † p < .10. * p < .05. ** p < .01. Two-tailed tests.

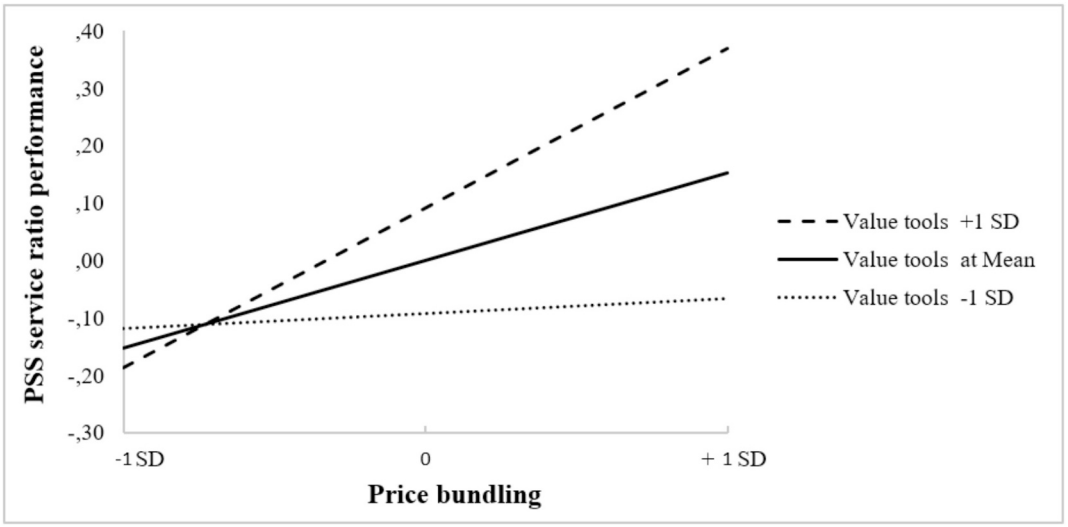

Fig. 2. Simple slope analysis of the moderating effects.

Table 3
Mediation and moderated mediation effects for PSS service ratio and customer growth performance relationships.

Mediation effects, excluding the moderation	B	STDEV	T-value	P- value
VBS - > Price bundling - > PSS service ratio performance	0.044	0.022	1.984	0.047 *
VBS - > Price bundling - > PSS customer growth performance	0.030	0.019	1.556	0.120
Value tools - > VBS - > Price bundling - > PSS service ratio performance	0.027	0.014	1.972	0.049 *
Value tools - > VBS - > Price bundling - > PSS customer growth performance	0.018	0.012	1.562	0.118
Direct moderating effects (Organizational value tools)	B	STDEV	T-value	P- value
Price bundling - > PSS service ratio performance conditional on Value tools at +1 SD	0.278	0.076	3.653	0.000 **
Price bundling - > PSS service ratio performance conditional on Value tools at Mean	0.152	0.062	2459	0.014 *
Price bundling - > PSS service ratio performance conditional on Value tools at −1 SD	0.026	0.077	0.342	0.732
Moderated mediation effects at different values of the moderator (Organizational value tools)	B	STDEV	T-value	P- value
VBS - > Price bundling - > PSS service ratio performance conditional on Value tools at +1 SD	0.081	0.032	2.531	0.011 *
VBS - > Price bundling - > PSS service ratio performance conditional on Value tools at Mean	0.044	0.022	1.984	0.047 *
VBS - > Price bundling - > PSS service ratio performance conditional on Value tools at −1 SD	0.008	0.024	0.328	0.743
Moderated mediation effects at different values of the moderator (Organizational value tools)	B	STDEV	T-value	P- value
Value tools - > VBS - > Price bundling - > PSS service ratio performance conditional on Value tools at +1 SD	0.050	0.020	2.455	0.014 *
Value tools - > VBS - > Price bundling - > PSS service ratio performance conditional on Value tools at Mean	0.027	0.014	1.972	0.049 *
Value tools - > VBS - > Price bundling - > PSS service ratio performance conditional on Value tools at −1 SD	0.005	0.014	0.330	0.741

5000 bootstraps; † p < .10. * p < .05. ** p < .01. Two-tailed tests.

moderating effects of value tools. We find support for one moderating effect as value tools positively moderate the relationship between price bundling and PSS service ratio performance (B = 0.126, $p < .01$). This supports 4c but not H4a, b, and d. The change in the R^2-test confirms that the changes are significant and substantial, and can be interpreted (see ΔR^2 in Table 2 at the bottom right). Fig. 2 illustrates the nature of the moderating effect.

Table 3 summarizes the results of the tests for hypothesized mediation and moderated mediation effects based on PLS-PROCESS analyses. The results indicate that price bundling significantly mediates the relationship between VBS and PSS service ratio performance (0.044, $p < .05$). The effect is also significant as part of the value tools – VBS – price bundling – PSS service ratio performance pathway (0.027, $p < .05$). It offers support for H3a but does not support the mediation effect related to H3b.

In turn, the results do not support the hypothesis that price bundling would actively mediate the link between VBS and PSS customer growth

Table 4
Total effects (at mean values of value tools).

	Indirect effects			
	B	STDEV	T-value	P- value
VBS - > Price bundling	0.293	0.068	4.304	0.000 **
VBS - > PSS customer growth performance	0.259	0.074	3.418	0.001 **
VBS - > PSS service ratio performance	0.024	0.072	0.309	0.758
Value tools - > VBS	0.614	0.055	11.119	0.000 **
Value tools - > Price bundling	0.180	0.045	4.021	0.000 **
Value tools - > PSS customer growth performance	0.326	0.065	4.385	0.000 **
Value tools - > PSS service ratio performance	0.106	0.094	1.018	0.309

5000 bootstraps, † p < .10. * p < .05. ** p < .01. Two-tailed tests.

performance. Interestingly, although its mediating effect via price bundling is significant, the total effect of VBS on PSS service ratio performance remains non-significant (see Tables 3 and 4); it seems to evaporate due to the direct negative effect we noted.

While the significant direct mediating effects are very small in size, the moderating effect of value tools notably changes the strength of the mediation effects. Specifically, as Table 3 (see direct moderating effects rows) and Fig. 2 show, the direct relationship of price bunding on service ratio becomes significant at medium and high (+1 SD) levels of value tool use (B = 0.152, $p < .05$; B = 0.278, $p < .01$) being close to zero and non-significant (B = 0.026, *n.s.*) for low values of value tools (−1 SD). As reported in Table 3, we find support for the hypothesized moderated-mediation as the mediating effects of price bundling in the relationship between VBS and PSS service ratio performance become notably stronger with the higher values of value tools (B = 0.081, $p < .01$ (+1 SD); B = 0.044, $p < .05$ (mean) and non-significant for the low values B = 0.008, *n.s.* (−1 SD). This holds true even for the value tools – VBS – Price bundling – PSS service ratio performance link (B = 0.050, p < .05 (+1 SD); B = 0.027, $p < .04$ (mean) B = 0.005, *n.s.* (−1 SD).

To conclude, we confirm hypothesis ***H1****: VBS has a positive relationship with Price bundling*. This finding aligns with the notion that VBS is a central enabler of solution price bundling. Second, regarding ***H2:*** *VBS has a positive relationship with* ***a)*** *PSS service ratio performance, and* ***b)*** *PSS customer growth performance, which is mediated by Price bundling,* we find partial support, particularly for H2b. In turn, for H2a, we find that the positive relationship between VBS and PSS customer growth performance is only direct, i.e., not mediated by price bundling. It indicates that solution price bundling is critical for increasing the firm's PSS service ratio through new sales, but it does not play a key role in PSS customer growth performance; that is, it does not help grow sales with existing PSS customers. Third, we find support for ***H3:*** *Value tools have a positive relationship with* ***a)*** *PSS service ratio performance and* ***b)*** *PSS customer growth performance, which is mediated by VBS.* Specifically, H3a is fully supported, as value tools positively influence service ratio performance, with this effect being fully mediated through VBS. In contrast, we find partial support for H3b, as value tools positively affect PSS customer growth performance, but this relationship appears to be direct only and not mediated by VBS. Finally, the findings provide partial support for ***H4****: value tools boost the link between VBS and* ***a)*** *PSS service ratio performance and* ***b)*** *PSS customer growth performance, as well as Price bundling and* ***c)*** *PSS service ratio performance and* ***d)*** *PSS customer growth performance.* Specifically, we find support for 4c, as value tools significantly strengthen the relationship between price bundling and the service ratio. The results for H4a are more nuanced than anticipated, revealing a moderated mediation effect in which the presence of value tools amplifies the mediating role of price bundling in the relationship between VBS and PSS service ratio performance.

6. Discussion

Although scholarly interest in VBS has steadily increased (Keränen, Totzek, et al., 2023), and its significance in selling PSS and solution offerings is well-established (Storbacka, 2011; Salonen, Terho, et al., 2021), its role in PSS pricing strategies remains surprisingly underexplored. This study extends the VBS literature by examining how VBS practices and organizational value assessment tools facilitate the effective use of price bundling to enhance PSS sales performance in B2B markets. Specifically, this study investigates the interplay between VBS, value tools, and price bundling in the context of selling PSS-based solutions, offering a nuanced perspective on the strategic role of price bundling. The key findings reveal that price bundling mediates the relationship between VBS and the PSS service ratio performance, with value tools positively moderating this relationship. In contrast, VBS and value tools influence PSS customer growth performance only through direct effects. The following sections discuss the theoretical and managerial implications of these findings in greater detail.

6.1. Theoretical implications

Our empirical findings offer three important contributions to contemporary VBS research. First, we respond to previous calls for more theory-driven VBS studies (Keränen, Totzek, et al., 2023) by applying signaling theory to examine the role of price bundling in the context of VBS and PSS. Our findings show that VBS and value tools represent powerful and complementary signals that enable customers to shift their focus from assessing the price of individual offering components to the total value-in-use of the solution and accept its price bundle. By integrating VBS and pricing literature with signaling theory, we offer a theoretically grounded explanation of how VBS facilitates the selling of PSS and go beyond exploratory and descriptive case studies that tend to dominate current VBS literature (Keränen, Totzek, et al., 2023).

Second, prior research has provided little insight into related pricing issues. A central pricing decision concerns whether to focus on a single bundled price *or* use individual prices, i.e., pricing each component separately for PSS solutions. While previous research has indicated that price bundling may be a sub-optimal pricing approach in B2B markets, potentially leading customers to pay approximately 5% less compared to individual pricing (Steiner et al., 2016), the results of this study show that value-based selling enables effective use of a solution price bundling. Specifically, VBS represents a powerful value signal that allows shifting buyers focus from the price of individual solution components to resulting value of using the integrated PSS solution in terms of total costs of ownership, savings, or increased revenues (Anderson et al., 2006; Terho et al., 2012; Terho et al., 2017), allowing suppliers to credibly communicate a single value-based price for a solution that is more than the sum of its parts. However, our results indicate that the price bundling is relevant for driving PSS service-ratio performance, but not for enhancing PSS customer growth performance. This suggests that price bundling is a critical approach for selling new PSS-based solutions. Apparently, for existing customers, price bundling does not strengthen PSS sales performance in the deployment stage of expanding their business with the existing solution supplier.

Third, our study extends prior work on value tools by clarifying their role in supporting VBS in a solution business context. While earlier studies have reported mixed findings (see Pöyry et al., 2021), our results support a more optimistic view of value tool effectiveness in a solution-selling context (Hinterhuber, 2017; Terho et al., 2017), showing that these tools are positively associated with both PSS service ratio performance and PSS customer growth performance. The findings suggest that the effectiveness of value tools depends on how well they are embedded into the broader sales process and aligned with sales objectives. Specifically, our results indicate that value tools have a direct positive effect on PSS customer growth performance, likely because they facilitate cross-selling and upselling. However, their role in driving PSS service ratio performance is more complex. Value tools are linked to VBS use and moderate the relationship between price bundling and service ratio performance, indicating value tools primarily serve to make incremental value tangible rather than to reconfigure the bundle. As such, value tools must be carefully integrated into salespeople's tasks and sales trajectories. Overall, our empirical findings support the view that, under the right organizational and strategic conditions, value tools are a central driver of salesforce-led VBS success in solution selling (Hinterhuber, 2017; Terho et al., 2017). These tools not only motivate salespeople to adopt VBS practices but also serve as a powerful credibility signal, enhancing the effectiveness of price bundling strategies.

6.2. Managerial implications

This study offers actionable guidance for managers responsible for pricing, sales, and commercialization of PSS. The findings highlight how VBS, price bundling, and value tools can be deployed as organizational selling mechanisms to improve firm-level PSS performance. Three implications follow.

6.2.1. Implication 1: use price bundling as a value-framing mechanism, not a discount tactic

Managers selling PSS often face customers who struggle to evaluate integrated offerings because products, services, software, and data components are deeply interdependent. In such situations, customers tend to fall back on comparing individual components, increasing price pressure and negotiation complexity. To avoid this, managers should instruct sales teams to present highly integrated PSS offerings using a single bundled price early in the sales process, rather than itemizing components or introducing bundling only as a late-stage negotiation tactic. When combined with VBS, price bundling shifts customer attention from the prices of individual components to the overall value-in-use of the solution. This reframing reduces the salience of component-level pricing and reinforces the supplier's credibility as an integrator capable of delivering outcomes rather than standalone products or services. Customers are more likely to accept the integrated PSS offering, enabling firms to increase their PSS service ratio and build a scalable installed base. If your solution is integrated, sell it as one value, not as a shopping list.

6.2.2. Implication 2: differentiate selling logic for acquiring versus expanding customers

Managers often apply the same selling and pricing logic to both acquiring new PSS customers and expanding business with existing customers, despite these situations involving fundamentally different sources of uncertainty and risk. To address this mismatch, managers should encourage the systematic use of price bundling supported by VBS when acquiring new customers ("hunting"), while relying less on price bundling and more on tangible value arguments supported by value tools when expanding business with existing customers ("farming"). For new customers, price bundling functions as a credibility signal that simplifies evaluation and reduces perceived integration risk. For existing customers, where trust has already been established, value tools help salespeople identify, quantify, and communicate incremental value from additional services or modules without requiring full rebundling. This differentiated approach enables firms to grow their PSS installed base through effective customer acquisition while simultaneously increasing share of wallet and customer growth performance among existing customers. So, bundle to win new customers, and make value tangible to grow existing ones.

6.2.3. Implication 3: build organizational capability, not individual sales heroics

Many firms rely on a small number of experienced salespeople to perform value-based selling effectively, which often leads to inconsistent execution and limits the scalability of PSS sales efforts. To overcome this, managers should invest in organizational value tools, standardized sales processes, and training programs that embed VBS and price bundling into routine sales activities across the organization. Organizational value tools function as shared cognitive and communicative devices that align salespeople around a common value narrative and provide consistent support for value communication. This consistency strengthens the signaling power of VBS and price bundling by making them observable, repeatable, and difficult for competitors to imitate. As a result, firms achieve more consistent PSS sales performance across sales teams and customers, while reducing dependence on individual sales talent and increasing the scalability of their solution business. So, if only your best salesperson can sell PSS, you don't have a strategy, you have a bottleneck.

6.3. Limitations and future research avenues

As with any research, this study has some natural limitations that offer fruitful avenues for further research. First, we used quantitative survey research to measure supplier firms' perceptions of their PSS performance, VBS usage, and price bundling. A natural extension would be to examine customers' decision-making units' reactions and perceptions of VBS and price bundling in this context, as well as the factors influencing their willingness to pay for PSS. This could include qualitative interviews and fuzzy-set comparative analyses with organizational buyers to identify the conditions necessary to ensure customer acceptance of solution price bundling (Salonen, Zimmer, & Keränen, 2021). Since we used cross-sectional data, causal inferences need to be made with caution. Longitudinal and diary-based studies among salespeople would be useful in this regard. Alternatively, quantitative studies could examine the short- and long-term effects of price bundling, while accounting for contract length and different price bundling structures. As part of this endeavor, researchers could also examine the effects of subscriptions and/or outcome-based contracts. Such an extension may require accounting for customer segments. Customers with a longer horizon may respond more favorably to a synergetic price bundle and also an outcome-based contract.

Second, although we included several controls, additional variables could have been used that might have affected our outcomes and, in turn, the estimates. Specifically, we mention value co-creation, value distribution over time, cost-plus signals, and revenue model structure. Future studies that aim to model price strategy beyond price bundling, including these effects in their model or using them as (extra) controls, could be useful.[1]

Third, while we examined how price bundling and VBS interact in the PSS context, future studies could expand our insights and test customer willingness to pay for price bundling under different conditions. This could help the generalizability of findings. This could include comparing different types of solution offerings or bundling configurations (Stremersch & Tellis, 2002), as well as different types of decision-makers and customer industries. Alternatively, future studies could compare the impact of VBS on the pricing of bundled and unbundled solutions or examine whether different types of value tools have stronger (weaker) impacts on specific performance outcomes (Pöyry et al., 2021). Furthermore, our measurement of price bundling may not fully capture the full richness of value-based pricing in the PSS context. We call for more nuanced future research that examines in greater detail how suppliers apply value-based pricing within bundling strategies, ranging from fixed performance-based pricing to more complex gain-sharing arrangements (see Keränen, Kienzler, et al., 2023).

Fourth, while we used signaling theory to explain how VBS influences price bundling and solution-selling performance, future studies could increase the number or the level of detail of the signals. It could also consider applying other theories in this context (Keränen, Totzek, et al., 2023). For example, mental accounting theory (Thaler, 1985) could be used to examine how customers evaluate and respond to pricing strategies based on the costs of individual components versus the value-in-use delivered by solutions. Alternatively, regulatory focus theory (Higgins, 2012) could be used to examine how different price bundling strategies and related VBS approaches resonate with promotion-or prevention-oriented buyers.

Fifth, scholars could delve more into the design of value tools. Of particular interest are the psychological principles and pricing methods employed by these tools (cf. Keränen et al., 2026). Models could juxtapose the current customer solution with the new solution and compare cost and revenue contributions. Further, in addition to emphasizing value derived, it could be combined with a cost-plus approach. Studying which approach or mix renders the best results in the short and long run would be interesting.

Finally, the profitable pricing of PSS and solution offerings in B2B markets is a major industry challenge, yet research in this area remains limited. We hope that this study encourages further scholarly research into effective solution pricing and the different VBS approaches that can support it.

[1] We thank one of the reviewers for making this point.

CRediT authorship contribution statement

Edwin J. Nijssen: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Harri Terho:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Conceptualization. **Joona Keränen:** Writing – review & editing, Writing – original draft, Conceptualization. **Michel van der Borgh:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Formal analysis, Data curation, Conceptualization.

Declaration of Competing Interest

Given their role as Guest Editors and Associate Editors respectively, Edwin Nijssen, Harri Terho, Joona Keranen and Michel van der Borgh had no involvement in the peer review of this article and had no access to information regarding its peer review. Full responsibility for the editorial process for this article was delegated to another journal editor.

Appendix A. Measures of study constructs and controls

Value-based selling (of the salesforce)	(Terho et al., 2017; 1 = "strongly disagree" – 7 = "strongly agree"). Our salesforce…: …works closely with customers to find out what is needed to improve their performance. …shows how our products/services will improve their firm's performance. …works toward improving our customers' bottom line. …focuses on identifying opportunities to improve customers' business profits.
Price bundling	(drawing on Guiltinan, 1987; 1 = "do not agree" – 7 ="do fully agree") When making an offer for a specific customer… - we bundle packages into one final offer with one price.
Value tools	(based on Terho et al., 2017; 1 = "strongly disagree"— 7 = "strongly agree"). Our firm has …developed tools to quantify the impact of our firm's product-service system on customers' business. …tools in place to estimate the financial implications for customers when using our firm's product-service system. …a method to assess the financial value that our firm's product-service system delivers to customers. …has a procedure to integrate customer evidence to build proof of the value of our firm's solution offering. … developed a configurator to facilitate solution-offering composition choices. …a product-service system configurator to compose the right solution for customers.
PSS service ratio performance	(based on Antioco et al., 2008; Hünerberg & Hüttmann, 2003; in percentage) In the last 12 months, what was the percentage of …PSS as part of total turnover …PSS deals sold with a performance contract … your company's profit generated by PSS?
PSS customer growth performance	(Schmitz et al., 2014; 1 = "strongly disagree"– 5 = "strongly agree") Our firm's PSS offering… …provided opportunities to sell additional products and/or services. …helped to increase customer share of wallet over time. …lead to insights on how to provide additional offerings to customers.
Customer preference expression	(Based on Franke et al. (2009) 1 = "strongly disagree"– 5 = "strongly agree") It is easy for our firm's customers to describe how their ideal PSS should look like.* It is no problem for our firm's customers to name those attributes of a PSS that are most important to them. Our firm's customers can easily explain to someone what kind of PSS they like best. Our firm's customers are able to clearly describe the kind of PSS that meets their needs.
PSS innovativeness	(based on Langerak et al., 2008; 1 = "strongly disagree" – 5 = "strongly agree"). Our firm's PSS offering provides novel products/service features to customers that competitors do not offer
PSS modularity	(Wang et al., 2017; 1 = "strongly disagree" – 5 = "strongly agree") Our firm's PSS offering… …is composed of standardized product modules. …is composed of standardized service modules. …allows for changes in key components of the product without redesigning others. …allows for changes in key components of the service without redesigning others. …has product modules that fit together with little adjustment.

* Excluded from analysis.

Appendix B. Descriptive statistics, construct reliability and correlation matrix

Construct	Mean	STDEV	Cronbach α	1.	2.	3.	4.	5.	6.	7.	8.
1.VBS	3.965	0.800	0.806	*0.631*							
2.Price bundling	3.560	0.993	na	0.298**	*1*						
3.Value tools	3.744	0.796	0.887	0.625**	0.359**	*0.638*					
4.PSS customer growth performance	3.960	0.674	0.775	0.591**	0.409**	0.606**	*0.527*				
5.PSS service ratio performance	57.824	21.095	0.734	0.332**	0.328**	0.397**	0.322**	*0.652*			
6.Preference	3.771	0.817	0.796	0.543**	0.352**	0.647**	0.565**	0.438**	*0.711*		
7.PSS modularity	3.697	0.785	0.876	0.473**	0.423**	0.500**	0.581**	0.411**	0.435**	*0.617*	
8.PSS innovativeness	3.760	0.882	na	0.432**	0.227**	0.504**	0.486**	0.360**	0.523**	0.373**	*1*

Notes: * $p < .05$. ** $p < .01$. Two-tailed tests. AVE in Italics on the diagonal.

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