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What does a service-dominant logic really mean for manufacturing firms?

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Abstract

In parallel with the product-to-service transition in the manufacturing industries, service-dominant logic has emerged as arguably the most challenging recent scholarly marketing debate. The objectives of this work are: (1) to delineate the distinct differences between a product-to-service transition and a transition from a goods-dominant to a service-dominant logic, (2) to discuss what these transitions mean for industry and academia, and (3) to suggest a revised definition of industrial product/service systems (IPS²) more in line with service-dominant logic. A transition to service-dominant logic implies much more than an increased emphasis on services; it implies a reframing of the purpose of the firm and its role in value co-creation.

Keywords: Service-dominant logic; service infusion; manufacturing firms; value-in-use; service transition; industrial product/service system (IPS²); product/service system (PSS)

1. Introduction

In industrial markets, services have often been seen as an add-on to the core product offering and as a necessary evil required for future product sales (Kindström, 2009; Kowalkowski, 2008; Robinson et al., 2002). However, as industries reach a mature stage, commoditization tends to erode the competitive differential potential of product markets. With attempts to remain competitive and avoid a deteriorating financial position, manufacturing firms have increasingly turned to the provision of industrial services and solutions such as “industrial product/service systems” (IPS²) (Davies et al., 2006; Meier et al., 2010; Sakao and Lindahl, 2009; Tan et al., 2010; Ueda et al., 2009). In the last few decades, General Electric, Ericsson, IBM, Toyota Industries, Xerox, and other leading-edge manufacturing firms have increasingly “moved downstream.” This so-called service infusion is frequently seen as a transitional path from transactional product sales to the provision of relational services and solutions (Gebauer and Friedli, 2005; Mathieu, 2001; Oliva and Kallenberg, 2003).

In parallel with the growing attention the service-transition phenomenon has been receiving in academia (e.g., through special journal issues and conferences), the “service-dominant logic” (S-D logic), first proposed by Vargo and Lusch (2004) and extended in subsequent works (Lusch and Vargo, 2006b, 2006c; Vargo and Lusch, 2008a, 2008b), has emerged as arguably the most important scholarly marketing debate in the last decade. For example, the seminal paper in which the foundational premises were introduced has been the most cited article in the *Journal of Marketing* in the last decade and has initiated several academic forums and special issues. S-D logic is also receiving increasing attention and interest in the CIRP community, being referred to in the *CIRP Annals*, the *CIRP Journal of Manufacturing Science and Technology* and in CIRP conference articles on topics such as service and IPS² development (Ang et al., 2010; Holmlid, 2010; Kimita et al., 2010; Tan et al., 2010), life-cycle management (Meier et al., 2010; Rese et al., 2009), business-model innovation (Copani et al., 2010), and customer value (Kimita et al., 2009; Olsson, 2010).

Vargo and Lusch put forward the S-D thesis for examination and debate as a possible foundation for evolving a general theory of markets and marketing. What they emphasized was how a supplier’s knowledge resources and core competencies are fundamental to firms’ value propositions, which are the basis for business interactions in networks of relationships.

Interaction between buyers and suppliers is critical to understanding their logic, as this is the enabler of innovation and the co-creation of value with customers and suppliers.

However, there have been many misconceptions of what S-D logic actually means, leading to misinterpretations and erroneous managerial implications. Thus, the objectives of this article are (1) to explain the distinct differences between a product-service transition and a transition from a goods-dominant to a service-dominant logic in a firm, (2) to discuss what this means for industry and academia, and (3) offer a revised CIRP definition of IPS² that is more in line with service-dominant logic. In the following section, the foundations of S-D logic are introduced and S-D logic is contrasted with goods-dominant logic (G-D logic), which is sometimes referred to as an *industrial view* (Ramírez, 1999) or *industrial logic* (Kingman-Brundage et al., 1995). The distinction between the two service transitions is then discussed, and, finally, implications for practitioners and researchers are presented. As the article is conceptual in nature, empirical examples from different industries are given to illustrate some of the main tenets.

2. Service-dominant logic as a paradigm

Discussing S-D logic in an industrial context is of undoubted interest due to the increasing strategic importance of services and “product/service systems” (PSS) for manufacturing firms (Gebauer, 2008; Kindström, 2009; Sakao and Lindahl, 2009). Furthermore, there is an increased awareness of that manufacturing exists to create value (Ueda et al., 2009). This has led to calls for the integration of goods and services offerings and solutions focusing on the customer’s business capabilities (Davies, 2004; Matthyssens and Vandenbempt, 2008; Möller and Törrönen, 2003). This growing attention to manufacturers’ service operations by academics and practitioners alike is most commonly understood as a necessary accommodation of services in today’s business world.

However the S-D logic orientation goes further, treating any knowledge-laden interactions between buyer and supplier as a service. To better understand the principles of S-D logic, it can be contrasted with the business logic that has traditionally prevailed in industrial firms, referred to by Vargo and Lusch (2004) as G-D logic, which they argue is built on the assumption that economic value is added through industrial processes, embedded in goods, distributed, and then realized in exchange in a transactional manner; that is, value-in-exchange.

Under S-D logic, in contrast, goods are seen as distribution mechanisms for service provision. Furthermore, the value of goods is based on their *value-in-use* and determined by the customer, which clearly goes beyond conventional value-in-exchange (i.e., market value or price). Value has not only an economic dimension, but also functional and psychological dimensions (Gupta and Lehman, 2005) that, if possible, should be measured in monetary terms. More controversially, this way of thinking reframes the value-in-use derived from goods as a customer service. In other words, all goods (including raw materials and partly-formed goods) are exchanged for their value-in-use, and until “used up”, goods act as service appliances in the hands of a customer. The role of the supplier then becomes that of a collaborative resource integrator and co-creator of value with the customer.

One controversial aspect of this agenda underneath the semantics is that every business becomes a service business. That is, the service-ability of goods in use is what is purchased. In S-D logic, service provision is what firms do, and customer assessments of value are made in direct interactions with suppliers as well as interactions with goods. A distinction is made between *operand resources*, which are usually tangible, static resources that require some action to make them valuable, and *operant resources*, which are usually intangible, dynamic resources that are capable of creating value (Vargo and Lusch, 2004, 2008a). Whereas the emphasis is on operand resources under G-D logic, operant resources are the key to competitive advantage from an S-D logic perspective.

Furthermore, the time logic of exchange becomes open-ended, from presale service interaction (e.g., pre-bid activities such as requirements definition) to post-sale value-in-use (e.g., post-project activities such as post-deployment support and operational services), and may develop further as the relationships evolve (Ballantyne and Varey, 2006; Kowalkowski and Ballantyne, 2009). The foundational premises (FPs) of S-D logic, which have profound implications for manufacturing firms, are summarized in Table 1 and merit further discussion.

Insert Table 1 here.

2.1. The inversion of exchange and the subordination of goods

S-D logic views goods as one method of service provision, with *service* as the common denominator of the exchange process, and service is what is always exchanged (Vargo and Lusch, 2006). Service is defined as “the application of specialized competences (knowledge and skills), through deeds, processes, and performances for the benefit of another entity, or the entity itself” (Lusch and Vargo, 2006a). This inversion of exchange as traditionally understood is illustrated in Figure 1.

Insert Figure 1 here.

Despite goods being subordinated to service in terms of classification and function, goods are not inferior in terms of importance and value because customers are the arbiters of value. For example, the engineering group Sandvik’s high-technology stainless-steel and cemented-carbide tools are distribution mechanisms for service provision that require knowledge-intensive research and manufacturing and that can have a major impact on the customer’s value-creating processes. If value creation is the focus, the traditional distinction between goods and services is not relevant. In fact, things (goods) and activities (services) both render service, which creates value (Gummesson, 1995). The function of goods is therefore to deliver service. This view is in line with Ueda et al.’s (2009) stance that goods and services need to be treated in a synthesized, comprehensive manner from the perspective of value creation.

Many of the ideas behind S-D logic are in line with contemporary management thought in service marketing, relationship marketing, and knowledge-management theory: the resource-based view of the firm, network perspectives, and the interaction perspective in industrial marketing. Vargo and Lusch brought together ideas from different sources and their theoretical contribution lies in the way these ideas were synthesized (Aitken et al., 2006; Day, 2004).

2.2. Two views of value: distribution and creation

Under S-D logic, business innovation is repositioned and made possible through value co-creation. The shift in focus, from a producer to a customer perspective (Grönroos, 2007; Gummesson, 1995) and then from a customer perspective to value-in-use, is a shift from the means of production to the means of utilization. From this perspective, the supplier role is that of

a resource integrator, and value is always determined by the customer as value-in-use, whether in direct interaction with the supplier or in indirect interaction through goods in use. Everything else the firm does is resource integration or a *value proposition* (Vargo and Lusch, 2004).

In S-D logic, customers are seen as the arbiters of co-created value and suppliers as resource integrators. A comparison between G-D logic and S-D logic concepts is laid out in Table 2.

Insert Table 2 here.

Table 2 is not seen as a final lexicon but as one that invites further work; indeed, an evolution of ideas (Lusch and Vargo, 2006c). However, the lexicon of key constructs does reflect the dimensions of the cognitive shift involved in any transition from G-D logic to S-D logic. The lexicon does not necessarily imply that G-D logic concepts are discarded. Rather, it suggests how G-D concepts might *logically* be subordinated to the corresponding S-D concepts. For an industrial firm mainly involved in manufacturing activities, these transitional concepts have implications in the form of potential challenges and opportunities (Kowalkowski and Ballantyne, 2009).

For example, price becomes part of the concept of value proposition, because value propositions are exchanged, one for another, and value-in-use expands the time horizon for a supplier firm to remain involved with the customers' use and experience of goods sold. Marketing *to* customers dominates conventionally, but under S-D logic, in line with the view of the late management researcher Normann (2001), the interactive process of marketing is *with* customers and other stakeholders. Hence, the offering may have a price set or negotiated as part of the value proposition, but this price is not confirmed as value until it is assessed or experienced by the customer in use. In other words, value is not necessarily confirmed at the point of sale through the medium of the exchange price.

2.3. PSS offerings as enablers for value creation

Interacting with customers to co-create value involves improving a firm's value propositions, supported by supplier resource integration, knowledge, and skills, something which Vargo and Lusch (2004) argue is very difficult for competitors to replicate. It involves rethinking the firm's

resource application in time and place contexts. Furthermore, the supplier can shift the balance towards higher-order, value-in-use considerations by including increasing degrees of complexity in its offerings.

When viewing value creation through the lens of S-D logic, it is possible to view both supplier and customer resources as “fluid and alterable rather than fixed or ‘given’” (Kohli, 2006, p. 290), thereby accentuating the dynamic nature of resource integration. The degree of complexity and resource integration can be linked to the concept of “density” explained by Normann (2001).

Many processes can be dematerialized and traditional enterprises can be unbundled in terms of place, time, actor, and actor constellation, and thereby be rebundled into new offerings.

Furthermore, this rebundling can be facilitated by interaction and reciprocity between the actors involved, as S-D logic suggests. Latest-generation technological devices have higher levels of density than their predecessors because of the way in which they enable the mobilization of resources.

Besides basic phone capabilities, advanced mobile devices (i.e., miniature computers with mobile operating systems and phone capabilities such as iPhones and Android devices) enable value-in-use by allowing customers to browse websites and use email, synchronize data, take high-resolution photos, use GPS-based services, enjoy music and videos, and download a multitude of applications, such as social media software. Not all customer segments will necessarily perceive the value-in-use potential as higher, however, because the existing technologies may be adequate for current activities and competitiveness. As opposed to sophisticated users of complex offerings, customers who use technology only for its most basic applications may in fact be discouraged from using advanced services, perceiving them to be too advanced and complicated for their basic needs.

Remote surgery is another example; it enables surgery even though the patient and the surgeon are in different locations. Combining robotics with advanced communication technology and information systems, this service has a higher level of density than conventional surgery and, by making the physical distance immaterial, permits the creation of additional value-in-use.

However, this is not a matter of simply following a new instruction manual. What follows are transitional shifts to move from a product (G-D) focus to a service (S-D) focus. For practitioners, S-D logic directions are summarized in Table 3. Thus, a transition to S-D logic implies much

more than an increased emphasis on the manufacturing firm's product-service systems: it implies a *reframing* of the purpose of the firm and its collaborative role in value co-creation.

Insert Table 3 here.

3. Two distinct service transitions

In light of the dominance and growth of the service sector and the service infusion in manufacturing firms, one may intuitively interpret the S-D logic as reflecting this major shift. However, S-D logic does not reflect the transition from an industrial era to a service era (Vargo and Lusch, 2006). Instead, Vargo and Lusch argue that service have *always* been exchanged for service. The idea that goods are embedded with value emerged from economics during the Industrial Revolution at a time when “science” equaled Newtonian mechanics and has ever since been the dominant paradigm (Vargo and Morgan, 2005). Furthermore, from the S-D logic perspective, manufacturing is a form of service provision. That is, service concerned with the synchronized application of the complex, specialized extraction, development, design, management, assembly, accounting, distribution, etc., of knowledge and skills. As Vargo and Lusch observed, “much of the apparent move to a service economy is nothing more than a further refinement and subsequent outsourcing of these operant resources” (2006, p. 45). Thus, the product-service transition and the transition from G-D to S-D logic are to be seen as two distinct dimensions: the first reflecting a strategic repositioning of the manufacturing firm in the marketplace though the addition of new services to its core offering, and the second reflecting a new perspective on value creation. This means that service infusion and a focus on S-D logic may (or may not) be parallel shifts. It also means that many firms in service industries may have a G-D logic perspective.

For instance, “marketing continues to point firms toward producing service instead of producing goods, rather than providing service. It continues to suggest that all that is needed is a change in the unit of output from the tangible to the intangible. This is a logic that not only misleads manufacturing firms, but one that has misled what are traditionally thought of as service industries” (Vargo and Lusch, 2008a, p. 256). Similarly, a manufacturing firm that pursues advanced research and develops new products in close collaboration with key customers,

suppliers, and other partner firms may be regarded as a product firm rather than a service provider, yet the manufacturer can have an S-D logic perspective on value creation.

The two distinct transition paths are illustrated in Figure 2. Arguably, most traditional manufacturing firms can be seen in Cell I. As firms move along the product-service transition line, they eventually reposition themselves into Cell II. However, firms in Cell II focus on “units of intangible output” rather than providing service for the benefit of the customer. Firms in Cells III and IV have an S-D logic perspective and have therefore shifted their focus from products and output (tangible and intangible) to customer-centric value co-creation.

Insert Figure 2 here.

For example, IBM has been developing and implementing a service-science business model for which it claims S-D logic as a theoretical foundation, based on thorough research coordinated by its Almaden Research Center in California (Kowalkowski and Ballantyne, 2009). Although somewhat simplified, IBM has moved from Cell I to Cell II over the last decades and more recently to(wards) Cell IV. Another firm with partial S-D-logic business practices is Rolls Royce. The firm coined the term “Power-by-the-hour[®]” to describe their outcome-based contracts for the continuous maintenance and servicing of aircraft engines and other avionics products. The task is to deliver outcomes rather than merely components, systems, or activities. Payments are tied to flying hours (i.e., the number of hours the customer gets power from the engine) instead of specific spare parts or service hours. Similarly, General Electric, Pratt & Whitney, Snecma, and other power-systems firms have also made the transition from just selling products and associated services to offering their airline customers PSS and outcome-based contracts (Nordin and Kowalkowski, 2010).

Due to the strong position that G-D logic has in most manufacturing firms among managers, engineers, and other employees, such a sequential transition seems to be the most likely (and perhaps the only viable route in many cases) towards an S-D logic perspective. This means that the service infusion can act as a catalyst for increased service focus. Thus, a manufacturing firm without a significant industrial service and/or PSS business is likely to experience major difficulties when trying to shift business logic (Kindström, 2009; Kowalkowski, 2008). One can therefore expect few firms to be positioned in Cell III.

In contrast, many service firms can be found in Cell II. This means that although the firms operate in the so-called service sector, they nonetheless have a G-D logic perspective on value and customers (cf. Table 3). Consider, for example, the Irish no-frills airline Ryanair that promotes low-cost flights across Europe. The company is highly successful despite poor customer service compared to traditional airlines, adding “hidden” costs such as credit-card charges and including insurance as a default option when booking flights (although most passengers already have insurance). Clearly, the company is not customer-oriented and is positioned in Cell II. Another example is many triple-play-services operators, such as the Swedish firm Com Hem, that have often been ranked at the bottom in performance-satisfaction indexes due to their poor value-in-use (even where the value-in-exchange may be high).

4. Discussion and conclusions

4.1. Managerial implications

S-D logic does not imply that firms should focus solely on services and outsource manufacturing activities, which is a common misunderstanding. For instance, even if a majority of the Fortune 100 firms claim to offer solutions, the question is whether solutions are a major part of their business or if this is merely a fashion statement. Day (2006) claims that it is unlikely that most firms are pursuing a “true” solutions strategy from the perspective of S-D logic (i.e., Cell IV in Figure 2). Instead, most firms are still to be found in Cells I and II. This means that firms are far from capitalizing on the value-creation possibilities as they, for various reasons, are still in the rather early stages of the transition to S-D logic.

Despite being a mindset and perspective on value creation rather than a theory, S-D logic offers some normative guidelines for practitioners (Lusch and Vargo, 2006a, p. 415):

1. The firm should be transparent and make all information symmetric in the exchange process. Because the customer is someone to collaborate with, anything other than complete truthfulness will not work.
2. The firm should strive to develop relationships with customers and should take a long-term perspective.

3. The firm should view goods as transmitters of operant resources (embedded knowledge); the firm should focus on selling service flows.

4. The firm should support and make investments in the developments of specialized skills and knowledge that are the fountainhead of economic growth.

From the four guidelines, it is possible to provide recommendations for managers and for engineering and design practice. The implications are based on empirical research of PSS offerings and increased service orientation in manufacturing firms (e.g., Kindström, 2009; Kowalkowski, 2008).

4.1.1. Symmetrical information exchange

Regarding the first guideline, studies of asymmetrical information exchange show that balanced knowledge sharing and symmetrical information exchange is critical for successful value constellations and propositions (Mascarenhas et al., 2008). The need for symmetric information becomes particularly evident in major industrial partnerships such as the one between the global technology company ABB and the pulp and paper company Fletcher Challenge Canada Limited (FCCL). ABB signed a full service-level agreement with FCCL to service its three Canadian pulp mills. When signed in 2000, it was the largest-ever full-service agreement ABB had undertaken. The two firms created a 50-50 partnership employing 380 people to maintain all of the mills' assets (electrical equipment, automation systems, the boilers for process steam, kraft pulp-processing equipment, and pollution-control systems).

However, even if an ideal position would be if all information exchanges between firms were symmetric, clearly this is not the case in practice. For example, customers may be more or less willing to share information, and within the manufacturing firm different functions and business units may be unwilling to share information. Politics and power plays can make the idea of symmetric information very challenging in reality. This is clear in research on the service transition where suppliers and/or customers may be unwilling to open up their books sufficiently enough so that the information needed is made transparent.

For PSS offerings, it is critical to define value metrics jointly with the customer and to be able to measure them systematically. This is particularly important if the provider has a result-oriented business model. In such a case, payments are fully contingent upon the extent to which customer value is realized, as measured by the predefined set of value metrics (Sawhney, 2006). This

means that systems must be designed in such a way that these metrics can be measured as objectively as possible, in order to avoid potential disagreements between the customer and the provider. Furthermore, collaboration and openness is required, not only with external customers (that is, the actual customers) but also with internal customers. Product and service business units generally have very different corporate cultures and norms and are often unwilling to cooperate (Gebauer et al., 2005; Kindström and Kowalkowski, 2009; Nordin, 2005). In traditional design processes, product and service design activities are conducted separately and by different staff. Consequently, it is difficult to increase transparency and share the necessary information between the product and service activities during the design phase (Hana et al., 2009). One way to overcome this problem is to foster a common corporate culture and work to a greater extent in cross-functional teams, for example, by integrating product and service engineering.

4.1.2. A long-term perspective

Following S-D logic orientation and the open-ended time-logic that applies, the second guideline means that the ability to participate in co-creating superior lifetime value-in-use for the customer (Kowalkowski and Ballantyne, 2009) and to derive an equitable part of that value is vital. A focus on lifetime value implies that firms need to apply a holistic perspective on value creation and customer relationships and not only view all product and service sales as separate and static. This relates to the concept of balanced centricity (Gummesson, 2008), that is, the idea that the interests (needs and wants) of customers and other stakeholders need to be secured. However, if customers have a G-D logic orientation it may not only be difficult but also unprofitable to engage in a close, long-term collaboration with some customers (Kowalkowski, 2011). Compared to G-D logic approaches in which the value emphasis is on value-in-exchange, the relative emphasis of the value propositions for customized PSS solutions needs to be based on the customer-perceived value-in-use. This requires not only an integrative approach to PSS development but also a genuine understanding of the customers' unique usage contexts in which the value is created (Vargo and Lusch, 2008b). It also means that when demonstrating the value potential of the PSS offering, the provider must have methods and tools in place to convincingly show the offering's potential value-in-use beforehand. Therefore, a major challenge for engineering design is to enable better visualization of the value of the offering, which many customers currently have difficulty with (Meier et al., 2010).

For example, a European manufacturer of outdoor power products realized that its customers were product oriented and had difficulties understanding service-related values and estimating lifecycle costs. The firm developed a number of highly complex spreadsheet applications used to show the value-creating potential of their new PSS offerings, identifying reduced total costs and increased total revenue. However, as these spreadsheets were too complicated to use for some salespersons, the firm also developed stripped-down versions illustrating key points such as customer profitability in interactive diagrams and graphs. More sophisticated methods include case studies from major reference customers and scenarios. Because virtual simulations are accessible for almost all industries today, scenario discussions are becoming more and more interesting, additionally allowing advanced visualizations for nontechnical and noneconomic aspects of the offering (Kowalkowski and Kindström, 2009).

In order to develop long-term customer relationships, firms need to have a thorough understanding of their customers' operations, from both a technical perspective and a business perspective. Focusing on the customer's value-in-use means that the traditional approach, in which new product features and design drives requirements for services, needs to be revised. Lifecycle costs and service aspects such as maintainability, reliability and supportability are increasingly being required to drive the requirements for manufactured products. These aspects must also be included in the early phases of the design processes. Furthermore, service engineering and service marketing employees need to be represented in project steering groups and decision forums. From a design engineering perspective, a key aspect of PSS development is not so much the design of the product offering but of the complete system. This means that product design and development skills need to be combined with service engineering methods and tools. The starting point should be to identify and seize opportunities for value creation for the customer (but also for the provider) rather than product technology, per se (Kowalkowski and Kindström, 2009). Accordingly, the design engineering task requires the ability to integrate not only the product(s) on a component or subsystem level but to integrate human and physical processes and bundle PSS offerings (Shimomura and Arai, 2009). This requires firms to have established processes and methods to capture customer needs and communicate them to engineering design. One technique for identifying requirements that may gain importance for PSS development in the future is use-case analysis (Meier et al., 2010). Another method of gaining ideas from front-line employees, for example, is through online brainstorming sessions such as IBM's Innovation

Jam. In 2006, IBM brought together more than 150,000 people from 104 countries and 67 firms, which resulted in the launch of 10 new IBM businesses. Manufacturing firms such as Volvo have also used this method. In 2010, more than 1,000 Volvo employees from around the globe participated in a 48-hour brainstorming session. Over 350 ideas were generated, which have led to several new development projects.

4.1.3. New opportunities for innovation

Developing customer and supplier relationships also relate to the third guideline. Under S-D logic, customers and suppliers are potentially part of the co-innovation process. This means that not only active but also passive customers unwittingly co-design “patterns of behavior” that supplier firms can use to improve their offerings. For example, by replacing barcode tags with RFID (radio-frequency identification) tags, the new data that these make it possible to capture can be used to understand such patterns (Mannervik and Ramírez, 2006). Therefore, when developing new PSS offerings or upgrading existing ones, engineering designers should consider how new information and communication technology (ICT) can be integrated in the system to enable better collection of customer usage data. There are also numerous examples of explicit co-creative innovation in research and long-term partnerships. Firms like Alstom Transport and Ericsson share information with their key customers in an open, consultative, and informal way at multiple levels across organizational functions (Davies and Hobday, 2005). By working together, the supplier and the customer can identify opportunities for innovation in which future value can emerge.

However, G-D logic tends to emphasize output such as production-ready, tangible components without recognizing opportunities for relationship value creation arising from the process itself. Therefore, S-D logic theory can extend existing G-D views on product development and business innovation (Kowalkowski and Ballantyne, 2009). Customer needs and inputs are essential elements in the early stages of PSS development and design (e.g., Müller et al., 2009). From an S-D perspective, however, customer input should be an integral part of each phase in PSS development and design. Therefore, firms should not blueprint complex product design models when they create design models for services and PSS. From a G-D perspective, the fact that service design processes tend to be highly intuitive, iterative and liability-oriented compared to better-structured product-design processes may seem problematic. However, as engineers and

service managers from six global manufacturing firms concluded at the end of a focus group on PSS, service design needs to be less structured and more customer-centric than conventional product design processes. For this reason, one of the participating firms has launched a global service design process that differs from the existing product and software design processes. For example, customers are actively involved in each design phase. However, in order to integrate product and service design processes, the same syntax and semantics that are used to describe service attributes should be used for product attributes. Since a precise separation between products and services is not feasible during the development or during the delivery phase (Meier et al., 2010), similar project gates and phases may need to be adopted. It is vital, therefore, that managers and engineering designers recognize both the differences between product and service design and the strategic linkages between the two areas (Kindström and Kowalkowski, 2009). From an S-D perspective, PSS design is as much about adopting customer-centric methods used in service design to support integration as it is about adopting product design methods to the requirements of services.

4.1.4. Investments in specialized skills

Finally, the fourth guideline emphasizes a long-term financial orientation that does not necessarily fit well with the short-term financial goals that tend to drive Western capital markets (Payne et al., 2008). Financial feedback is a multidimensional, long-term-oriented metric in S-D logic. It does not equal profit (although it can include profit) as it may include cash flow, market share, sales, growth, etc. (Lusch and Vargo, 2006a). However, despite the normative goal of emphasizing value-in-use and customers' long-term well-being, for most firms it is difficult to always emphasize value-in-use, for example, due to the customer focus on products and transactional exchange value. If customers focus on a low purchase price, for example, managers in the supplier firm need to have the ability to understand why this is the case. Explanations may include not only the customer's financial directives or strong budgetary constraints but also the firm's own poor demonstration of the value potential of its PSS offerings and a lack of understanding of the customer's cost structures and lifecycle earnings (Kowalkowski, 2011). Furthermore, even if a firm has the ability to propose a competitive value proposition and to convince the customer that the firm is committed to the offering, not all manufacturing firms have the organizational capabilities, knowledge of customer processes, and risk-management

skills required to pursue a solutions strategy with PSS offerings that focuses on value-in-use (Day, 2006). This means that in many cases investments (both long- and short-term) in the specialized skills required for the provision of competitive offerings are needed. Unfortunately, PSS engineers and designers often struggle internally to allocate the resources required to design and develop new offerings (Kindström and Kowalkowski, 2009), a situation that has even worsened due to many firms' cost-cutting excesses in the recent financial downturn.

Despite the challenges, a mindset change is generally required in order to succeed with S-D logic practices. Firms pursuing PSS offerings require skills and knowledge about how new product features and design drives requirements for the service area and about also how services and lifecycle aspects drive requirements for manufactured goods (e.g., serviceability and maintainability) (Kowalkowski and Kindström, 2009). Thus, in addition to expert knowledge in the fields of product design and service engineering, companies must have comprehensive knowledge about interdependencies between the products and services (Meier et al., 2010). Feedback loops from service personnel are important in order to design equipment that is not only easy to assemble in the manufacturing plant but also easy to replace in the field. For PSS offerings and extensive services such as rental and performance-based contracts, issues like predictability of maintenance and lifecycle costs are particularly critical, which calls for collaboration between product design and service engineering. Furthermore, product designers in successful PSS companies often focus more on making it simple to assemble the components on the assembly line than on assembling them in the field, where conditions are much more difficult. The wheels on a warehouse truck, for example, may be replaced twice a year. Likewise, although the use of cheaper components can lower the product unit price, if the result is lower quality equipment, it will lead to more frequent repair and maintenance (Kowalkowski, 2008).

Because service advantages are predicted to dominate business in the coming 5–10 years (Meier et al., 2010), investments in specialized service-related skills and knowledge will become even more important. The ability to handle flexible and result-oriented business models in order to cope with changing customer demands is critical and should be complemented with new tools, such as service CAD, risk calculators and virtual service prototyping. Service modularity is another topic of growing importance (Pekkarinen and Ulkuniemi, 2008) and the ability to design modular service platforms and processes is of particular concern for PSS providers. Adopting an S-D logic perspective not only implies that new engineering and design competence is needed; it

may also necessitate the replacement of certain competences. For instance, manufacturing firms shifting towards providing PSS offerings need new sales competence because the existing sales force is too product-centric (Kindström, 2009; Kowalkowski, 2008). This requires a radical change to the selling approach and, if necessary, the replacement of some of the sales force. In some cases, PSS providers have replaced more than 50 percent of their existing product sales force in the first 12 months (Krishnamurthy et al., 2003). A similar shift in engineering design would imply the need for more dedicated expert service designers with a focus on customer-centric value co-creation and also for service engineering and design to have a much more central role in PSS development. By acquiring new service capabilities and changing the design approach, the firm not only moves along the product-service transition line but also along the transition from goods-dominant to service-dominant logic, as shown in Figure 2.

4.1.5. Summary

It is argued that S-D logic and focus on value-in-use facilitates the development of new business models, such as outcome-based contracts and other types of offerings where the supplier and the customer need to jointly determine the potential productivity gains over time (i.e., value-in-use). In contrast to the many consumer firms pursuing mass-production and mass-marketing activities, many manufacturing firms in the business-to-business (B2B) sector view customers as resources with whom to interact and they focus on offerings with high value-in-use. Albeit by no means a straightforward matter, this means that a transition from G-D logic to S-D logic can be less strenuous for B2B manufacturing firms undertaking a product-service transition than for consumer firms.

To summarize, applying S-D logic as a market orientation also means that the traditional division of goods sales from after-sales services and solutions are no longer discrete functions, and this elevates the strategic importance of the lifetime value of the customer relationship, regardless of the combination of services and goods (Kowalkowski and Ballantyne, 2009). For practitioners, this has implications for the organization required to offer customized PSS solutions. For instance, it means that research and development, sales, service, finance, human resources, and other local and central organizational functions must work together to a greater extent than is usually the case in manufacturing firms (Kowalkowski, 2008).

4.2. Research implications and a revised IPS² definition

S-D logic shifts the unit of analysis from products to value creation; however, it is a mindset and an organizing framework rather than a theory (Vargo and Lusch, 2008a). The dominant position of G-D logic in academia and business, and its restricted view of value creation, means that many opportunities for value creation and competitive advantage may be obscured. G-D logic concepts are also commonly used when analyzing service infusion. This may make sense if firms are only changing their offerings through the addition of new services and solutions, but it may be insufficient if firms shift their business focus towards S-D logic. In such cases, the knowledge gained may be limited due to the inadequate constructs used. For example, it is interesting to note that the CIRP definition of IPS² is “an integrated product and service offering that delivers value in use” (CIRP IPS² Conference, 2009, 2010).

Integration is a key part of the definition, because a solution should provide more value than the sum of the individual parts (Nordin and Kowalkowski, 2010; Sawhney, 2006). This means that bundling between product and service elements is in and of itself an inadequate criterion for IPS²; there need to be synergies and linkages between the bundled elements. Furthermore, in line with S-D logic, value-in-use (i.e., not only value-in-exchange) is emphasized. However, value is seen as delivered rather than co-created, a view that obviously has G-D logic connotations. Therefore, in line with Grönroos’ (2009) view on marketing, a revised definition of IPS² may be: “an integrated product and service offering that enables co-created value-in-use in the customers’ processes, in a mutually beneficial way”.

As highlighted by, for example, Blois and Ramírez (2006) and Grönroos (2009), it is critical for the supplier (and for the customer and other stakeholders in the long term) that value is created in a mutually beneficial way. However, from an S-D perspective, the concept of an *industrial* product/service-system by definition has G-D logic connotations and it may therefore be more suitable to replace it with *integrated* product/service-system. While most likely not playing down the industrial context, such a revision would further highlight the central role of integration between the elements of the system. Furthermore, one may argue that it would be more appropriate not to emphasize products (indirect service provision) and services (direct service provision) in particular but instead focus on the overall “application of specialized competences”. However, that would most likely imply the abandonment of the IPS² definition in

favor of a more generic concept such as the “integrated complex system”, which lies outside the scope of this discussion. Moreover, such a definition would neglect the fact that the integration of products and services specifically is a key (and growing) issue for many manufacturing firms, and that how to best integrate these elements is a growing research area within both the manufacturing science and technology and the marketing and management fields.

Even if the service-transition phenomenon is often referred to as a product-service transition, it does not imply abandonment of prior offerings to the benefit of new offerings with higher service content. Rather, firms tend to increase the breadth of the PSS offering, which they need to manage and coordinate (Stremersch et al., 2001). Thus, it may be more correct to talk about a service infusion rather than a service-transition process. In accordance with S-D logic, knowledge (renewal) is regarded as the fundamental source of competitive advantage (Ballantyne and Varey, 2006; Vargo and Lusch, 2004), and the acquisition of specialized skills and knowledge is often a prerequisite for the ability to offer new types of services and PSS. This means that effective organizational learning as well as the ability to unlearn G-D practices and mindsets is needed, which can be difficult. For example, it can be difficult to unlearn things such as an engineer’s inclination for technical features, a salesman’s focus on product sales, or a service technician’s working method for maintenance and repair activities (Kowalkowski, 2008). A final comment on S-D logic is that the conceptual polarization of G-D and S-D logic is not fully reflected in and supported by studies of service infusion. For example, firms’ traditional business logics, which overall are congruent with G-D logic rather than S-D logic, also share some central components with S-D logic, such as viewing customers as resources with whom to interact. Not only leading service firms but also many manufacturing firms have highlighted the importance of long-term customer relationships, where social aspects such as trust, commitment, and even friendship links are important ingredients. Thus, the shift from product sales to service provision must not be equated with a shift from transactional routines to long-term relationships.

4.2.1. Limitations and future research

Being conceptual in nature, this work is a first attempt to frame the two distinct service transitions that many manufacturing firms undertake or strive to undertake. A relevant future research avenue is thus to investigate in depth the transition paths of manufacturing firms, as shown in Figure 2. As little empirical research has analyzed S-D logic practices to date, such

studies should investigate firm performance, value propositions, offerings, customer relationships, and how an S-D orientation affects the development and design of PSS offerings. For instance, it would be relevant to study whether or not there are significant differences in firm performance between firms with G-D and S-D orientations and possible differences between different types of manufacturing firms. Second, linking S-D logic to theory of complex adaptive systems (Holland, 1992; Surana et al., 2005) and the value co-creation models and classes put forward by Ueda et al. (2009) can be a fruitful way of synthesizing ideas from different research streams. Since it is increasingly important for manufacturing firms to understand the dynamics of manufacturing and service systems, such an integrative approach can be a way of operationalizing S-D logic in practice. Third, despite the trend to “go downstream”, there are firms moving in the opposite direction (i.e., focusing more on manufacturing activities) (Davies, 2004). A better understanding of antecedents and drivers for downstream and upstream transitions is thus another future research avenue.

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Foundational premise	Comment/explanation
a) The application of specialized skill(s) and knowledge (i.e., service) is the fundamental unit of exchange.	The application of operant resources (knowledge and skills), “service,” as defined in S-D logic, is the basis for all exchange. Service is exchanged for service.
b) Goods are a distribution mechanism for service provision.	Goods (both durable and nondurable) derive their value through use – the service they provide.
c) The customer is always the primary co-creator of value.	Implies value creation is interactional
d) The enterprise cannot deliver value, but only offer value propositions.	Enterprises can offer their applied resources for value creation and collaboratively (interactively) create value following acceptance of value propositions but cannot create and/or deliver value independently.
e) A service-centered view is inherently customer oriented and relational.	Because service is defined in terms of customer-determined benefit and co-created it is inherently customer oriented and relational.
f) All social and economic actors are resource integrators.	Implies the context of value creation is networks of networks (resource integrators)
g) Value is always uniquely and phenomenologically determined by the beneficiary.	Value is idiosyncratic, experiential, contextual, and meaning laden.

Table 1. Key foundational premises of S-D logic (Vargo and Lusch, 2008b, p. 7).

G-D logic concepts	Transitional concepts	S-D logic concepts
Goods	Services	Service
Products	Offerings	Experiences
Feature/attribute	Benefit	Solution
Value-added	Coproduction	Cocreation of value
Profit maximization	Financial engineering	Financial feedback/learning
Price	Value delivery	Value proposition
Equilibrium systems	Dynamic systems	Complex adaptive systems
Supply chain	Value chain	Value-creation network
Promotion	Integrated marketing communications	Dialogue
To market	Market to ...	Market with ...
Product orientation	Market orientation	Service orientation

Table 2. Conceptual lexicon of marketing (Lusch and Vargo, 2006c, p. 286).

G-D logic	S-D logic
Making something (goods or services)	Assisting customers in their own value- creation processes
Value as produced	Value as co-created
Customers as isolated entities	Customers in context of their own networks
Firm resources primarily as operand	Firm resources primarily as operant
Customers as targets	Customers as resources
Primacy of efficiency	Efficiency through effectiveness

Table 3. Transition for practitioners (Vargo and Lusch, 2008a, p. 259).

Figure 1. The hierarchies of exchange in G-D logic and S-D logic (Kowalkowski and Ballantyne, 2009).

Goods-dominant logic

Service-dominant logic

Figure 2. The two distinct service transitions.