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## Method to create proposals for PSS business models

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### Abstract

Different authors of the product-service bundle literature agree on the fact that business models are central to implement PSS successfully. However, most of the studies about PSS business models mention its importance but do not explore which content should compose such models. Furthermore, PSS business models are explored taking into account a partial view of business model dimensions. Finally, actions that lead to the creation of a new business for PSS or the adaptation of a current one are not distinguished. The goal of this study is to present a guideline to support the creation of PSS business models. Through systematic literature review and consulting with experts, the content of such models were developed. This content is organized in steps that encompass tasks, which must be performed in order to create a PSS business model. The method was already improved after application through a case study and currently is being utilized to generate a PSS business model for a bicycle sharing system. Final considerations include the weak and strong points of the method and further steps to enhance it.

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**Keywords:** Product-service system; business model; fuzzy front-end.

### 1. Introduction

PSS is an alternative for companies seeking business innovation. The paradigm of developing solutions only in the form of physical products to be sold must be broken, because value is not necessarily provided through the sale of the product, but by means of the functionality or result it can generate. Thereby, PSS does not address only the configuration of service and product components, but also the configuration of business models [1]. Business models represent how companies create and deliver value to its clients based on their strategic choices [2] and enable to express simplified description and representation of the business logic of a firm [3]. Tan [4] states that the business model concept is useful to characterize PSS, since its implementation often requires the redefinition or creation of new business models [5].

Despite the fact that recent studies highlighted that business models are essential to implement PSS successfully [6,7,8],

orientation on how companies should plan and implement such models is still very limited [8,9,10].

The lack of guidance on how to create PSS business model might be related to some factors. First, there is a lack of agreement about the definition of PSS business models [11] because there is little fundamental research developed on business models for PSS [7].

Second, these studies explore PSS business models taking into account a partial view of a given business model, i.e. they consider just some business model dimensions [11].

Third, there is a lack of methods and tools that support the creation of proposals for PSS business models in the fuzzy front-end [12].

The goal of this research is to develop a method, named Configurator of PSS Proposals, to cope with the factors mentioned and guide companies during the creation of PSS proposals for a current or new business model.

The proposals, also named as business case [13,14], covers information about the potential market to be reached,

customer needs and technical and financial analyses to support final decision-making [15].

## 2. Methodology

The methodology adopted as main approach is the design research methodology (DRM), which presents four stages: Research Clarification, Descriptive Study I, Prescriptive Study and Descriptive Study II [16].

The Research Clarification stage addresses the formulation of a realistic and valuable research objective (section 1 of this paper), based on gaps identified in the literature.

In the Descriptive Study I stage, the content of the configurator was defined based on systematic literature reviews, whose steps are presented in [17]. It is considered that PSS business models should embrace specifics of product and service development projects besides the PSS development. Thereby, attributes of PSS, product and service development projects were searched. Table 1 presents two of the 106 attributes identified. The different options covered by the attributes, the references and from which literature the attribute was found are also mentioned in the table.

Table 1. Examples of attributes identified by systematic literature reviews

Attributes	Options			Ref.	Literature
Types of product-service orientation	product oriented	use oriented	result oriented	[18]	PSS
				[19]	
Level of innovation on the product	incremental	really	new radical	[20]	Product Development

According to the DRM in the Prescriptive Study stage, the researches use their increased understanding of the existing situation to correct and elaborate a proposition [16]. Thus, a concept of the configurator was outlined and the attributes identified in the previous stage were classified according to business model dimensions. The Descriptive Study II stage covers the investigation of the impact of the method and its ability to achieve the goal, i.e. the desired situation [16]. The last two stages are carried out iteratively.

Two rounds of experts' evaluation were used to assess the attributes identified by the systematic literature review. By means of a questionnaire, they evaluated the relevancy of the attributes to create PSS proposals by giving grades between 1 (not relevant) and 5 (really relevant) to the attributes. Taking into account the grades and through a discussion with the experts, inclusion, exclusion and enhancement of attributes were carried out and a consolidated database built.

The method is being applied to generate a PSS proposal for a bicycle sharing system.

## 3. Configurator of PSS proposals

### 3.1. Application Context

The decision about creating or modifying a business model takes place in the fuzzy front-end.

The fuzzy front-end is a planning phase that encompasses activities performed prior to the development of technologies [15], products and/or services or new business [13]. The fuzzy front-end has as input the identification of an idea or opportunity and outputs a proposal for new product, service, technology or business [14,21].

Figure 1 shows the context of utilization of the method.

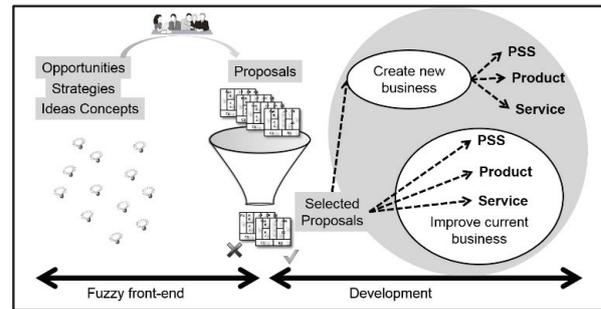


Fig. 1. Context to utilize the method

This study defines PSS proposal as a document elaborated based on strategies, ideas, opportunities or concepts and created during fuzzy front-end, which contain the description of PSS business a company intends to develop. These proposals need to be evaluated and selected to be further developed. It is important to mention that the scope of this study is to create such proposals but not to define criteria to select the proposals. In addition, it does not cover the selection of which strategies, opportunities, ideas and concepts should be used as input for the method.

### 3.2. Elements of the method

The method is composed by five elements, named inputs, outputs, steps, tasks and help.

Figure 2 presents the complete overview of the method.

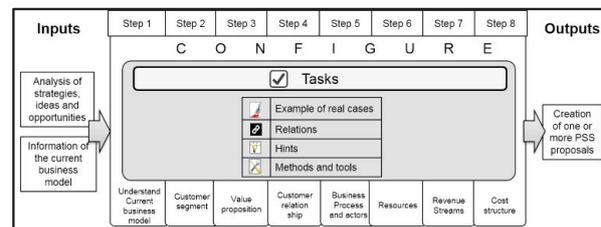


Fig. 2. Representation of the method

### 3.2.1. Inputs and outputs

As the method should be utilized during the fuzzy front-end, the main inputs and outputs are similar to the ones of this phase. Thereby, inputs are (i) analysis of strategies, ideas, concepts and opportunities and (ii) information about the current business model. The second input is required when an existing business model is being adapted to PSS. The main output is the PSS proposal that will be developed by using the method.

### 3.2.2. Steps

The content of the method is organized in steps that address different business models dimensions. Table 2 shows the title of the steps and which business model dimension generates them.

Table 2. Correspondence between steps and business model dimensions.

Order of the step and title	Business model dimension
Understand your business model	---
Configure Customer Segment	Customer Segment
Configure Value Proposition	Value Proposition
Configure Customer Relationship	Customer Relationship
Configure Business Processes and Actors of the Network	Processes and Activities, Partnership and Distribution channel
Configure Resources	Resources
Configure Revenue streams	Revenue streams
Configure Cost Structure	Cost Structure

Step 1 invites the user to analyze the business context through the understanding of the current business model. Steps 2 to 8 present as main activity the configuration of the information required on each of the business model dimensions.

### 3.2.3. Tasks

Each step encompasses a range of tasks that must be performed in order to create a PSS proposal. The tasks were deployed from the 106 attributes of product, service and PSS development projects identified by systematic literature reviews.

Examples of attributes mentioned in Table 1 and the tasks they deployed are shown in Table 3.

Table 3. Correspondence between attributes and the tasks they deployed

Attribute	Name of the task	Task type 1	Task type 2
Types of product-service orientation	PSS orientation	Select one option for types of product-service orientation	---
Level of innovation on the product	Product of the PSS offer	Select one option for level of innovation on the product element of the PSS offer	What is the product that should compose the PSS offer? Which are its attributes?  Detail type of innovation

As shown in Table 3, two types of tasks are placed in the method: select predefined options; and perform specific actions to include additional information.

The first type concerns the selection of options of the attributes according to the company strategic orientation. For instance, step 3 “Configure Value Proposition” presents the attribute “level of innovation on the product”. The options, i.e. the possible values of this attribute, are: incremental, really new and radical. All options resulted from the stage Descriptive Study I based on the systematic literature review. In order to generate a flexible method, additional options can be created when required. Since the attributes possess different options that should be selected, the selection of one or more options of each attribute leads to the configuration of different PSS proposals.

However, only the selection of options is not enough to create a proposal. Predefined options might not cover all relevant information of a PSS proposal, so that additional specific and descriptive information might be required.

Thereby, a second type of task was defined where specific actions are proposed. For instance, concerning the example given for the attribute “level of innovation on the product”, an action is: Detail the type of innovation on the product. Detailing, describing, specifying are examples of actions of the second type of task.

### 3.2.4. Help

In other to support carrying out these two types of tasks, i.e. selecting options and performing specific actions, a help tool is available. This help contains additional information to support the user during the creation of a PSS proposal, such as: examples of companies that adopted PSS; hints of practices to assist in the utilization of the guideline; useful methods and tools for defining a specific attribute. Yet, relations between attributes show the influences they have on each other.

The help is represented in the method according to Figure 3.

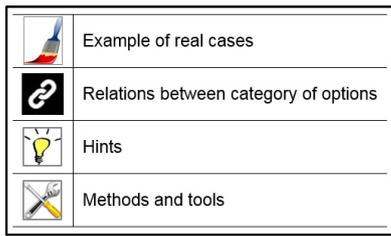


Fig. 3. Representation of help

Figure 4 exhibits a screenshot of task 3.5 which is encompassed by Step 3 “Configure Value Proposition”, and the different help it addresses, i.e. example of a real case and relations with other tasks.

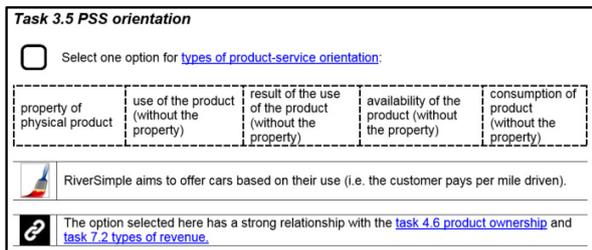


Fig. 4. Task 3.5 of the method

As most of the tasks, task 3.5 possess hyperlinks that lead the user to the meaning of terms and the references utilized to develop the content. Furthermore, the relation between task 3.5, 4.6 and 7.2 are also stated. Thereby, the user should verify the results of the different related tasks in order to guarantee coherence between the results of them.

### 3.3. Partial results of the application

Figure 5 demonstrates a screenshot of the method in order to exemplify its application. Task 3.6 is shown, which is also encompassed by Step 3 “Configure Value Proposition”.

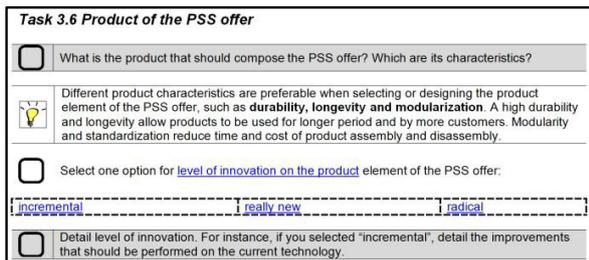


Fig. 5. Task 3.6 of the method

To demonstrate the utilization of the method, a screenshot of the results of task 3.6 concerning the PSS proposal for a bicycle sharing system is exhibited in Figure 6.

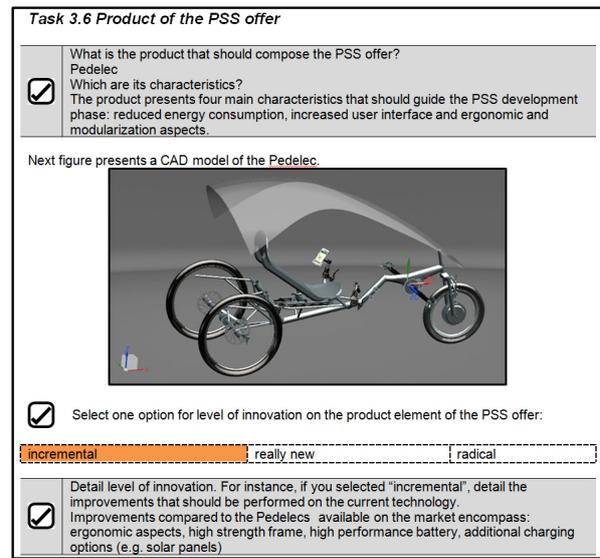


Fig. 6. Results of task 3.6

As demonstrated in Figure 6, the team creating the proposal checked the checkbox for the tasks already performed. In orange are the options selected for that specific case. The results of the descriptive tasks (task type 2) are placed inside the gray line.

Until the moment, the team involved in the creation of the PSS proposal already performed some comments about the method. First, the following benefits were pointed out:

- Increase of knowledge about different possibilities for the content of a PSS proposal;
- Gathering of important information and knowledge for a PSS business that could be spread in different departments or with people from different areas.

Some disadvantages of the method were also pointed out. For instance, the team mentioned that the application consumes too much time. In order to reduce the time required to utilize the method, a software tool is under development as mentioned in the next in “Final Considerations”.

### 4. Final Considerations

On the one hand, the method provides a starting point to deal with PSS by generating a PSS proposal that may lead to a successful PSS business model implementation in the future. The creation of PSS proposals may increase the knowledge and understanding about the opportunities and challenges to develop PSS business models and then provide more consistency concerning the decisions made during the fuzzy front-end. Moreover, the method allows:

- To characterize, differentiate, compare and describe PSS proposals;
- To stimulate the emergence of new ideas and opportunities for new PSS oriented business;
- To provide a shared knowledge about PSS in the organization and between different areas of expertise;
- To encourage the constitution of multifunctional teams during the fuzzy front-end;
- To create a document that can be utilized to present the PSS proposal to stakeholders.  
The method differs from ones presented in the literature and its originality relies on:
- A list of tasks based on a complete set of attributes of product, service and PSS
- Relation between tasks
- The element help, with examples of real cases, advices and so on.

Limitations of the study can be highlighted. First, the method was applied in the case of the creation of a new business model. Therefore, the method was still not tested for improving already existing business models.

Next steps of this research aims to conclude the application of the method for the bicycle sharing system and, after that, improve the method considering the comments and suggestions performed by the team.

The authors intend to implement the method via website to facilitate its use, e.g. the use of the hyperlinks, and to organize better the contents in different pages, e.g. the description of the methods and tools. This action might foster the adoption of PSS by means of increasing the acknowledgment and the utilization of the Configurator.

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