Product-Service Systems across Life Cycle

# What's in it for the Provider? The Case of a Telecom Vendor's Value Capturing from the Transition to Product-Service Systems

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**Abstract**

In adopting highly integrated Product-Service Systems (PSS), incentive structures change and the value attainable for providers throughout the lifecycle becomes an issue of growing complexity. Nonetheless, value for PSS providers has up to now not been considered in a multidimensional fashion. In an effort to move towards a characterization of provider's value, an offering in the information communication technology sector was examined through an investigation with ten staff-members of Ericsson, Sweden. This led to a value-categorization, which can be utilized in the PSS design process to enhance the value captured throughout the lifecycle beyond immediate monetary benefit. In an effort to provide general learnings, the results are discussed with a focus on PSS business models, PSS design and management communication. Overall, the results presented provide a more comprehensive picture of what a provider has to gain from a PSS offering throughout its entire lifecycle.

## 1. Introduction

Since the 1990s, Product-Service Systems (PSS) have been heralded as one of the most effective instruments for shifting society towards a resource-efficient economy [1]. In scientific literature, an increasing amount of research results has been published, especially since 2007 [1]. In the manufacturing industry, PSS has been influencing different functions to different extents and has been provided as offerings in varying form. Comparing the levels between the expectations on and the practices of PSS, one can find a clear gap and researchers have begun to investigate why PSS has not been implemented so widely as expected [2]. Insights available in literature to answer this question are insufficient to support the industry to make full use of the potential of PSS. In 2010, Meier et al. [3] envisioned the future of PSS by stating: "In 10 years the following statements will be relevant: Result oriented business models evolve as an industry standard." Although the mid-point in time has already been passed, the academic society has yet to succeed in providing industry practitioners with effective insights and incentives towards higher PSS adoption.

Motivated by this gap, this research began with a fairly simple but fundamental question: What is in it for PSS providers? The need of top management commitment is recognized to realize PSS in a company with multiple functions to be involved [4]. The top management needs to comprehend the benefits of PSS to implement PSS. Therefore, this research aims to clarify and give understanding of what values exist for PSS providers – i.e. what can providers gain by developing and offering PSS with a focus on the long term and the entire lifecycle. Matschewsky et al. (2015) have presented a categorization of provider-focused value based on literature analysis, as well as proposed a way to operationalize the concept of value to the PSS provider in the conceptual design stage [5]. In the research on Provider Value (PV) for PSS, the authors argued the relevance of a comprehensive unit of measurement in order to assess the provider's benefit of offering PSS beyond monetary value as it is measurable during PSS design [5]. An example may clarify the need for

such an alternative measurement: PSS providers increasingly rely on remote maintenance and sensor technologies. This makes regular on-site visits by service technicians often obsolete. Through this, the direct human interaction between customer and provider is reduced to a minimum. Nonetheless can the information and feedback retrieved on-site be critical for the relationship to the customer and the provision of future offerings. Now, the PSS provider may decide to send a technician once a year, even though no technological necessity is there. In economic terms, this means a cost without a direct corresponding benefit, which rules out such an activity. PV aims to make the inherent benefit of this interaction measurable to move towards a more holistic assessment of what providers of PSS have to gain throughout the entire lifecycle. In this, PV is aimed to complement the existing focus on monetary value in order to more accurately reflect the true complexity of providing PSS and the value this can provide.

This paper reports a new empirical study conducted with a front running firm in PSS within the information communication technology (ICT) sector in order to provide more solid understanding of PSS provider values. The ICT sector has been critical in the continued transition towards "servitized" offerings and PSS [6]. The research method adopted is interview study. The insight in this paper is expected to support the manufacturing industry in making better informed decisions regarding the implementation of PSS.

The remainder of the paper is structured as follows: Section 2 discusses relevant literature in the field, while the following Section 3 explains the research approach. Section 4 presents the results of the empirical study. Section 5 discusses the results and Section 6 concludes the paper with presenting some future research trajectories.

## 2. Literature background

This section provides a brief overview of relevant prior research in the field of PSS and adjacent fields. Through this, the research motivation and trajectory is clarified further.

The value-concept is present in many streams of research. Research conducted in the field of (service-) marketing bears high relevance for the study conducted here. The boundary between provider and customer-value is traditionally characterized through value-in exchange for providers at time of the sale (when the value is measured in monetary terms) and value-in-use for the customer [7]. Under a service-dominant logic [8], customer and provider spheres increasingly coincide [7], and the aspect of co-creating value receives growing importance [9,10]. This aspect is of high relevance for PSS and PSS design and therefore key for the research presented. However, the research on value co-creation has nonetheless a strong customer-focus [11] without explicitly tackling the capture of value aspects for providers of "servitized" offerings, which arise from this deepened and long-term relationship.

The understanding of the value created by PSS has been a strong focus in existing research in the PSS-field: Creating value for clients is named as a key success factor for PSS

[12]. The focus in prior research has been largely laid on customer-oriented aspects: Sakao and Lindahl (2012) have presented an evaluation method for customer value in the PSS design process [13] and customer satisfaction with PSS offerings has been examined [14]. Researchers have further investigated the trajectory of value-driven design for PSS and the integration of value aspects into the PSS design process in a CAD-based approach [15], and in the scope of a modelling-approach [16]. Pezzotta et al. (2014) examined the connection between customer satisfaction and the efficiency and productivity of providing services as part of a PSS offering [17]. Nonetheless, a dedicated focus on new and long-term focused value creation opportunities for providers of PSS offerings is lacking in existing research [5].

## 3. Research approach

### 3.1. Overview of the case company and its PSS activities

This study focuses on the transition of providers of telecommunication infrastructure equipment towards PSS. Our case company is Ericsson that has been a major player in providing communication technologies and services for around 140 years. A research focused company with more than 33,000 patents, the company has more than 115,000 employees working in more than 180 countries. The company has been traditionally focused on the development and sales of complex telecommunication systems. Ericsson, like other industry players, has therefore focused on the physical products as the main source of revenue for the organization. During past decades and as a means of ensuring customer satisfaction and additional revenue streams, services have become an increasingly important component of Ericsson portfolio and account for more than 40% of revenues in 2014, according to annual reports. Nevertheless, only recently the industry is moving towards integration in development of product and services, thanks to digitalization, the introduction of new technologies and changes in the market. In the following section, we will discuss one of the pioneering cases of embracing PSS by looking at an offering called DCP.

### 3.2. Overview of the addressed offerings

In this paper, we focus on Ericsson Device Connection Platform (DCP), a new offering by Ericsson that bundles products and services in a distinct way compared to other offerings of the company. Selling products in an integrated approach is a new experience for Ericsson and therefore the DCP case serves as an interesting context for comparing the requirements and implications of the transition from a traditional manufacturing approach to PSS. DCP is a cloud service that enables Ericsson's customers, i.e. mobile network operators, to offer connectivity management to their own customers, which in this case mainly consist of enterprises. The offering promises new revenue streams for mobile operators from a vast variety of devices that will utilize telecommunication services based on this offering. It is also expected to simplify the process and reduce the cost of connecting devices.

*3.3. Interviews conducted*

In order to get a broad understanding for what may constitute PV for the case company when offering DCP, practitioners from different departments within the company were interviewed in the form of semi-structured interviews.

This means, that an interview-guide and questions were prepared, but that these were adjusted to the progress of the interview and to the responses of the interviewee. In order to get a broad set of practitioners to participate, 30 individuals were contacted by email. Eventually ten persons with various backgrounds and deep knowledge of the offerings of the company participated in the study, most of them being managers and specialists (see Table 1**Fel! Hittar inte referenskälla.**).

Table 1 - Participants in Interview Study

| Interviewee | Type of Interview | Duration (mins.) |
|---|---|---|
| Senior Researcher | Face-to-Face | 103 |
| Product Owner | Telephone | 50 |
| Site Manager | Telephone | 68 |
| Manager Service Sales | Telephone | 54 |
| Sales Development Manager | Telephone | 68 |
| Technology and Development Manager | Telephone | 58 |
| ICT Coordinator Infrastructure and Delivery | Telephone | 54 |
| Research Director | Face-to-Face | 68 |
| Sales Development | Telephone | 40 |
| Product Manager | Telephone | 46 |

In order to be able to compare the results and reach the necessary amount of consistency, a clear interview-guide was used. This guide had been tested previously by the research group from Linköping University and had to be slightly adapted for the use in phone-interviews.

In order to be able to understand the value created for the company by offering PSS, the way the respondents work and their involvement with the PSS offering DCP was investigated. Through this, the value creation, which is directed back at the company without being immediately measurable in monetary terms, was explored.

A limitation of this study is that conducting interviews of exploratory nature proved to be difficult, and thus not all aspects of PV which are apparent to the practitioners could be captured.

*3.4. Deriving overall categories*

Many different items were mentioned by the various respondents. In order to be able to utilize the results in research as well as within the company, the interview results had to be aggregated into categories. This allows for the future use of the results through e.g. the ProVa method for the assessment of component-based PV during the design stage of PSS, as introduced in [5]. In order to do this, the categorization was performed together with the interviewee. In that, it is clear, that some of the individual points

mentioned by the practitioners may not be exclusive to one of the categories, however, no responses were excluded deliberately and the results were confirmed by the company experts. Further, direct quotes are utilized in Section 4.1 in order to support the PV categories identified.

**4. Results**

*4.1. Obtained categories for Provider Value*

In the course of the interviews, a substantial amount of knowledge on the topic of PV was gathered. In order to improve the manageability of this PV-related information, and to be able to use it in an evaluation method such as ProVa [5], it was condensed into overall categories of PV. The results presented here are based on the findings discussed in [18]. In addition to monetary value, five overall areas of PV were identified in the course of the interviews. These areas are *Information, Ownership and Control, Environment, Relations,* and *Market Opportunities.* In the following, the reasoning of the practitioners is presented in order to substantiate the relevance of the areas of PV introduced here.

*Information* – One of the benefits mentioned most often by the interviewees was the aspect of gathering data during the operation of the offering. This is an aspect facilitated by offering PSS, which can be of immense value to the provider outside the immediate monetary realm. One of the practitioners formulated the issue of information as PV as follows: *"We used to work through the operators and we didn't have that kind of end to end contact and we were pushing out solutions, our products, through the telecom operators. Now when we are starting up discussions with end customers we will get a lot of market intelligence and we can derive that experience or knowledge back in to our R&D."* Another notable benefit is the deeper understanding for the performance of the offerings that is acquired throughout the lifecycle of the PSS. Further, the aspect of receiving timely feedback was seen as a substantial value, including the reduction of unexpected outages. Overall, the practitioners identified notable value in the area of information and an overall great relevance of the related aspects.

*Ownership and Control* – According to the practitioners interviewed, there is substantial value to the provider in retaining ownership and control over the PSS offering. One of the interview participants justified this assertion as follows: *"[…] the ownership will also give us the confidence in securing our services and products. Because when we deliver our products outside then any kind of external parties can probably have access to our products, the way they look, and the competitors may use it to develop their own products. But when we have our product inside, when we have the ownership, we can reduce the leakage of this information to the external parties, so that is one benefit of taking the ownership of the product."* Therefore, in the case of this participant, the issue of ownership and control is closely intertwined with offering closed PSS. Another closely related issue that delivers value to the provider side is the ability to update and upgrade the offerings. Through the control available in cases of result-oriented PSS (see e.g. [3]),

significant opportunities arise for testing and upgrading of offerings already deployed. One of the interviewees illustrated this by way of a comparison: *"We can do what Spotify does. Spotify does not roll out a new application to all their customers at once. What they do is that they roll out the application to a few customers and then they get feedback from that and they add more and more users to that application. And once they have it stable and good enough and people are satisfied, they roll it out to all customers. I think we have to go towards that way of working as well."*

*Environment* – This area of PV mainly assembles information given by interviewees which points to lifetime extension of offerings and efficiency-related aspects. An item mentioned by an interviewee is the possibility of deploying offerings with other customers after the deployment at the first customer ends. Another notion mentioned by respondents is that the provider of the offering is capable of ensuring that the offering runs under optimal utilization: *"Run the equipment to an optimized level so that you are not selling over capacity, you sell the right capacity."*

*Relations* – Practitioners interviewed stated, that offering highly integrated PSS will create stronger bonds between providers and customers. In addition, PSS give rise to a customer-provider relationship that allows for learning possibilities and new experiences that were previously unknown. A further aspect of this is the possibility of co-creating new offerings together with practitioners [9], which in turn is fit to reduce the risk for developing the wrong offerings. Another opportunity resulting from strengthening customer relations is the possibility of a lock-in by providing tailor-made solutions, according to one of the respondents.

*Market Opportunities* – According to the interviewed practitioners, the integrated nature of PSS offerings allows for the company to venture into new fields of business: *"It definitely opens the market, opens the possibilities to find new customers […]."*

## 5. Discussion

### 5.1. Relating empirical ICT sector-focused and literature-based Provider Value categories

PV in the context of PSS was first discussed in [5]. Therein, categories of PV were derived based on the existing PSS literature. However, at the time that paper was published, no empirical information with respect to practitioners' views of what companies actually have to gain from offering PSS, was available. Now, it is of high relevance and interest to examine the relation between the empirically founded PV categories presented here and the theory-based ones introduced in [5]. In order to do this, first the literature-based PV categories will be very briefly introduced, with a discussion of the commonalities and differences between these and the ones found for the ICT sector following thereafter.

The literature-based PV categories are *Environment, Customer Relations, Information, Infrastructure and Time to Market.* Within the category **Environment**, stakeholder benefits that manifest themselves within the company are

encompassed (see [3,19,20]). Further, lifecycle focused design is critical in the design of PSS [21], leading to environmental- as well as provider-benefits. Increased provider dependency [22] is a cornerstone for the value of *Customer Relations* to the provider. Additionally, PSS have been shown to foster longer relations to the customer and to increase the quality of the customer contact [3]. The category of *Information* includes, among others, customer feedback as well as information retrieved automatically through remote monitoring systems [23]. The PV category **Infrastructure** is focused on the commonly usable production and use-base of PSS [3]. Substantial possibilities for efficiency-improvements are seen in this area [24]. Being able to reduce the *Time to Market* is seen as one of the major advantages designing highly integrated PSS [25]. This has a notable impact on the design of PSS and the associated design decisions.

Now, there are obvious relations between the PV categories identified in the literature and presented in [5] to the ones found in the ICT sector within this study. One may attribute that in part to interviewer bias, but it should be mentioned, that the authors of [5] did not participate in the data collection. Further, the quotes given in section 4.1 serve to clarify the relationship between the statements of the practitioners and the aggregated PV categories given. Table 2 shows the relation between literature-based and empirically founded PV categories.

Table 2 – Relation of literature-based and ICT sector PVs

| ICT Sector PVs | Literature-based PVs |
|---|---|
| Information | Information |
| Ownership and Control | |
| Environment | Environment |
| Relations | Customer Relations |
| Market Opportunities | |
| | Infrastructure |
| | Time to Market |

Within the categories of Information, (Customer) Relations and Environment, there is a direct connection between the theory-based PV categories as well as the ones that are based on the study within the ICT sector. The direct quotes given in section 4.1 further serve to reinforce the usefulness and applicability of the categories found in this area of providing PSS. The literature-based categories of Infrastructure and Time to Market appear to be of lower relevance, as these issues were not related to any of the interviews with the practitioners. This may of course be for a multitude of reasons, such as the positions of the interviewees within the company or the relevance of these aspects for the current market phase. Nonetheless, it may also point to a lower-than-expected relevance of these issues when considering the provider-focused value of offering highly integrated PSS, which calls for further research and consideration. In addition, the value of Ownership and Control over the offering appears to be substantial and is reinforced by a number of the practitioners' statements. This aspect must therefore be taken into particular focus when evaluating the implications of the

findings onto the design of PSS in the ICT sector. The PV category of Market Opportunities exemplifies the possibilities enabled by PSS particularly in this area of the industry and points to pathways for the extension of the existing business together with the customers.

### 5.2. Implications on the research on business models

This study has important implications on understanding the implications and requirements of successful business model innovation. First, the relationship between technological innovation and business model innovation is at this point not well understood [26]. This study provides additional details into the interdependencies between the changes that transition towards PSS, enabled by new advanced technologies, brings to products and business models of the organization. Second, our findings provide some answer to the questions revolving around how value capturing mechanisms, a core component of business models of organizations, need to be adjusted in connection with new customer value creation mechanisms that PSS brings. Prior research has emphasized the need for joint consideration of value creation and capturing mechanisms in order to have a better understanding of drivers of competitiveness in a changing context [27,28]. This research takes a step in that direction.

### 5.3. Better PSS Design through Provider Value

In order to be able to improve the PV of a highly integrated offering in the ICT sector, the results of this study must be operationalized in a way that allows their use within the PSS design process. It is the design stage, where performance, utility and efficiency of a PSS throughout the lifecycle are, for the most part, defined (see e.g. [19,21,29,13]). In order to have maximum impact from both an industrial as well as environmental perspective, the important aspects presented here must be taken into account early on. One approach may be utilizing the identified PV categories within the ProVa provider-value-evaluation method presented in [5]. Thus, when deciding on which components and services to include within a particular offering, a lifecycle oriented decision-support is available which goes beyond only monetary-oriented considerations. The focus-shift incurred by this, e.g. through concentrating on fostering aspects such as information and relations to other stakeholders early on in the design process may lead to the company providing offerings that deliver higher PV with more efficiency and usability for the end customer. Not including this aspect may lead to optimization with a traditional product-focus, which can result in sub-optimization and in an offering that is designed to be sold being marketed as an integrated offering. In turn, this may lead to inefficient offerings, diminishing both PV and customer experience.

### 5.4. Utilizing Provider Value for communication with management

The PV's identified in this study put emphasis on the eco-system in which the PSS are being delivered, furthermore the information flow in-between actors in the system, i.e. the environment and relations, is highlighted both in the study and in the literature. These findings are vital to communicate to the management segment of the provider. However, for the results to be clearly communicated in such a corporate environment, the relations between those PV's need to be clarified and put into context case by case. In an integrated PSS offering, the eco-system needs to be defined, the relations and value flows in that system, as well as the information flow. By way of this, there will be a direct relation between the research findings and the business case, i.e. it will be clear what differentiates a product provider from a PSS provider, and what additional value the PSS approach generates.

### 5.5. Analysis of scientific and practical implications

In order to arrive at a deeper scientific understanding of PV for PSS, several issues must be tackled. First, the question of generalization: How relevant are the identified results outside of the ICT sector? The comparison made to the literature-based provider value categories and the overlap found there demonstrates, that there may be a more general relevance of the results of this study. Nonetheless, a deeper investigation into this matter is needed. In addition, best-practices and recommendations for managers and companies as to how to support the transition towards integrated offerings while attaining high value for both customer and provider, should be derived. This should be done in regard to existing research on e.g. customer value in PSS [30].

This research further has important practical implications for Ericsson and other companies affected by the transition towards PSS. To incentivize engagement of different business units to move away from traditional mentalities, discussing value from a customer viewpoint is not sufficient. First, our findings emphasize that practitioners should understand the multitude of ways that PSS transformation may bring value for their organizations. This understanding will engender a positive perception towards the change across the organization, and such a perception is crucial for overcoming potential resistance and aligning the organization towards the change. Second, knowing the identified value for providers will not be attained without a great deal of planning, Ericsson and other companies need to systematically seek focus on different value categories and ensure the responsibility of different units of the organization for the value capture in different PV categories, which were proposed in this research.

## 6. Conclusion and future work

This paper has presented an empirical study on Provider Value (PV) for Product/Service Systems (PSS) in the Information Communication Technology (ICT) sector. Provider Value aims to capture the substantial value incurred for the provider when offering PSS which cannot be immediately and entirely measured in monetary terms in early stages of design and development. Prior to this paper, different dimensions of PV were only available based on literature [5]. For the first time, this paper has presented PV categories based on a study consisting of semi-structured

interviews with ten practitioners working within a company in the ICT sector. Similarities and differences between literature- as well as industry-based PV categories were discussed. The results of the study are of relevance for the fields of business model research as well as research on PSS design and design evaluation. The operationalization of the PV categories identified and their applicability within the design process and under the use of the ProVa method for the evaluation of the PV of product and service components [5] are vital to enhance the relevance of the results for practitioners. As a result of the presented study, a first understanding for the benefits of offering PSS within the ICT sector, as observed by the provider of such an offering, was created.

In future research, the applicability of the found dimensions within the design process in the ICT sector will be evaluated, in order to examine the usefulness and effectiveness of this approach to design highly integrated PSS offerings with a strong lifecycle focus and improved value for providers and customers.

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