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Procedia CIRP 16 (2014) 50 – 55

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Product Services Systems and Value Creation. Proceedings of the 6th CIRP Conference on Industrial Product-Service Systems

Balancing Product-Service Provider's Performance and Customer's Value: the SErvice Engineering Methodology (*SEEM*)

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Abstract

Manufacturing companies are currently competing for the identification of innovative value propositions to position themselves in the market. This led to a shift from providing traditional transaction-based and product-centric offerings towards the provision of integrated solutions to their customers. In this context, Service Engineering, the discipline concerned with the systematic development and design of service and product-services, is gaining particular interest. This paper provides a contribution in this field proposing a *SErvice Engineering Methodology* (*SEEM*) which aims to support servitizing companies in: (i) (re)engineering of service and product-services offering, (ii) defining the most suitable and complete service and/or solution for customers, and (iii) balancing the excellence in the customer satisfaction and the efficiency and productivity in the service provision process.

Selection and peer-review under responsibility of the International Scientific Committee of "The 6th CIRP Conference on Industrial Product-Service Systems" in the person of the Conference Chair Professor Hoda ElMaraghy"

Keywords: Service Engineering, PSS; Service Operational Excellence, Customer Satisfaction

1. Introduction

The recent economic crisis has contributed to increasing the awareness of the strategic relevance of the provision of product-related services, as an anti-cyclical remedy for tackling the dramatic contraction experienced in some business-to-business (B2B) and business-to-consumer (B2C) markets. This strategic evolutionary path towards servitization, undertaken by many manufacturing companies nowadays, is mainly motivated by the necessity to continuously quest for new sources of value, either reactively fulfilling explicit customers' requirements [1], or proactively providing them with new integrated product-service solutions [2].

A major managerial challenge during the servitization journey is for product-service providers to re-think and re-design their organizational principles, structures, processes [3], capabilities [4], relationships with customers [5], and supplier relationships [6].

Under such a pressure, the design and development of a product-service solution, along with the management of its whole lifecycle, raise new issues. In particular, the cultural shift from a transaction-based approach to a long-term relationship with a customer needs to be thoroughly understood by product-service providers, throughout the acquisition of suitable models, methods and tools for collecting, engineering and embedding in a solution all the knowledge that meets or exceeds people's emotional needs and expectations [7] [8]. Indeed, the service component of the product-service solution introduces further requirements when compared to product-based solutions. In this context, Service Engineering (SE) has emerged as a discipline calling for the design and the development of an integrated product-service offering adding value to the customers.

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doi:10.1016/j.procir.2014.01.008

In spite of the great success of the SE as a discipline in the academic context, only few authors have proposed methodologies and tools, which can be easily adopted by industrial companies as they are usually product-centric during the design of a solution. In addition, the existing models ([10] [9] [11] [12] [13] [14] [15]) in SE are mainly focused on designing solutions able to technically satisfy customer needs, while omitting the balance with operational excellence during the delivery of the service solution.

This paper proposes to address those challenges and gaps by introducing the *SEEM* (*SErvice Engineering Methodology*). In particular, *SEEM* aims at supporting companies embarking in the servitization journey during either the engineering of a new product-related service, or the reengineering of already available offerings. The *SEEM* allows for the definition of the most suitable and complete service and/or solution for a customer in terms of service content and service provision processes. A particular emphasis is also given to balancing the excellence in the customer satisfaction and the efficiency and productivity of the service-related processes.

It is worth mentioning at this stage that the *SEEM*. The methodology benefited from extensive industrial feedbacks. SEEM has been developed starting from the theoretical background on SE, addressing the related gaps; then, it has been continuously refined considering the input and the feedback obtained from several industrial test cases. In particular, thanks to several meetings carried out with service managers, it has been possible to refine the theoretical aspects and terminology, making the methodology more intelligible and suited for practical use.

The reminder of the paper is structured as follows: Section 2 presents a literature review on Product-Service and Service Engineering with a focus on the models and methods currently available. Section 3 describes the main constructs of the methodology, providing a full overview of its deployment, while Section 4 concludes the paper and proposes further research prospects.

2. PRODUCT-SERVICE SYSTEM ENGINEERING

The first definition of product-service appears in the literature in the ‘70s by Rathmell [16]: “Services may be an accompanying sale of a product”. Although a sharp distinction between the two concepts of product and service was still present, due to the intangibility of the service compared to the corporeality of the product, it portrayed a new perspective for their mutual integration to improve customer satisfaction. Later, the idea of integrating physical products and additional services grew a step further and became crucial for many companies [17]. Today, this concept has a new meaning, and the basic idea behind the Product-Service System (PSS) concept ensues from an innovation strategy, shifting the business focus from designing and selling physical products to designing and selling systems consisting of products, services, supporting networks and infrastructures, which are jointly capable of fulfilling specific customer demands [18] [9].

The profit generation and the commercial success of the PSS offering critically depend on its conceptualization, design and development, although this notion has been largely ignored [19]. Designing and developing a PSS is a complex task due to the long and unpredictable lifecycle of the solution and the number of interactions existing between the different actors involved and the components constituting it [20] [21]. Issues related to service design and development are increasingly being recognized by designers, engineers and managers as relevant to the success of their business, even-though the knowledge on how to develop a PSS and who should design it is still marginal [22]. According to Baines et al. [9], the plethora of models and methods available for designing PSS are typically a rearrangement of conventional processes, and lack of a critical and in-depth evaluation of their performance in practice. In fact, service when compared to physical products are generally under-designed and inefficiently developed [23].

This is the main motivation behind the rise of Service Engineering (SE) as an emerging technical discipline since the ‘90s and of its today’s relevance. Based on the definitions provided by Bullinger et al. [19] and Shimomura and Tomiyama [15], SE can be termed as a technical discipline concerned with the systematic development and design of services, aiming at increasing the value of artefacts. It is a rational and heuristic approach based upon the discussion of alternatives, goals, constraints and procedures, through the adoption of modelling and prototyping methods. Accordingly, the aim of SE is to increase the value of service offering by improving the service conception, service delivery and service consumption. This can be achieved through the evaluation of existing services and the design of new services by visualizing the relationship between customer’s requirement and the service delivery process.

Among the several available models and methods, few have been developed specifically for service and PSS design, development and engineering. Most of the available Service Engineering models, methods and tools derive, however, from the adaptation of traditional engineering, business and computer science approaches to the Service System or PSS fields [1] [24] [25].

The development of a Service Engineering methodology implies the definition of process *models* describing the steps needed to engineer a service, and concrete *methods* defining how to perform the model phases [9]. A detailed analysis of a literature on Service Engineering Models demonstrates that there is a plethora of proprietary process models, each providing a different nomenclature and a specific relevance to the engineering phases. Summarizing the most widespread models ([10] [9] [11] [12] [13] [14] [15]), four main common phases can be highlighted: 1) customer analysis, 2) requirements analysis, 3) PSS design, and 4) PSS test and implementation. Table 1 provides a further detailed view on how these phases are carried out as well as an analysis of the main methods currently available. Each method is then linked to the phases where it has been implemented [1][26][27].

The common thread between these models and methods is the central role covered by the customer, where customization, customer satisfaction, and long-term relationships are the leading elements. This is due to the fact that the main focus in the service paradigm is the customer with its preferences and its desires [28].