A Framework to Support Value Co-creation in PSS Development

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Abstract. The design of innovative offers involves deep collaboration between the provider and the customer to create higher value than in traditional offers. Product-Service Systems (PSS) are bundles of products and services and constitute innovative offers designed to fit complex customer needs. The academic literature on PSS development has a strong focus on the provider perspective, and only a few works address customer involvement in the process of value co-creation. This paper proposes a methodological framework composed of a customer view and a provider view, highlighting the interface between them, in which value co-creation takes place. The proposed framework aims at supporting the collaboration process between the customer and the provider during the entire PSS development. The framework has been built within a R&D project in a French company called Vibratec.

Keywords: value co-creation · PSS development · customer value · case study

1 Introduction

The design of innovative offers involves deep collaboration between the provider and the customer to create and capture higher value than traditional offers [7]. Product-Service Systems (PSS), which are essentially bundles of products and services, are considered as innovative offerings designed to fit complex customer needs. Usually, the literature approaches the process of PSS development from the provider perspective [11, 10]. Few studies integrate the customer perspective of value creation in PSS development [4, 2]. In this research, we consider the customer as a key actor on value co-creation, according to the service-dominant logic (SDL) [6]. This paper proposes a three-fold conceptual framework composed of a customer view (value expectations); a provider view (value proposition), highlighting the interface between both of them; and a general context view.

Customer value is considered here as the point of departure for the process of value co-creation. Indeed, clear visualization of customer value constitutes the

key entry for supporting the provider in the development of high value-added offerings [12]. This research aims at exploring the customer and provider perspectives of the value expected from a PSS offer, looking for the alignment of both perspectives. The research question guiding this research can be formulated as follows: *How is the process of value co-creation between the customer and the provider in PSS development?*

Action research is carried out within a small-sized French company called Vibratec. Vibratec is an innovative company in the sector of vibration analysis. The empirical approach adopted is based on a qualitative analysis throughout the deployment of semi-directive interviews with the key actors.

The structure of the paper is as follows. Section 2 presents briefly a literature review on value co-creation and PSS. Section 3 introduces the proposed framework. Section 4 presents the case study, describing the empirical approach and the application of the proposed framework. Finally, conclusions and research perspectives are explained in section 5.

2 Value co-creation and PSS development

In the literature, there are two main approaches to value co-creation. On the one hand, service-dominant logic (SDL) defines value co-creation as a relational process in which the customer and the provider collaborate to create superior value For the SDL the customer is the beneficiary of the value created and the provider is a facilitator [6]. Indeed, the customer defines what value is according to its needs and experience, which is known as the value in use. On the other hand, the resource-based view (RBV) [3, 1] defines value co-creation as the strategic integration of resources and knowledge coming from several actors (i.e., in a dyadic or a networked relationship) with the aim at developing innovative offerings able to create high value for all the actors.

Focusing on the dyadic customer-provider relationship, the interest for each actor to adopt a co-creation strategy has been analysed. Firstly, the provider is interested in incorporating the customer knowledge and expertise in the offer development from the early stages of idea generation and conceptualization. This allows the provider to respond the closest possible to the customer expectations, reducing the risk of failure during the commercialization phase [9, 12]. Particularly in B2B relationships, a reason to integrate the customer in the offer development corresponds to a strategy of cost and risk-sharing. This case usually takes place in the development of innovative offerings triggered by a specific customer demand [9]. In conclusion, integrating the customer in the offer development process represents an opportunity to be more competitive in a highly dynamic market.

Similarly, according to [9], the customer is interested in co-creating value with its providers for acceding to their missing skills, knowledge, and resources. For instance, in B2B relationships, customers collaborate with providers to increase their capacity, get operational or methodological expertise, obtain market information, or gain in legitimation in their business activities [9]. Moreover,

closer collaboration with the providers enables customized solutions, able to fit particular and complex customer needs.

In the context of PSS, the integration of the customer in the process of value creation is a crucial factor to have a successful business model [5]. A few works refer to customer and provider collaboration. For instance, [14] propose an improvement of the BMC by adopting the principles of the service-dominant logic (SDL), which is translated into collaborative practices between customers and providers. Most of the contributions in this category are based on the PSS typology proposed by [13] (i.e., product-oriented, used-oriented, and result-oriented). Besides, [12] highlight the concept of value co-creation as the fact of involving the customer from the early to the later phases of the offer development. For these authors, the value co-creation process aims at achieving a trade-off between the accomplishment of customer's value expectations and the development of feasible value propositions according to the provider capabilities. This research adopts an organisational point of view of PSS development, centred in the collaborative process between customer and provider.

3 Methodological framework to support value co-creation in PSS development

This methodological framework resumes the global pathway to co-create an innovative offer, and is based on the authors' previous research [8]. It takes into consideration the interactions between the customer and the provider, which is the base of value co-creation. The framework is composed by the two main pillars of value co-creation: the customer view (value expectations), and the provider view (value proposition). Additionally, considering the literature in innovation, a third view concerning the analysis of the general context is added. Fig. 1 shows the detailed model.

3.1 General context analysis

This step of the methodological framework consists of a deep understanding of the company's internal and external contexts. According to the reviewed literature, several external factors can trigger or block the development of innovative offers development like PSS. External factors coming from competition, politics, economics, society, technology, environmental issues, and legislation, influencing innovative offer development. For this phase, tools for strategic analysis as PESTEL are suitable for having a global view of the context.

3.2 Customer view

This view refers to the identification of the potential and current customer segments and their associated factors of value creation. This derives into a deep understanding of the called customer perceived value. From the methodological point of view, an exploratory approach can be adopted during this step. For

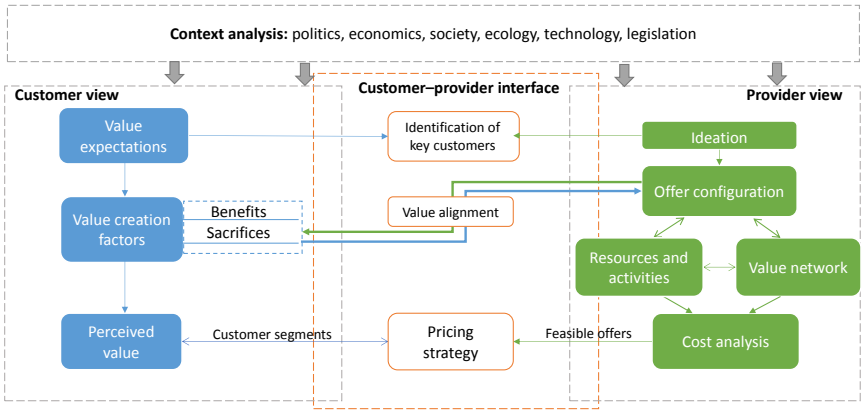

Fig. 1. Methodological framework for collaborative PSS development.

instance, semi-structured interviews allow getting a qualitative characterization of the customer's expected value. The results of this phase constitute a key entry to ideate PSS opportunities from then provider view.

3.3 Provider view

The aim of this view is to identify the provider capabilities to fulfil customer value expectations. Following an iterative process of collaboration with the customer, the provider would be able to entail the PSS offer development process. At this phase, the provider integrates the customer value expectations and confront them with its own capabilities and skills to fulfil them. This phase allows the provider structuring a process of PSS development: i) opportunities ideation, ii) identification of activities and resources needed, iii) value network configuration, and iv) economic analysis of PSS alternatives. The output of this phase is a set of suitable PSS offers to be commercialized, integrating the value created for the customer and the economic feasibility for the provider.

3.4 The customer-provider interface

This view of the methodological framework is transversal with respect to the other three views and is the core view of the proposed framework. This interface consists of an iterative process of collaborative innovation between the customer and the provider. It allows them to align their respective visions of the value expected from the early design of the PSS offer until its commercialization. We characterize this process by some steps: i) identification of key customer types, ii) identification and prioritization of value creation factors, and iii) defining a value-sharing strategy, translated into the pricing model.

4 The case of Vibratec: an action research approach

4.1 Research context

The case of a small-sized company in France, called Vibratec, is analysed in this research. Vibratec main activity remains on service provision of specialized analysis of vibrations, applied to different industrial fields (e.i., railway systems, aeronautics, automotive, among others). Recently, in the frame of an R&D project, Vibratec developed a highly-innovative prototype destined to maintenance management in railway systems (i.e., rolling material and infrastructure). The product is in the prototype phase, and the company aims at finishing it to start commercialization. Currently, it is necessary to develop supplementary services around the offer, configuring a bundled offer of products and services to respond to specific customer needs. The company desires to move from a product-based offer towards a PSS offer to be more competitive in a new market.

The action research approach has been implemented to collect the data and be able to analyse the case of Vibratec. The methodology of action research implemented in the company comprehends four steps: i) context analysis; ii) key actors identification; iii) development of interviews; iv) analysis of interviews and conclusions. These steps are concrete support to the proposed framework.

An exploratory approach based on semi-structured interviews was deployed with the key actors identified by Vibratec's commercial department. The main objective of these interviews was to identify the factors of value creation for each customer category throughout the content analysis. 15 interviews have been executed between 2018 and 2020.

4.2 Methodological framework implementation

The project development is at the second stage of the methodological framework. However, it is possible to draw out some insights for each of the phases.

Context analysis. The railway system in France is a complex ecosystem in which several actors are involved. This complexity corresponds to the relevance of public transport for the development of any society. The PESTEL framework has been implemented to analyse the macro context in this research:

(P) Politics: decisions regarding investments on maintenance systems depend on the transport authorities (AOT) at national, regional, and local levels.
(E) Economics: the target market of the innovative Vibratec's offer is currently dominated by big-sized and well-positioned companies in the railway sector. Nevertheless, some opportunities for market positioning are possible regarding the company's innovation strengths.
(S) Society : the public transport system in France favours the accessibility to any individual, providing multi-modality and high levels of comfort.
(T) Technology: current developments correspond to self-driven and hydrogen-based trains. All the political efforts and investments are currently addressed on these directions.

(E) Ecology: new policies and technologies address the need for energy-efficient trains.
(L) Legislation: a recent law of mobility in France (2019) encourages an augmentation of the use of public transport. It promotes comfort standards related to vibration and acoustics management.

Customer view: key factors for customer value creation. Firstly, actual and potential customers for the innovative offer of Vibratec are identified.

The targeted customers of Vibratec are AOTs (Transport Authority), transport operators, and technical experts. Firstly, the AOTs are the governmental entities responsible for mobility management in a territory (in this case, regional, or local). They have a financial role in the transport ecosystem. Secondly, the transport operators are contracted by the AOTs and they are responsible for the operations and, then, the maintenance management of the railway system. Finally, the technical experts are private or public companies with expertise on a specific domain of knowledge (e.g., financial, vibrations and acoustics, etc.), which provide services linked to the maintenance activities. Some of the findings of value creation factors are summarized in the following:

AOT: this type of customer is placed at a strategic and political level of decision, lacking technical knowledge about maintenance management. For this type of actor, the main factors of value creation correspond to environmental and social issues. For the environmental dimension, the AOTs look for solutions extending the life cycle of the rolling material and the infrastructure. In terms of social value, one of the major interests of the AOTs is to guarantee a tolerable level of noise to the citizens, linked to vibration management.
Transport operator: this actor is placed at an intermediate level, dealing with strategic and operational decisions. The main value factor concerns the reduction of maintenance costs in the long-term. Besides, at the technical level, transport operators look for decision-aiding support that allows them to optimize the maintenance activities.
Technical expert: this customer type is concerned with specific technical issues. The main factors of value creation identified correspond to the reduction and or the elimination of mechanical failures (e.g., geometry measurements, screeching, short defaults, among others).

The provider view: insights to the offer configuration. After the interviews performed with the targeted customers, Vibratec can elucidate major insights to further develop their PSS offer.

Firstly, it exists an economic barrier considering the customer willingness to pay for the desired offer. This is derived from the general difficulty of the customers to visualize the entire value that the offer can provide them. Giving this fact, some strategies are being studied by Vibratec to guide the offer development, for instance: i) extending the customer target, ii) further development of additional services modules, iii) rethinking the business model associated to

the offer, different from product-selling (i.e., pooling, location, among others), and iv) considering the provision of a complete solution for the customer.

The last point appears essential for different customer segments. Indeed, a complete offer means going from the diagnostic of the failure until the maintenance service provision. In this case, Vibratec, whose core business is based on vibration analysis and not in maintenance activities, should considering strategic partnerships with maintenance service providers. It requires the construction of collaborative business models based on win-win value-sharing strategies.

In the continuity of the project, further development of the provider view is considered. Concretely, the deployment of workshops with internal employees of Vibratec is proposed. The aim of the subsequent steps is to generate ideas about the future offer configuration until getting a refined set of PSS alternatives.

The customer-provider interface: value co-creation process. This research is currently in the first stages of the value co-creation process, involving key customers identification and value alignment process.

Firstly, concerning the key customer segments, at the beginning of the project, Vibratec delimited the target customers according to their own vision of the offer functionalities and commercialization potential. Nevertheless, as a result of the interviews with the different customers, new key customers were identified and then added to the scope of the study. Then, besides the AOTs and the transport operator (i.e., identified by the commercial engineers at Vibratec before the interviews), the "technique expert" was included (e.g., grinding service provider). They are potential customers, which could integrate Vibratec offer into their own value offer of maintenance.

Concerning the value alignment, new factors of value creation have been elucidated from the customer perspective. For instance, the social value (e.g., preserving employments linked to rudimentary maintenance methods like visual inspection). Further investigation is required to quantify the different value creation factors, establishing the priorities for both customers and the provider.

Finally, the pricing strategy is not yet analysed given the current state of the research. It will be based on the deep analysis of the customer perceived value for each segment, as well as the cost analysis of the final alternatives of the PSS offer and the corresponding business model.

5 Conclusions

This methodological framework for PSS design was applied to a French company in the railway transport sector. The framework highlights the importance of defining structured mechanisms to support a strong interaction between the provider and its customers, bringing the two visions within an active value co-creation process. Throughout these structured and managed interactions, the framework aims at enabling a better adaptation and acceptability of the offer, a larger creation of value, as well as a cognitive alignment between both customers' and providers' points of view.

The current case study is still under progress, only the first steps of the framework are described here. Nevertheless some managerial implications can be highlighted based on the insights obtained from the single case study. Firstly, the framework provides to Vibratec a formal and structured base to support their marketing and commercial strategies. Secondly, the framework represents a tool for the commercial department to communicate internally with the technical department (which facilitates the technical development of the PSS offer), and with the decision-makers (guiding financial and organisational decisions).

The perspectives of the paper are to provide a full validation with Vibratec, before any further extension through additional case studies and larger theoretical confrontation.

References

1. Barney, J.: Firm resources and sustained competitive advantage. Journal of Management **17**(1), 99–120 (1991)
2. Bertoni, A., Bertoni, M., Johansson, C.: Analysing the effects of value drivers and knowledge maturity in preliminary design decision-making. In: Design Information and Knowledge Management. International Conference on Engineering Design, Design Society (2015)
3. Corsaro, D.: The emergent role of value representation in managing business relationships. Industrial Marketing Management **43**(6), 985–995 (sep 2014)
4. Edvardsson, B., Kristensson, P., Magnusson, P., Sundstrm, E.: Customer integration within service developmenta review of methods and an analysis of insitu and exsitu contributions. Technovation **32**(7), 419 – 429 (2012)
5. Kindström, D., Kowalkowski, C.: Development of industrial service offerings: A process framework. Journal of Service Management **20**(2), 156–172 (2009)
6. Lusch, R.F., Vargo, S.L.: Service-dominant logic: reactions, reflections and refinements. Marketing Theory **6**(3), 281–288 (2006)
7. Neubert, G., Lambey-Checchin, C.: The sustainable value proposition of PSSs: The case of ECOBEL "Shower Head". Procedia CIRP **47**, 12–17 (2016)
8. Orellano, M., Medini, K., Lambey-Checchin, C., Neubert, G.: A system modelling approach to collaborative pss design. Procedia CIRP **83**, 218 – 223 (2019)
9. Petri, J., Jacob, F.: The customer as enabler of value (co)-creation in the solution business. Industrial Marketing Management **56**, 63 – 72 (2016)
10. Schmidt, D.M., Malaschewski, O., Mrtl, M.: Decision-making process for product planning of product-service systems. Procedia CIRP **30**, 468–473 (2015)
11. Shen, J., Erkoyuncu, J.A., Roy, R., Wu, B.: A framework for cost evaluation in product service system configuration. International Journal of Production Research **55**(20), 6120–6144 (2017)
12. Tran, T., Park, J.Y.: Development of a strategic prototyping framework for product service systems using co-creation approach. Procedia CIRP **30**, 1–6 (2015)
13. Tukker, A.: Eight types of product–service system: Eight ways to sustainability? Experiences from SusProNet. Business Strategy and the Environment **13**(4), 246–260 (2004)
14. Xing, K., Ness, D.: Transition to product-service systems: Principles and business model. Procedia CIRP **47**, 525–530 (2016)