

Product-Service Systems for Influencing Customer Barriers and Customer Acceptance

D. M. Schmidt, P. Bauer, and M. Mörtl

Abstract—Product-Service System (PSS) is an approach, which is beneficial for several stakeholders, like society, provider and customer. In most literature, PSS is described from the perspective of providers and how companies can use PSS to gain benefits. However, we claim that product designers can use PSS to increase the customer acceptance by reducing or eliminating the influence of barriers of customer acceptance. In this, paper, we did a literature research to identify barriers of customer acceptance to reveal to need for research, how PSS can influence customer acceptance. We identified effects and phenomena of product and customer, which are barriers of customer acceptance and clustered them into eight categories: complexity, costs, reliability and availability, interoperability, irrationalities, trust, unawareness of need and values and beliefs. If a product lacks in customer acceptance, designing a PSS should consider those barriers.

Index Terms—Customer acceptance, product design, product-service systems.

I. INTRODUCTION

Several authors see Product-Service Systems (PSS) as an approach to better meet customer requirements, to provide more sustainable products and to increase customer loyalty [1], [2]. A PSS is a combination of physical products and services [2]. However, a PSS is not about the coexistence of product and service, but product content and service content are interconnected and bound together from the start of the development and design process.

Even though PSS facilitate advantages and benefits for customers, the approach PSS was developed for providers [3] and PSSs are not optimized for their effects on customers [4]. Researchers outline that PSS have several disadvantages for the customers which prevents them from buying PSSs and decreases the customer acceptance [3]-[8]. Exemplary disadvantages are missing trust to the provider or too high perception of lifecycle costs. However, PSS can also increase the customer acceptance, for example by lower total costs of ownership [9] or customizing [10].

As this paper is the first step of an approach to increase customer acceptance, we firstly define customer acceptance. The attitude psychology defines acceptance as the basically affirmative attitude of acceptance-subjects, dependent on the context, the situation and the reference object [11]-[12]. This means for customer acceptance that the acceptance object is the customer and the reference objects are products. The context and the situation is the purchase situation, where a

product is needed. However, this situation does not only focus the point of sale. The area of marketing focus the increase of customer acceptance by influencing the purchase situation and the customer based on the product and the customer. The area of product design focuses the increase of customer acceptance by configuring the product based on the product and the customer. In this paper, we identify barriers of customers, which can be influenced by product design. In this context, barriers of customer acceptance are issues of customers or products, which affect the customer acceptance in a negative way.

The term adoption related to the term acceptance, as adoption is described as a pre-stage of acceptance [13] and acceptance is also defined as post-adoption [14]-[16]. For this reason, we also consider barriers of customer adoption in our work.

II. RESEARCH QUESTION AND FOCUS

Several authors declare PSS's benefits for providers, customers and other stakeholders [6], [17]-[20]. However, some researcher point out that PSS can cause influence customer acceptance in a negative way [3]-[4], [7], [8], [21]. They mention costs, risk or trust as barriers for customers to decide for a PSS. Those factors might help PSS-providers to improve customer acceptance of PSS. Our approach is to increase customer acceptance using PSS. We do not focus disadvantages of PSS but barriers of customers to decide for a product, be it a pure product, a pure service or a PSS.

The differences between the approaches "increasing customer acceptance of PSS" and "increasing customer acceptance using PSS" is comparable to the differences between the push-strategy and the pull-strategy of marketing. Fig. 1 shows this push-approach.

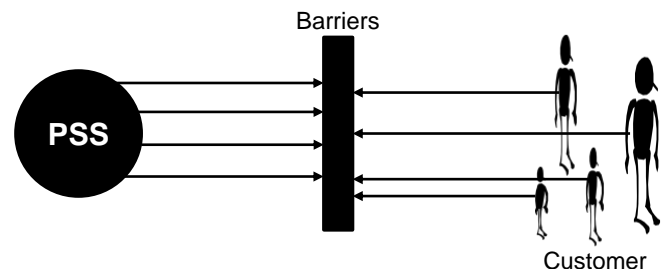


Fig. 1. Customer acceptance of PSS (push-strategy).

Increasing customer acceptance of PSS is similar to the push-strategy, as the designer wants to push the PSS to the customer. On the contrary, increasing customer acceptance using PSS is similar to the pull-strategy, as the designer wants to make the product more attractive that the customer

Manuscript received August 4, 2014; revised October 28, 2014.

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pulls the PSS. Fig. 2 depicts this pull-approach.

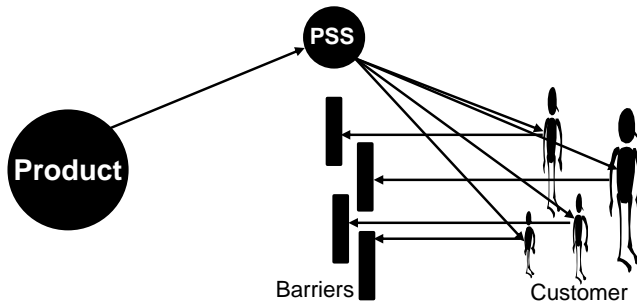


Fig. 2. Customer acceptance using PSS (pull-strategy).

The approach of eliminating or reducing the negative factors of PSS conveys a sense of forcing the customer to decide for PSS, because the provider takes more advantage of selling a PSS than selling a pure product. However designers should not focus the customer acceptance of PSS but the customer acceptance itself and how a PSS can help in increasing the customer acceptance. We consider barriers of customer acceptance, which are not traditionally linked to PSS, as factors to be influenced by PSS. Our main focus is the customer and how PSS can affect their acceptance, while other researchers focus the PSS and how its customer acceptance can be increased. We ask the research question: Which barriers of customer acceptance exist and how can PSS influence them? In this paper, we only consider the first part of the question: *Which barriers of customer acceptance exist?*

To identify barriers of customer acceptance, we conducted a literature research. Barriers of customer acceptance differ in B2B- and B2C-markets. Since both markets are relevant for increasing customer acceptance using PSS, we did not restrict the focus to one of those markets. However, we focus on customer and not on users or consumers. Sometimes, consumers and customers are the same (private car owners), sometimes they are different (taxi driver and taxi guest). Only the second case is relevant for focusing and we decided to focus the customer: in most cases of different consumer and customer, the consumer is not aware of the product's business model, whether it is a PSS or a pure product.

We conducted the literature research by analyzing literature from mainly marketing and psychology, because the barriers describe phenomena about the perception of customers and customer behavior itself. In total, we identified around 60 single effects. As a number of 60 is too high to handle, we clustered them into 8 thematic categories. As some effects are related to each other, the categories do not have clear boundaries. Relations and interdependencies are between different categories.

III. BARRIERS OF CUSTOMER ACCEPTANCE

We identified various phenomena and effects, which might cause barriers of customers and decrease customer acceptance. Structuring those effects in eight thematic categories facilitated the clarity of barriers. The identified barriers are shown in Fig. 3. The barriers product's complexity, costs, reliability and availability and

interoperability are products' attributes perceived by customers. The factors irrationalities of customers, trust to the provider and unawareness of need are aspects of customer behavior. The factor values and beliefs is allocated to the overlap of products' attributes and customer behavior.

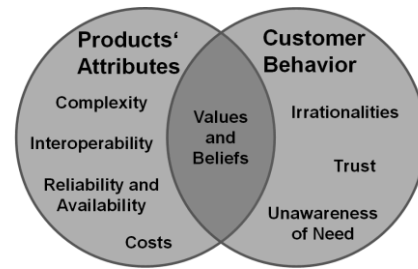


Fig. 3. Barriers of customer acceptance.

Products' attributes describe barriers, which arise from the product itself as they are perceived by customers. The attribute itself is not relevant but the perception by the customer. For example, the barrier complexity does not focus the product's complexity but how complex a product is perceived by the customer. The more complex a customer perceive a product, the more difficult a product is to understand and to use, which is a matter of the product's usability.

Customer behavior describe barriers, which arise from feelings and behavior from customers, which might be influenced by the product. However, those barriers are not based on products' attributes.

A special case of the barriers is "values and beliefs", as this barrier is based on the customer and its behavior and the product itself. For example, one issue of values and beliefs is sustainability. People evaluate sustainability differently, some people only use sustainable products, and other people do not care about products' sustainability. On the other hand, the perceived sustainability depends on the product, electrical vehicles are perceived as more sustainable than conventional gasoline-driven cars.

A. Costs

The overall price of purchase costs, operating costs, and disposal costs are too high for the customer and prevent the customer from buying a product. However, only the costs of purchase can be a barrier for customers, while customers might accept higher operating costs [22]. The so-called vendor-lock-in, which describes the transactions costs for customers to switch to another vendor [23], [24]. Furthermore, customers might deny to purchase a product because of the fact, that they need it only once. The costs of purchase could be too high for customers to finance it by cash or credit [25], [26].

B. Reliability and Availability

Customers might be not convinced about the product's reliability or about the stability of software-processes. This reservation prevents customers to purchase new or innovative products. The saying "never touch a running system" describes the core of this barrier: customers tend to keep known and established products than trying new, maybe better products. For this category, privacy protection is also

relevant, as it becomes increasingly important for business-to-business markets and business-to-customer markets [26].

The aspect of availability deals with the problem that a product cannot be delivered on time or at all. There are various options as the non-availability of a whole product, a spare part or a product is not available in a particular composition [27].

C. Complexity

This category describes the product's complexity perceived by the customer. The current high level of technology or products of higher functionalities might complicate the usage and the understanding of a product [22]. However, the product itself is not the only difficult issue. Owning a product causes administrative efforts as well as efforts for starting it up [28]. This problem is closely related to the area of usability, as the lack of usability might be a barrier of customer acceptance [28].

D. Interoperability

Interoperability is the ability of different systems to work together. This requires certain industry standards and the combination and integration of products in an existing system landscape [29]. Another topic is inadequate infrastructure and market penetration. As electrical vehicles are becoming more popular, a lot of people are chilled by the fact, that there are not enough charging stations [22]. A low market penetration of a certain product might be a problem for the customer. However, a too high market penetration could be also a barrier for purchase because of the lacking exclusivity [30].

E. Unawareness of Need

This issues describe the phenomenon that a customer does not purchase a product, because he is not aware of his own need for the product. This can be caused in three reasons: first, a customer does not know about a new product and its advantages. In the case of construction industry, a building company do not know about a new tool that saves construction workers time and results in a higher overall productivity. Second, an existing problem may not have been identified, resulting in a new demand. The third and last type is a lack of necessity. A motorcycle driver may not realize that he has the need for an ABS-brake-system as long as he did not use one [26], [31].

F. Irrationalities of Customers

Irrational behavior of customers might bias their purchase decisions. The prospect theory of [32] describe several irrational phenomena, which influence customers' purchase decisions. Exemplary effects are relativity bias [32], [33], anchoring effect [32], [34], availability bias [32], [35] or the mere-exposure effect [36]. Those effects are faced by marketing strategies and methods but not in product design [37].

The availability bias describes that facts, events and probabilities that are most recent or most salient and distinct on the mind are usually overvalued in their weight or significance in decision making [35]. In its original definition, [38] term the availability bias as a heuristic of human

thinking that is a "useful clue for assessing frequency or probability, because instances of large classes are usually better and faster recalled than instances of less frequent classes". For example, the brand of Mercedes-Benz is widely considered to stand for luxury and hence for high quality. Yet, their cars are ranging midfield in rankings on quality [34]. Since the association of high quality and Mercedes-Benz are easily accessible (easily available) in the minds of customers, they tend to overvalue the quality criteria for Mercedes-Benz cars.

G. Trust

A customer may lack trust in a particular product but he could also lack trust in a whole company and therefore refuse to buy the company's goods [26]. This can be caused in negative experiences with a previous product of the same provider, a lack in expertise to evaluate a product thoroughly or defective packing and instructions manuals [39], [40]. Some customers do only trust one provider and they are loyal to this company and do not try other products than provided by this company. This may be caused by bad reputation or poor sales staff and other sales channels [41]-[43].

H. Values and Beliefs

Environmentally friendly and sustainable products are ever more demanded [22]. In addition, trends such as increasing frugality can be witnessed in many modern societies. Often people do not buy a car because they have no use for it, but also because they do not want and need it as a status symbol [44].

In a heterogeneous world, where products and services are offered worldwide, also social, ethical, cultural and religious barriers play an important role in customer acceptance. A product that may be marketed easily in European countries might face strong denial in Arabian countries [26], [45].

IV. CONCLUSION AND OUTLOOK

According to our definition of customer acceptance, we have identified eight categories of barriers for customer acceptance. Those barriers are effects and phenomena of customer behavior and products' attributes as they are perceived by customers. Some of those barriers, like costs, are already faced by conventional product design. However, conventional approaches focus on influencing the product attributes itself and not the perception by the customer. Other barriers from customer behavior are approaches from marketing, which are not considered in product design. We claim that those barriers can be considered into product planning using the approach of PSS. For example, providing a PSS as a use-oriented or a result-oriented solution conserves the customer from the total costs of purchase, as the customer only has to pay per usage or per result. Our work shows that there is a need for research for the second part of our research question, how PSS can influence barriers of customer acceptance. To answer this question, our future work will focus the single barriers. For this, we will analyze the barriers and how PSS can increase customer acceptance by reducing or eliminating those barriers.

ACKNOWLEDGMENT

We thank the German Research Foundation (Deutsche Forschungsgemeinschaft – DFG) for funding this project as part of the collaborative research center ‘Sonderforschungsbereich 768 – Managing cycles in innovation process – Integrated development of product-service-systems based on technical products’. Furthermore, we would like to acknowledge the support of Sebastian Schweigert, who made a valuable contribution to this research by his extended literature research.

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