

## **Integration of service principles into the creative process of PSS: Application in an organizational case**

Emanuela Lima Silveira, Aguinaldo dos Santos  
manuhsilveira@gmail.com, asantos@ufpr.br  
Federal University of Paraná - Street General Carneiro, 460 (Room 717), Curitiba -  
Brazil

### **Abstract**

The process of creating Product+Service Systems (PSSs) can be considered complex as it involves tangible products, typically qualitative and intangible services, integrated into a multi-actor system and variable touch points. In this regard, there is still a lack of methods and tools that adequately support the PSS's creative process. Given this context, a theoretical survey about PSS and Service Design creativity complexity was conducted, highlighting the heuristic principles considered relevant to enhance the creativity process. Then, a case study explored the integration of heuristic principles from the Servqual scale, into the creative process of a PSS in a Brazilian multinational company. This article intended to contribute to the theme's theoretical and practical basis, stressing the emphases and gaps in the use of heuristics for the design of PSSs in the organizational context.

**Keywords:** product-service system, service design, creative process, heuristic methods, servqual scale

## Introduction

When considering the creative process of Product+Service Systems (PSSs) the attention of designers involved should be necessarily systemic due to the presence of multiple and complex variables involved whilst creating solutions. PSS Design is indeed an innovation strategy that shifts the focus from merely offering products to a broader design approach that systemically integrates product and services, focusing on producing structural changes in the way production and consumption systems are organized (Ceschin & Gaziulusoy, 2019).

The PSS, according to Baines et al. (2017), can generate social, economic and environmental benefits, such as:

- Differentiation of companies against their competitors, due to the offer of more complete systems directed to the consumer's demands;
- Environmental benefits, as the producer starts to think about different and more sustainable business models;
- Renting or selling the result of higher value added products, using less energy or material, thus reducing costs and environmental impacts.

In order to create integrated solutions in manufacturing industry contexts, thinking more closely on the user experience, the PSS approach can be combined with the Service Design approach, offering important and complementary perspectives (Costa et al. 2018).

Service solutions have the potential to enable greater value in use and increase the competitiveness of manufacturing companies. For Stacey and Tether (2014), the development of PSS should allow companies to better address customer experience and emotions. However, according to Morelli (2009) some PSS approaches lack the organizational network component that allows the operationalization of service concepts.

In this context, heuristics methods are recognized for having structures that meet complex demands and help in the generation of ideas encompassing the whole system (Chu et al., 2010; Tessari & De Carvalho, 2015). The use of heuristics can stimulate the creative process regardless of the spontaneous ability of those involved in the process (Forcelini et al., 2018), by proposing a standard developed based on the analogy of effective and high quality solutions already implemented previously (Kwon,

Lee & Kim, 2015). This feature can assist the creative process in competitive environments, as all participants receive stimuli and similar external knowledge, with internal knowledge being relevant but not limiting.

This paper presents an attempt to integrate heuristics in a more direct and simplified way. After bibliographic research, the application of heuristic principles from the Servqual scale was conducted. The Servqual scale is recognized for its quality mainly in the evaluation of services. Therefore, it was assumed that consideration of heuristic principles within services may be useful for the initial transition of manufacturing companies to the systemic thinking proposed by the PSS model. It was intended to evaluate, through a case study, the limitations and contributions of the heuristic principles of Servqual in the creative process of PSS in the organizational scope.

## **PSS and Service Design**

The PSS's strategic and systemic approach as applied to business innovation primarily aims to decouple value creation from increased resource consumption. The term PSS arises from the need for a new approach, which values the systemic discontinuity in the patterns of production and use (Vezzoli et al., 2018).

Vasanth et al. (2012), emphasize that the creative process of a PSS can be considered complex because it deals with interpolation of several elements such as: actors from different areas and with different levels of involvement in the PSS; environment variations with multiple touch points and interactions; user requirements and various activities at each stage of the PSS life cycle, among other elements. For the authors, the PSS ideation process is still limited, as PSS propositions and solutions are still fragmented and few PSSs are idealized from a holistic perspective that considers the entire life cycle.

Service Design, in turn, has a participatory multidisciplinary and human-centered approach (Meroni & Sangiorgi, 2011). Mager (2008) points out that service designers visualize, formulate and choreograph solutions to problems that may not yet exist. That is, service designers observe and interpret behavioral requirements and standards and turn them into potential future services.

According to Costa et al. (2018), PSS and Service Design approaches offer complementary perspectives, but additional integration is required. For Boehm & Thomas (2013), PSS approaches rooted in cleaner production have led to a company-centered perspective focused on creating more efficient and environmentally sustainable product service system solutions that tend to ignore the customer/user experience.

Creating new PSS that take into account the systemic view of service is a complex task. Therefore, the following article highlights the importance of methods that properly integrate PSS and Service Design in order to create more consistent systems that consider the customer / user experience.

## **Heuristic principles and servqual scale**

Chu et al. (2010) and Tessari & De Carvalho (2015) point out that among the existing creation methods, one that can be recognized for meeting complex demands and assisting in the generation of ideas, is that which involves more structured systems, such as heuristic methods. According to Tessari & De Carvalho (2015), the main objective of a heuristic is to assist problem solving, making the process more efficient by sharing previous experience to guide the generation of new solutions. The analogy of existing systems and their standards, as proposed by heuristics, is part of the main auxiliary means that results in improved solutions (Kwon, Lee & Kim, 2015).

Following this direction, it is believed that heuristic principles can stimulate the generation of ideas with greater potential for innovation. The process of generating solutions through the application of heuristic principles becomes more efficient due to the sharing of previous experiences that guide the creative process, increasing the potential for innovation (De Carvalho, Savransky & Wei, 2004).

The Servqual scale is identified as one of the significant heuristic tools and was selected to be applied in this case study as it has reference to heuristics in quality of services.

The Servqual scale was proposed by Parasuraman, Zeithaml & Berry in 1985, from the perspective of marketing, as an instrument for measuring customer-perceived quality of service (Cavalieri & Pezzotta, 2012). In order to understand how users perceived and evaluated the quality of services, Parasuraman, Zeithaml & Berry (1985) proposed a study involving twelve focus groups, with three groups targeting each one of the

four different services investigated (retail, credit card, stock brokerage, repairs and maintenance).

In the research conducted by Parasuraman, Zeithaml & Berry (1985), the pattern found in the answers revealed evaluative criteria, considered in the following article as heuristic principles. Users can appropriate these principles for quality analysis, regardless of the service investigated. A list of heuristic principles was proposed by the authors:

- Tangibility: physical appearance of facilities, equipment, workforce and regulatory materials;
- Reliability: ability to perform the promised service reliably and accurately;
- Responsiveness: ability to help users promptly;
- Competence: appropriation of required skills and knowledge to perform services;
- Cordiality: politeness, respect, consideration and friendliness of workers;
- Credibility: trust, truth and honesty;
- Safety: no danger, risk or doubt;
- Accessibility: proximity and empathic contact;
- Communication: keep users informed in an appropriate language, and;
- Understanding: strive to understand the user and their needs.

These principles shape the Servqual scale and from each of them it is possible to measure the gap between the level of service quality desired by the user versus what is actually being delivered (Pena et al. 2013). However, the following article shows the application of such heuristic principles not in the evaluation phase of a service, but in the previous stages of gathering requirements and creative process.

## Case study: Designing meta-scenarios of PSS for a piping manufacturing company

The method for conducting this research follows a qualitative approach of an interpretative nature (Polaine et al. 2013), which involved an unsystematic literature review. The qualitative data assists the reflection of the subjective aspects of the research. Such interaction allows a greater understanding of the personal relationships and existing variables.

From the theoretical framework it was possible to structure the creativity process applied in a case study (Yin, 2015) with participant observation (Gil, 2011), that was performed by the authors. Regarding the observation technique, Gil (2011) points out that it allows a direct perception of reality, without any intermediation.

From the theoretical framework it was possible to structure the creativity process applied in a case study (Yin, 2015) with participant observation (Gil, 2011). This was then performed by the authors.

The case study took place in a project carried out between the Design and Sustainability Center of the Federal University of Paraná (UFPR) and a multinational company based in the Southern region of Brazil. In this case study the application of heuristic principles from the Servqual scale has been integrated into the creative process of PSS.

The project had five phases, which were carried out within a period of nine months between October 2017 and June 2018 (Figure 1). The project aimed to develop a Product+Services System (PSS) focused on water efficiency from solutions for: a) rainwater capture and reuse; and b) aerobic treatment of activated sludge. Due to confidentiality issues, the final results will not be described, but some methods and tools used by the Federal University team of designers will be presented.

Methods and Tools used in each phase:

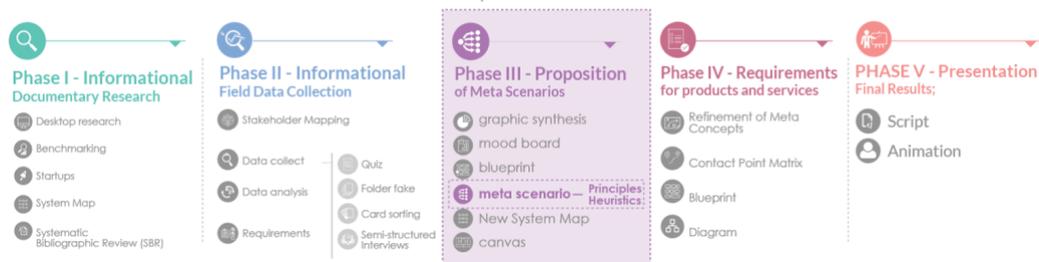


Figure 1: Methods and Tools applied in the project (UFPR Team, 2017)

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This research emphasizes mainly the phases II and III, because these phases use heuristic principles for field analysis, and for application in the process of creating PSS scenarios respectively. In Phase II, field research was carried out with the main actors of the system (builders, manufacturers and end users, among others) involved in some selected state capitals. The following data collection methods were applied: semi-structured interviews; fake folders and cardsorting. This study highlights the use of Servqual's heuristic principles (Parasuraman, Zeithaml & Berry, 1985) for the development of cardsortings applied during Phase II (Figure02).



Figure 2: Cardsorting developed with Servqual principles for field research application (UFPR Team, 2017).

In the dynamics of using cardsorting, actors were instructed to rank cards with the quality principles they considered more relevant to a PSS focused on rainwater collection and a wastewater treatment system. The application of heuristic principles in the form of cardsorting helped to capture, more interactively, the different perceptions of the actors.

In Phase III - propositions and meta-scenarios - the following tools were applied: graphical synthesis of contents from the informational and field phase; moodboards according to user requirements; blueprints for creating and defining interactions in the proposed concept; the design of PSS meta-scenarios; system maps and canvas.

Among the tools of Phase III, the dynamics adopted in the creative process stage of the PSS meta-scenarios can be highlighted. In addition to the proposition of the scenarios based on the literature and the requirements collected in the field, in this phase the heuristic principles proposed in the ServQual scale were also integrated, in order to stimulate

the creative process of the UFPR team. This then enabled the presentation of the scenarios generated to the company's innovation team. The heuristic principles were of great relevance for the survey of reference cases, which inspired and illustrated the ideas created for each of the proposed scenarios.

The following image demonstrates the heuristic method used for the design and presentation of solutions by the UFPR team. Due to confidentiality issues, certain texts that represent the ideas created for the company are not readable (Figure 3).

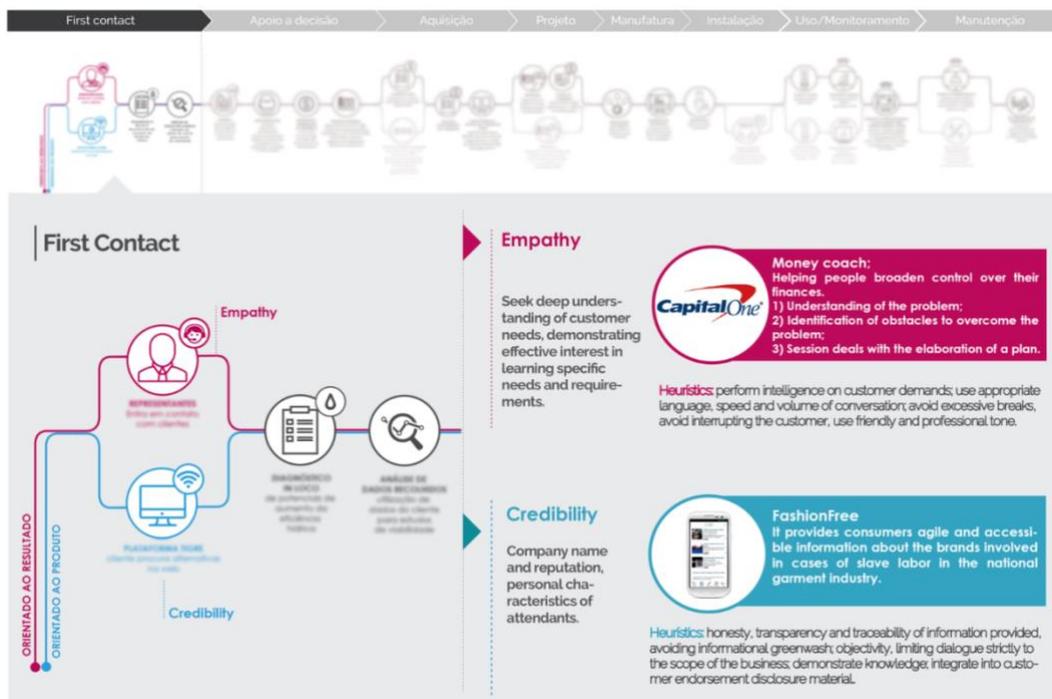


Figure 3: Business Journey Example with Principles Applied by Parasuraman et al.1985 (UFPR Team, 2017)

The use of heuristic principles occurred in an integrated way in the company/user journey. This stimulated thinking around each of the new PSS operating stages, resulting in a complete PSS scenario. As the previous image illustrates, the principles for first contact were “empathy” and “credibility”. Examples of how other companies have sought to strengthen these heuristic principles were considered important in inspiring realistic solutions for the company.

More detailed heuristic descriptions have been added to each Servqual principle to stimulate the design process. For example: “Empathy Heuristics: perform intelligence on customer demands; use appropriate language; speed and volume of conversation; avoid excessive breaks; avoid interrupting the customer; use friendly and professional tone ” and “Credibility Heuristics: honesty, transparency and traceability of information provided; avoid informational greenwash; objectivity; limiting dialogue strictly to the scope of the business; demonstrate knowledge; integrate into customer endorsement disclosure material.”

Such descriptions helped to generate ideas of greater viability and quality, however it was important to stimulate the creative process so that they were also innovative and not copies of the proposed examples.

## **Final considerations**

This article emphasized the complexity of the creative process of PSSs, highlighting the use of heuristic principles of service in order to improve the ideation process of PSS and connect the user and customer experience. This strategy was important for demonstrating an alternative to bridge the gap between PSS theory and Service Design, proving effectiveness in a practical application via a case study in a multinational enterprise.

According to the designers involved in the case study, the use of the Servqual heuristics proposed were very useful for both the initial collection of some requirements and to guide the generation of higher quality ideas. The heuristics stimulated creativity not only within the product range, but also within the service scope, creating thinking about the user experience.

The examples applied to the heuristics made the creative process more dynamic, and improved the interaction between the UFPR team and the company’s team of innovation, standardizing shared knowledge and reducing the dependence on designers’ spontaneous creative capacity. This corroborates the perception of Forcelini et al. (2018).

It should be noted, however, that even if the use of Servqual’s heuristic principles has been considered important in broadening the view of manufacturing companies to the scope of service, other applications can be explored in future projects. An approach to be explored in future research would be to enable designers to create thinking systemically.

That is, to go beyond creating product to services (and vice versa) and include new actors and even eliminate the need for certain products.

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