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EXPLORING BUSINESS MODELS FOR IT-ENABLED PRODUCT-SERVICE SYSTEMS

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Abstract

Offering customer-oriented bundles of products and services – product-service systems (PSS) – can create additional customer value in comparison to offering all components individually. PSS allow providers to create a long-term customer relationship, market success, and has the potential to support differentiation from competitors. Offering bundles solving customer problems will have several effects on internal and external activities, and thus the providers' business model (BM). However, until now, theoretical and empirical insights regarding this impact are sparse. Therefore, we aim to explore the impact of the rise of PSS on the providers BMs, especially focusing on how value is created. This helps IT decision-makers to identify appropriate IT-enabled PSS their businesses could provide and subsequent changes that need to be made in their BM. Consequently, businesses are supported in the innovation process of their products. To achieve this goal, we plan to review at least 20 successful BMs of the most valuable enterprise tech companies in the world. We focus on IT-enabled PSS, since IT is a key driver of PSS, economic growth and profitability. In this research-in-progress paper, we present the theoretical foundations, develop a definition of BMs for IT-enabled PSS, and provide details concerning the methodology of our planned review.

Keywords: Business models, product-service system, information technology.

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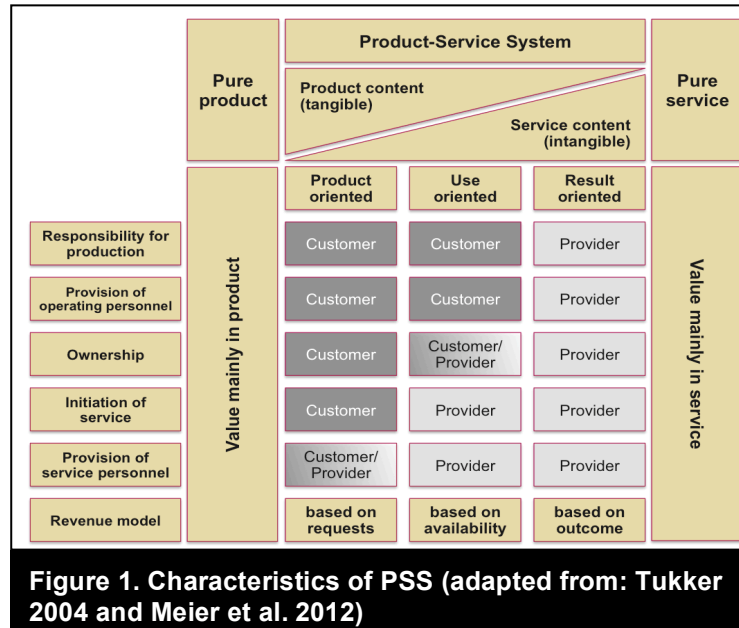
The economic environment is undergoing a constantly changing process. Key drivers are technological innovation, changing consumer needs and market structures, blurring company boundaries, as well as the increasing pressure of price competition (Ceci and Massini 2013). Competitive differentiation hardly occurs in traditional business activities, like selling products or services. Nowadays, selling bundles of products and services in so-called PSS that address specific customer problems has become increasingly important (Galbraith 2002). Offering PSS oftentimes requires a full or partial revision of the current business model (Ceci and Prencipe 2008; Storbacka 2011). For example, the aerospace company Rolls Royce revised their product range by increasing the number of additional services and including innovative sales agreements (Knowledge@Wharton 2007). One of the most popular is *Power-By-The-Hour*, in which airplane owners pay a fixed value for using the engine, however, the ownership of the engine still remains with Rolls Royce. The impact of such changes on the BM of a company can be risky, difficult to realize and unpredictable (Sandstrom and Osborne 2011; Zott and Amit 2007). Nevertheless, several businesses already adopted the PSS-logic, and found that offering customer- and problem-oriented innovative bundles of products, technologies, software and services creates new and lucrative added value (Davies et al. 2006; Rai and Sambamurthy 2006). According to these experiences, it is worth making the effort of adapting the current BM, since it comes with advantages, such as the potential to create a long-term customer relationship and long-term market success. Further, it is of particular interest to focus on information technology (IT)-enabled services, since IT is the key enabler for sustained growth in size and significance in the service sector. Moreover, it is a dominant factor in the growth of an economy (Murrell et al. 2008). The continuous revolution in IT enables a high degree of automation and efficiency in supply chain management. For this purpose, a closer investigation of BMs for IT-enabled PSS appears to be of significant interest. However, thus far, there is no focus on BM for IT-enabled PSS in the literature. Hence, no conclusions can be drawn from the offers, the effects, the benefits and the value proposition of IT-enabled PSS. Our research study aims to fill this gap, in order to obtain a better understanding of BMs for IT-enabled PSS, their characteristics and specifics, and how value is being created, since Amit and Zott (2001) proposed the BM-construct *as a unifying unit of analysis that captures the value creation arising from multiple sources* (p. 494). This research-in-progress paper presents the current state-of-the-art of BMs for IT-enabled PSS, the methodology of our study, implications and contributions expected to result from our study.

Related Work on Product-Service Systems

The main characteristic of PSS is the close interaction between products and services. In most cases, these interactions take place during the phases of conception and development, with the re-

sult that a subsequent decoupling might be hard to manage (Leimeister and Glauner 2008). This integrated development of physical products and services merges the boundaries between these partial components. As a consequence, new value creation structures can be developed to offer custom-tailored solutions (Gräßle et al. 2010). Previous publications pointed out that service-competition suggests higher margins in comparison to hardware-producers (Anderson et al. 1997). At the end of the 1990s, the turnover resulting from these additional services was 10-30 times higher than that resulting from the sale of new products (Wise and Baumgartner 1999). Neely (2007) pointed out that companies offering PSS have significantly higher revenues than companies with a product-dominant logic. In addition, offering services is a competitive advantage, which satisfies individual customer needs (Bowen et al. 1989). Recent research shows a continuous increase in the offering of integrated solutions (Kapletia and Probert 2010). Further, PSS can affect the consumer, the provider, the environment and the society in several positive ways (Baines et al. 2007; Krucken and Meroni 2006). In sum, the main benefits of PSS can be seen in the satisfaction of consumer demands and the continuous improvement of the business (Aurich et al. 2010). The core of PSS can be defined as a *marketable set of products and services capable of jointly fulfilling a user's need. The product/service ratio in this set can vary, either in terms of function, fulfillment or economic value* (Goedkoop et al. 1999, p.18). As stated in the definition, PSS consist of products and services that condition each other (Maussang et al. 2009). Moreover, PSS were proposed as a method for developing innovative, as well as functional-, disposal- and goal-oriented BMs (Meier et al. 2010) that have the aim at satisfying consumer needs and generating customer value (Storbacka 2011). The main characteristics of PSS are its product-, use- and result-orientation, as shown in Figure 1 (Meier and Uhlmann 2012; Mont 2002; Tukker 2004). The term product-oriented PSS means the product itself is the core product offering that is enhanced by an additional service (Pardo et al. 2012; Tukker 2004). The customer purchases the product, and can buy the additional services according to their own personal circumstances and/or requirements. For example, buying a machine and further maintenance and repair services in addition to the PSS. In use-oriented PSS, the product remains in the possession of the producer. The reason being the aim to maximize the use of a product, to fulfill customer demands and to extend the product lifecycle (Baines et al. 2007; Yoon et al. 2012). Products and service are then priced according to usage. Various options for making the product available to the customer include e.g., renting, product leasing or pooling (i.e. car rental services) (Tukker 2004). In the case of result-oriented PSS, the product remains in the possession of the producer as well, but goal-oriented arrangements between the producer and the customer are defined (Yoon et al. 2012). The goal of the producer is to achieve the predefined result with the aid of a product-service-bundle, for example by means of pay-per-copy instead of the purchase of a photocopier. Figure 1 shows that tasks which were previously the domain of the customer in a more

product-dominated environment are now being assumed by the provider due to the increasing service orientation.



Related Work on Business Models

Since the mid 1990s the BM concept gained a lot of interest, many authors from different scientific disciplines focused on the term BM regarding several aspects. The most important driving force has been the advent of the internet (Zott et al. 2011). Nevertheless, the theoretical foundation still remains underdeveloped. At present, e.g., no common definition of a BM exists (Porter 2008). Magretta (2002) compares a BM with a kind of story, which tells how a company works. In its core a BM describes the rationale of *how an organization creates, delivers, and captures value* (Osterwalder and Pigneur 2010, p. 14). According to Osterwalder and Pigneur (2010), the components of a BM include a *company's value proposition, revenue streams, channels, customer segment, key resources, customer relationship, key activities, cost structure, and key partnership*. According to Magretta's (2002) elaborations, a BM definition is necessary for understanding a BM and for applying different concepts of a BM-logic. Further a BM will help to evaluate and innovate business model logic as well as strategic planning decisions (Teece 2010).

Business Models for IT-Enabled Product-Service Systems

Combining insights from BM and PSS theory as well as the role of IT as a key enabler for new business configurations – for example increasing work in partnerships or offering joint value propositions (Osterwalder 2004) – leads to an operational definition of BMs for IT-enabled PSS. Therefore, a BM for IT-enabled PSS can be defined as *the way an organization creates, delivers and captures value by partly relying on IT to offer a marketable bundle of products and services tailored to fulfill a customer's need* (adapted from Goedkoop et al. 1999; Osterwalder and Pigneur 2010). As already presented in Figure 1, the PSS concept impacts several units of a company, effects internal and external activities and has large implications on the organizational structure and culture (Kujala

et al. 2011; Martinez et al. 2010). Companies' facing these challenges need to review present activities like stakeholder partnership, revenue streams, value creation and value appropriation in order to identify potential for change. As a result of this evaluation process, these changes will lead to the need to change business logic and thus will also lead to a restructuring of the current BM. Consequently, it is of high interest to gather new insights for understanding BMs for IT-enabled PSS.

Research Methodology

To create insights into the specifics of BMs for IT-enabled PSS, we will conduct a multiple comparative case study. We will rely on the 20 companies (Bort 2012) identified as the most valuable enterprise tech companies in the world based on market capitalization according to Google Finance. If the data collected on these 20 companies is not sufficient, we will include further enterprise tech companies. In the first step, we analyze whether the identified companies offer PSS. Further, in accordance with Amit and Zott (2001), we review how value is created in the selected companies by taking the theoretical views of the value chain framework, Schumpeter's theory of creative destruction, the resource-based view of the companies, the strategic network theory and transaction costs economics into account. As proposed by Amit and Zott (2001), these frameworks make valuable suggestions about possible sources of value creation. Further, the data collection (see table 1 for a graphical illustration) is structured using the dimensions of the model proposed by Barquet et al. (2011), who combined the BM-logic using the main BM-components proposed by Osterwalder and Pigneur (2010) and the product-, use-, and result-oriented PSS-logic as proposed by Tukker (2004). The identification of PSS characteristics combined with and related to BM elements helps to distinguish BMs of IT-enabled PSS, and facilitates understanding and identification of shared characteristics. Following Amit and Zott (2001), we plan to review publicly available sources, for example company websites, annual and investment analysts' reports. According to Barquet et al. (2011), the nine BM building blocks related to the PSS-logic can be described as follows. The **value proposition** resembles the value provided by a PSS through the integration of products and services. With regard to the **customer segments**, it is recommendable to take the target group ownership ideas, the consumer habits, behavior and values into account. In result-oriented PSS, the ownership will remain with the producer. The **distribution channels** – sales and retail departments – should define how the PSS should be offered to make it more attractive than a product-based option. The **customer relationship** in terms of long-term relationships could be enhanced by means of direct relations and intensified by detailed contracts with customers, thus creating added value. The block **revenue streams** can offer opportunities for augmenting revenue by improving the function offered by the PSS provider. The payments may be based on the availability of the PSS, frequency of use or final results. PSS providers must develop new competencies as **key resources** to deal with

the fact that they are now providers of PSS, which address specific problems of their customers.

Key activities are mirrored by the fact that PSS providers must focus on the main activities of their customers, instead of focusing on activities related to a product, even when the product provides a core function. Due to the complex nature of the value proposition and the mix of competencies required to implement a PSS, a **partnership network** is essential. In such networks the identification of core competencies of involved stakeholders and actors plays a vital role. The **cost structures** may need to be restructured to support different cash-flow requirements, because the time scale of financial flows changes from an almost immediate return of capital to an extended use period.

Table 1. Graphical illustration of research framework									
	Value Proposition	Customer Segments	Distribution Channels	Customer Relationship	Revenue Streams	Key Resources	Key Activities	Key Partnerships	Cost Structures
Microsoft									
IBM									
Oracle									
Cisco Systems									
Siemens									
....									

Expected Implications and Contributions

This research-in-progress paper outlines a planned study, which is aimed at exploring and understanding the specifics of BMs for IT-enabled PSS. This paper contributes to the literature by developing a definition of BMs for IT-enabled PSS, combining insights from theory on BMs and PSS. The final study will close the outlined research gap regarding insights into BMs for IT-enabled PSS, and will help to identify new research potential in this area. A general overview of the practice of PSS will be given and information regarding the core characteristics of the BMs of IT-enabled PSS will be provided. When completed, this research will make a number of further contributions to this field. Firstly, it will make a contribution to the existing literature by testing existing theories related to the BM theories developed by Amit and Zott (2001) and Barquet et al. (2011). Secondly, it will explain the phenomenon of BMs for IT-enabled PSS and how they transform organizations. Thirdly, the applied framework will provide a lens for analyzing BMs for IT-enabled PSS. Finally, this paper provides an overview of BMs for IT-enabled PSS by analyzing the 20 most valuable enterprise tech companies in the world. Additionally, we also seek to develop a set of successful practices regarding how companies apply the PSS-logic in their BM. This research will help decision makers to identify appropriate IT-enabled PSS that their businesses could provide and subsequent changes that need to be made in their BMs, supporting them in overcoming innovation backlog and competitive disadvantages.

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REFERENCES

- Amit, R., and Zott, C. 2001. "Value creation in e-business," *Strategic Management Journal* (22:6-7), pp. 493–520.
- Anderson, E. W., Fornell, C., and Rust, R. T. 1997. "Customer satisfaction, productivity, and profitability: Differences between goods and services," *Marketing Science* (16:2), pp. 129–145.
- Aurich, J. C., Mannweiler, C., and Schweitzer, E. 2010. "How to design and offer services successfully," *CIRP Journal of Manufacturing Science and Technology* (2:3), pp. 136–143.
- Baines, T. S., Lightfoot, H. W., Evans, S., Neely, A., Greenough, R., Peppard, J., Roy, R., Shehab, E., Braganza, A., Tiwari, A., Alcock, J. R., Angus, J. P., Bastl, M., Cousens, A., Irving, P., Johnson, M., Kingston, J., Lockett, H., Martinez, V., Michele, P., Tranfield, D., Walton, I. M., and Wilson, H. 2007. "State-of-the-art in product-service systems," *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture* (221:10), pp. 1543–1552.
- Barquet, A. P. B., Cunha, V. P., Oliveira, M. G., and Rozenfeld, H. 2011. "Business Model Elements for Product-Service System," 3rd CIRP International Conference on Industrial Product Service Systems, Springer Berlin Heidelberg, pp. 332–337.
- Bort, J. 2012. "The 20 Most Valuable Enterprise Companies - Business Insider," *businessinsider.com*.
- Bowen, D. E., Siehl, C., and Schneider, B. 1989. "A framework for analyzing customer service orientations in manufacturing," *Academy of Management Review* (14:1), pp. 75–95.
- Ceci, F., and Massini, A. (2013). "Specialized capabilities in Integrated Solutions: The Role of Fit," *International Journal of Business and Systems Research* (7:2).
- Ceci, F., and Prencipe, A. 2008. "Configuring capabilities for integrated solutions: evidence from the IT sector," *Industry and Innovation* (15:3), pp. 277–296.
- Davies, A., Brady, T., and Hobday, M. 2006. "Charting a path toward integrated solutions," *MIT Sloan Management Review* (47), pp. 39–48.
- Galbraith, J. R. 2002. "Organizing to Deliver Solutions," *Organizational Dynamics* (31:2), pp. 194–207.
- Goedkoop, M., van Halen, C., Riele, T., and Rommens, P. 1999. *Product Service Systems, Ecological and Economic Basics*.
- Gräßle, M., Thomas, O., and Dollmann, T. 2010. "Vorgehensmodelle des Product-Service Systems Engineering," Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 82–129.
- Kapletia, D., and Probert, D. 2010. "Migrating from products to solutions: An exploration of system support in the UK defense industry," *Industrial Marketing Management* (39:4), pp. 582–592.

- Knowledge@Wharton 2007. "Power by the Hour: Can paying only for performance redefine how products are sold and serviced?," <http://knowledge.wharton.upenn.edu>.
- Krucken, L., and Meroni, A. 2006. "Building stakeholder networks to develop and deliver product-service-systems: practical experiences on elaborating pro-active materials for communication," *Journal of Cleaner Production* (14:17), pp. 1502–1508.
- Kujala, S., Kujala, J., Turkulainen, V., Artto, K., Aaltonen, P., and Wikström, K. 2011. "Factors influencing the choice of solution-specific business models," *International Journal of Project Management* (29:8), pp. 960–970.
- Leimeister, J. M., and Glauner, C. 2008. "Hybride Produkte—Einordnung und Herausforderungen für die Wirtschaftsinformatik," *Wirtschaftsinformatik* (50:3), pp.196-207.
- Magretta, J. 2002. "Why business models matter," *Harvard Business Review*.
- Martinez, V., Bastl, M., Kingston, J., and Evans, S. 2010. "Challenges in transforming manufacturing organisations into product-service providers," *Journal of Manufacturing Technology Management* (21:4), pp. 449–469.
- Maussang, N., Zwolinski, P., and Brissaud, D. 2009. "Product-service system design methodology: from the PSS architecture design to the products specifications," *Journal of Engineering Design* (20:4), pp. 349–366.
- Meier, H., and Uhlmann, E. 2012. "Hybride Leistungsbündel – Ein neues Produktverständnis," In *Integrierte Industrielle Sach-und Dienstleistungen* Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 1–21.
- Meier, H., Roy, R., and Seliger, G. 2010. "Industrial Product-Service Systems—IPS2," *CIRP Annals - Manufacturing Technology* (59:2), pp. 607–627.
- Mont, O. K. 2002. "Clarifying the concept of product–service system," *Journal of Cleaner Production* (10:3), pp. 237–245.
- Murrell, S. J., Berg, D., and Einspruch, N. G. 2008. "Enabling the enabler: Information technology and the services sector," Presented at the International Conference on Service Systems and Service Management, pp. 1–4.
- Neely, A. 2007. "The Servitization of Manufacturing: an Analysis of Global Trends."
- Osterwalder, A. 2004. *The Business Model Ontology - a proposition in a design science approach*, Lausanne: l'Ecole des HEC de l'Université de Lausanne.
- Osterwalder, A., and Pigneur, Y. 2010. *Business Model Generation: A handbook for visionaries, game changers and challengers*, John Wiley & Sons.
- Pardo, R., Bhamra, T., and Bhamra, R. 2012. "Sustainable Product Service Systems in Small and Medium Enterprises (SMEs): Opportunities in the Leather Manufacturing Industry," *Sustainability* (4:2), pp. 175–192.
- Porter, M. E. 2008. *On Competition*, Harvard Business School Press.
- Rai, A., and Sambamurthy, V. 2006. "The Growth of Interest in Services Management: Opportunities for Information Systems Scholars," *Information System Research* (17:4), pp. 327–331.
- Sandstrom, C., and Osborne, R. G. 2011. "Managing business model renewal," *International Journal of Business and Systems Research* (5:5), pp. 461.

- Storbacka, K. 2011. "A solution business model: Capabilities and management practices for integrated solutions," *Industrial Marketing Management* (40:5), pp. 699-711.
- Teece, D. J. 2010. "Business Models, Business Strategy and Innovation," *Long Range Planning* (43), pp. 172–194.
- Tukker, A. 2004. "Eight types of product–service system: eight ways to sustainability? Experiences from SusProNet," *Journal of Manufacturing Technology Management* (13:4), pp. 246–260.
- Wise, R., and Baumgartner, P. 1999. "Go Downstream: The New Profit Imperative in Manufacturing," *Harvard Business Review* (77:5), pp. 131–141.
- Yoon, B., Kim, S., and Rhee, J. 2012. "An evaluation method for designing a new product-service system," *Journal of Cleaner Production* (39:3), pp. 3100–3108.
- Zott, C., Amit, R., and Massa, L. 2011. "The Business Model: Recent Developments and Future Research," *Journal of Management* (38), pp. 375-414.
- Zott, C., and Amit, R. 2007. "The fit between product market strategy and business model: implications for firm performance," *Strategic Management Journal* (29:1), pp. 1–26.