SUSTAINABLE PRODUCT-SERVICE SYSTEM REQUIREMENTS IN FASHION RETAIL

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ABSTRACT

Product-Service System (PSS) arises as dematerialization strategy to consumption and reduction of firms' environmental impact. This paper aims to integrate requirements for designing a sustainable PSS in the context of department stores. We identified requirements for a PSS offer through a literature review and focal groups with customers and managers of department stores using the Value Proposition Analysis tool. To prioritize the requirements demanded, we carried out a survey in Southern Brazil with 160 department store customers. Technical and process requirements were prioritized using the Quality Function Deployment (QFD) and, based on the Product Service Blueprint, the PSS processes were designed. Among the requirements prioritized, the following were cited: the use of more sustainable fabrics and packages, and the absence of store lines. The prioritized processes of support, product use, and services were designed using the Product-Service Blueprint indicating the stakeholders involved, the integration points, and the sustainability reach point.

Keywords: PSS; Requirement integration; Sustainable PSS; Fashion retail

1. INTRODUCTION

The dematerialization of consumption is seen as a solution to reduce environmental impact. Several authors have studied the concept of product-service system (PSS) as a strategy of consumption dematerialization and a possible solution for the reduction of environmental impacts (e.g., Mont, 2001; Lee et al., 2012).

PSS is a solution based on the combination of products and services that focuses on delivering value to the customer generating less environmental impact than traditional offers, because what is commercialized is the right to use the good and not its property (Baines et al., 2007).

Most studies of the PSS literature have been developed in the manufacturing industry context (Kim et al., 2015). Research on PSS development focuses on integrating services into the main product-based offer through servitization. In this sense, service providers and, more specifically, retail can be an important link between industry and customers, making sustainable PSS offers possible.

The fashion industry perceived the need to innovate its business models with the aim to reduce environmental impact (Business for Social Responsibility, 2009). One way to innovate business models is through PSS. According to Heiskanen and Jalas (2003), PSS reduces dependence on natural resources and increases product quality and lifespan, as well as customer satisfaction.

The application of PSS in retail is still a novel subject with literature gaps (Armstrong, Lang, 2013; Hu et al., 2014). Niinimäki and Hassi (2011) indicate customers' interest in services such as leasing, participatory design, and repair services. However, because product ownership is important for status reasons, in cases such as high fashion clothing, the functional offers of PSS may not be attractive to customers (Armstrong, Lang, 2013).

Fashion libraries are a good example of collaborative consumption, such as the Albright Fashion Library in New York. Clothes, shoes, and accessories are lent at reasonable rates with a collection that grows and changes every week, thereby holding users' interest (Armstrong et al., 2016). Another example of PSS in the fashion industry is Mud Jeans from the Netherlands, which offers a rental contract for jeans made from recycled cotton. Additionally, it offers repair services for rented products. Another emerging business model is clothing exchange. An example is the Swap Meet Ups in New York where a fee is charged for exchanging items. Another option is the consulting service, which increases the lifecycle of clothes by giving customers tips on how to combine the clothes they already own and which, generally, have been unused for a long time because customers' do not know how to wear them. An example of such a model is the Coset Dash which offers individual style counseling by videoconference or in person (Armstrong et al., 2016).

Regarding PSS requirements, incorporating subjectivity, uncertainty, imprecision, heterogeneity, and fluctuation in requirement definition is still a challenge. The evaluation of PSS domain requires a specific focus with feedback loops in requirement engineering steps (Vasantha et al, 2015).

Literature still lacks studies and approaches of requirement engineering that consider the requirements of the product-service system in an integrated way considering the characteristics of PSS offers (Berkovich et al., 2011). Some initiatives propose the use of Quality Function Deployment (QFD) adaptations for PSS offers (eg Kim, Yoon, 2012, Li et al., 2016), but they present deficiencies. In addition to the QFD tools for identification and prioritization of requirements in the first phases of requirement engineering (elicitation and analysis), it is necessary to incorporate other tools for value identification, such as Value Proposition Analysis (Osterwalder et al., 2014) and for PSS offer design such as Product Service Blueprint (Geum; Park, 2011) and Sytem Map (Vezzoli, et al, 2017).

In this context, the objective of this paper is to identify and prioritize requirements for sustainable PSS offers in fashion retail services from the point of view of customers, focusing specifically on department stores. Based on the requirements mapped, the prioritized offer is designed considering the process and the concept of prioritized PSS offer.

2. METHOD

The research was carried out in eight steps adapted from Sutanto et al. (2015). In the first step, we conducted a theoretical review on the literature on PSS requirements to identify studies on requirement engineering for PSS, other studies on sustainable fashion retail and sustainable PSS in fashion retail. We did not find research papers addressing the requirements of Sustainable PSS in fashion retail.

In the second step, Value Proposition Analysis (VPA) was used to contextualize the problem and to identify both the needs of the stakeholders involved and the value proposition that would meet customers' demands in the context of fashion retail (Osterwalder et al., 2014). To this end, a focus group was held with 9 customers from fashion retail department stores selected by convenience. The voice of the customer was identified through the focus group. We organized it, eliminated redundancies, and ranked requirements at first-order level according to their similarities. Subsequently, an interview was conducted with two fashion retail department store managers to fill the second stage of the VPA.

In the third step, the quantitative research instrument was built for requirement prioritization. In addition to the questions regarding sustainable PSS requirements in fashion retail, we added questions related to the profile of the respondents, such as: age, gender, and frequency of service use.

Next, the quantitative research instrument underwent the evaluation of a specialist with academic background and a user of fashion retail department stores. Based on the feedback obtained in the evaluation of specialists, im-

provements were made to the instrument and, afterwards, we ran a pre-test with four users to verify if the questions were clear and easy to understand.

In the fifth step, the instrument was applied with 160 users of fashion retail. The questionnaire was designed using Google Forms and sent via social networks and email. Sampling was non-probabilistic and by convenience, mainly covering respondents from Southern Brazil.

In the sixth step, the collected data were tabulated, and the descriptive analysis was executed to identify the prioritized requirements. Respondents' profiles were analyzed, and after that we calculated the prioritization of the quality items demanded by the customers considering the importance index defined by the users in the questionnaire (IDi), the strategic evaluation (Ei), and the contribution to sustainability (Si).

From the prioritized requirements, we applied the QFD tool (Ribeiro et al., 2001). In the quality matrix, the first quartile (25%) of the prioritized requirements was used. For each requirement demanded by the customer, we assigned corresponding technical requirements and, subsequently, the relationship of these technical requirements with the requirements demanded by the customer was evaluated. Based on the quality matrix, we built the process matrix. To that end, all the processes of the offer were deployed to evaluate the relation of the processes with the technical requirements. The definition of the technical requirements, the processes, and the filling of the matrices was conducted by specialists in the area.

Finally, in the last step, the necessary processes for the delivery of the prioritized PSS offers were designed using the Product Service Blueprint tool (Geum; Park, 2011). In the Product Service Blueprint, the critical processes that were prioritized in the QFD process matrix were highlighted. The design of the prioritized concept for the PSS offer was made using the System Map tool (Tischner; Vezzoli, 2017), which synthesizes the main stakeholders and their relationship in the new offer.

3. RESULTS

3.1 REQUIREMENTS PRIORITIZED BY CUSTOMERS

The requirements identified through the VPA were prioritized based on the customers' declared importance in the quantitative research. Customer importance was weighed based on the strategic market evaluation and contribution to the sustainability of the offer.

Among the prioritized requirements, the following sustainability-related ones were highlighted: use of fabrics that cause less environmental and social impact, use of sustainable packaging, possibility of returning the clothes to the store after use, and consulting to assist in the combination of old pieces of clothing.

Service requirements have also stood out, with three of them ranking among the eight priority ones: warranty for merchandise quality issue, repair and alteration service, and various payment options in the place and remotely. Priority requirements also include the absence of lines, which is a requirement of customer experience.

3.2 DEPLOYED PROCESSES

In the quality matrix, only the first quartile (25%) of the prioritized requirements was used. The requirements demanded by the customers were associated with the corresponding technical requirements, as defined by the researchers and a department store manager. For each requirement demanded, at least one technical requirement was defined. The main prioritized requirements were the number of service channels available, parts' lifecycle, fabric degradation time in the environment, number of consultants assisting in outfit matching and packaging degradation time in the environment.

After the construction of the demanded quality matrix, we designed the process matrix by relating the prioritized technical requirements from the quality matrix with the process steps of the department store offers. The following processes were prioritized: consulting in the combination of parts, raw material selection, recycling of fibers, selection of suppliers, employees' hiring and training.

3.3 DESIGN OF THE PRIORITIZED OFFER

Based on the requirements prioritized by customers, the prioritized offer was designed using the Product Service Blueprint tool. In the PSS offer, presented in Appendix 2, the whole process was graphically drawn, from production until the customer returns the clothes to the store for fiber recycling.

The prioritized processes in the process matrix of the QFD tool were highlighted, according to table label. The offer presented an economic point of value (the payment), four points of product-service integration and four points of sustainability.

In the designed offer, several services were added with the purpose of increasing product lifespan. The PSS offer also allows the customer to return pieces to the store, which becomes responsible for heading them to an outsourced company to recycle fibers, and afterwards use fibers to manufacture new products. This PSS model can be classified as product-oriented, since services were added to increase the lifespan, but the customer still holds the ownership of the product, as prioritized by customers.

Finally, the concept of the PSS offer was designed using the System Map tool (Appendix 1). In the concept, the relationship between the main stakeholders of the offer can be identified, namely: the customer, the department store, the manufacturer, and the distributor.

4. CONCLUSION

This paper addressed sustainable product-service systems in fashion retail, focusing specifically on department stores. The objectives were to identify the demands of the customers, prioritize such demands and, finally, to design the prioritized offer.

The work provides a methodology to design a prioritized PSS offer for fashion retail based on customers' demands, which is still a recent issue in the literature.

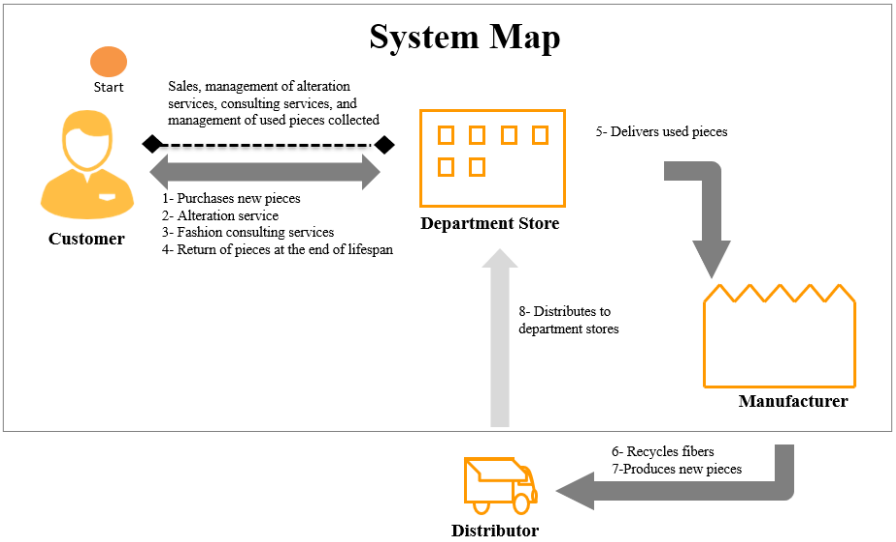
A limitation of our paper was that the requirement prioritization only considered customers' point of view and the strategic analysis based on a consensus among the authors, without the presence of fashion retail specialists. Future research could validate the requirements of other stakeholders of the offer, such as retailers, manufacturers, and distributors.

For future work, an analysis of economic and technical feasibility is suggested, as well as follow up on the development and implementation steps of the proposed PSS offer. Finally, another suggestion for future research is the application of this methodology in other segments of retail, such as home appliance retail, which already presents a tendency of consumption dematerialization.

6. REFERENCES

1. Armstrong, C.m. & Lang, C.; (2013). *Sustainable Product Service Systems: The New Frontier in Apparel Retailing?* RJTA Vol. 17 No. 1.
2. Armstrong, C. M.; Niinimäki, K.; Lang, C. & Kujala, S.; (2016). *A Use-Oriented Clothing Economy? Preliminary Affirmation for Sustainable Clothing Consumption Alternatives*. Sustainable Development, 24, 18.31.
3. Berkovich, M. & Leimeister, J. M.; (2011). *Requirements Engineering for Product Service Systems: A State of Art Analysis. Business & Information Systems Engineering*.
4. *Business for Social Responsibility*, (2011). Apparel Industry Life Cycle Carbon Mapping. Disponível em: <http://www.bsr.org/reports/BSR_Apparel_Supply_Chain_Carbon_Report.pdf>. Acesso em: 05 de maio de 2018.
5. Lee, S.; Geum, Y.; Lee, H. & Park, Y.; (2012). *Dynamic and multidimensional measurement of product-service system (PSS) sustainability: a triple bottom line (TBL)-based system dynamics approach*. Journal of Cleaner Production, (32) 173-182.
6. Li, T.; He, T.; Wang, Z. & Zhang, Y.; (2016). A QFD *Based Evaluation Method for Business Models of Product Service Systems.* Hindawi Publishing Corporation.
7. Geum, Y. & Park, Y.; (2011). *Designing the sustainable product-service integration: a product-service blueprint approach. Journal of Cleaner Production*, 1601-1614.
8. Heiskanen, E. & Jalas, M.; (2003). *Can services lead to radical eco-efficiency improvements? A review of the debate and evidence*. Corp. Soc. Responsib. Envoron. Manag. 10(4), 186 e 198.
9. Hu, Z. H.; Li, Q.; Chen, X. J. & Wang, Y. F.; (2014). *Sustainable Rent-Based Closed-Loop Supply Chain for Fashion Products*. Sustainability.
10. Kim, S.; Son, C.; Yoon, B. & Park, Y. (2015). *Development of na Innovation Model Based on a Service-Oriented Product Service System (PSS)*. Sustainability.
11. Kim, S. & Yoon, B. (2012). *Developing a Process of concept generation for new product-service systems: a QFD and TRIZ-based approach. Springer*, 6: 323-348.
12. Mont, O. (2001). *Introducing and developing a PSS in Sweden*. IIIEE, Lund University, p.6.
13. Niinimäki, K. & HASSI, L. (2011). *Emerging design strategies in sustainable production and consumption of textiles and clothing*. J. Clean. Prod. 19, 1876 e 1883.
14. Osterwalder, A., Pigneur, Y., Bernarda, G. & Smith, A. (2014). *Value Proposition Design*. Wiley.
15. Ribeiro, J.l.d.; Echeveste, M.l. & Danilevicz, A.m.f. (2001). *A utilização do QFD na otimização de Produtos, Processos e Serviços.* Fundação Empresa Escola de Engenharia da UFRGS.
16. Tischner, U. & Vezzoli, V. *Product Service System: Tools and cases*, 2017. Disponível em: http://www.d4s-sbs.org/MC.pdf. Acesso em 10 dezembro de 2017.
17. Vasantha, G. V. A.; Roy, R. & Corney,J. R.(2015). *Advances in Designing Product- Service Systems*. Journal of the Indian Institute of Science.
18. Sutanto, A.; Tjahjono B.; Yuliandra, B. & Hadiguna, R. A. (2015). *Product-service system design concept development based on product and service integration*. J of Design Research.

APPENDIX 1
System Map of the prioritized PSS offer



APPENDIX 2
Product Service Blueprint of the prioritized PSS offer