

# 21 Exploring Student Perceptions of Product-Service Systems

*Pierre Yohanes Lubis*

*Department of Design, University of Waikato,  
Hamilton, New Zealand*

*Bahareh Shahri*

*School of Product Design, University of Canterbury,  
Christchurch, New Zealand*

## Introduction

There is much interest in the topic of Product-Service System (PSS), which can be defined as the network, infrastructure, and governance structure needed to “produce” a product-service (Tischner & Tukker, 2006) and the perception towards PSS has been well documented. One study found the public has concerns that a PSS always entails entering into contract-based service agreements (Cherry & Pidgeon, 2018). Other studies focus on small and medium enterprises (Hernandez-Pardo, Bhamra, & Bhamra, 2013; Rapitsenyane, 2014) and consumers (Armstrong, Niinimäki, Kujala, Karell, & Lang, 2015; Catulli & Reed, 2017; Long, Wang, Zhao, & Jiang, 2016). Insights to students’ perception towards various design approaches towards a circular economy are available (Ramirez, 2007a, 2007b, 2018). However, studies are lacking in terms of PSS designs, addressing the problems of people living in poverty. This study sets out to investigate Product Design students’ perceptions towards PSS to provide a richer set of perceptions towards PSS across a different demographic, less privileged communities. This study explores how students perceive PSS, its significance, and positioning in the field of Product Design. Student comprehension is an important factor to examine the success of PSS education.

## Background

“No Poverty” is first on the list of Sustainable Development Goals, the latest iteration of the sustainable development agenda first set by the United Nations (UN) in 1992. However, Polak (2009) argued that the strategies employed by the UN are heavily flawed. Big infrastructure investments, agriculture projects, and budgets controlled by governments of developing countries have failed multiple times in the past and have simultaneously undermined all the efforts of the poor rural people living on small farms. Emphasized on top positions of power (i.e., governments, institutions, and corporations), they are treated as an outlet for philanthropy without considering the outcome of such actions. Heffner (1975) argues that the outcome

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is where the judgment should have been placed rather than upon the intentions. It is self-evident that no amount of increase in donations, national economic growth, and big business is truly capable of ending poverty (O'Shea, 2013). Various forms of free-market capitalism, however, have lifted more than a billion people in developing countries out of poverty between 1990 and 2010 (Horwitz, 2016; *The Economist*, 2013). Moreover, markets generally work better as compared to government planning (Sowell, 2001). Philanthropy can impede human dignity, but market-based solutions can foster community engagement and cultivate self-esteem. Manzini (2015, 2019) elaborated on how people (re)discover the power of collaboration to increase their capabilities, and how this (re)discovery gives rise to new forms of collaborative organization and design intelligence. Esteem, according to Maslow (1943), is desired by all people who need a stable and firmly based high evaluation of themselves, for self-esteem and for the esteem of others.

Scholars classify poverty differently. Some maintain it at \$2 a day while others look to whether certain people have access to basic services or whether they are excluded from the social and political sphere (Karnani, 2016; London, 2007, 2008). Scholars also acknowledge the ineffectiveness of traditional development strategies in addressing the problems of the poor and suggest a market-based approach instead (Hart, 2007; London, 2008; Prahalad, 2006). Labeled as designing for the Base of Pyramid (BoP), this approach reframes the poor as small business owners and entrepreneurs. The focus on BoP has shifted to PSS design regarding addressing poverty (Emili, Ceschin, & Harrison, 2016; Jagtap, Larsson, & Kandachar, 2013; Letaifa & Reynoso, 2015; Santos, De Sampaio, Silva, & da Costa Junior, 2014; UNEP, 2006). The International Learning Network on Sustainability (<http://www.lens-international.org/>), a network of universities with the aim of internalization, intercultural cross-fertilization, and accessibility to Design for Sustainability, focuses on Distributed Economy and PSS for communities of middle- and low-income context. PSS with such focus can be categorized as PSS design for the BoP (Ceschin & Gaziulusoy, 2016).

Researchers and designers have focused more on social issues and exploring design implications for the BoP compared to the previous decade (Castillo, Diehl, & Brezet, 2012; Ceschin & Gaziulusoy, 2017). The main focus of a PSS is the customer's satisfaction rather than exchanging product ownership (Aminoff & Kettunen, 2016), and a sustainable PSS focuses specifically on solutions that reduce environmental impacts, lower usage of resources, and minimize waste (Clark, Kosoris, Hong, & Crul, 2009; Kang & Wimmer, 2009), thus, contributing to sustainable development (Retamal, 2017). Designing a PSS requires better insights into the stakeholder's value chain and the cultural and economic dimension of the stakeholder denotes the requirement for a tailor-made design process. The pursuit of a universal solution is futile as the context differs across the board. However, the lack of individual ownership in a PSS may present problems concerning individuality, but there is a considerable amount of control that can be retained in terms of product use. The product has a lower likelihood to be misused or abused. The integration of services to a product increases community involvement. The expansion of design activity to include service design also supports the concept of sustainability. By designing both products and services holistically, designers

are now designing systems. This is in complete accordance with the mindset of sustainability, which emphasizes the interconnectivity of things and how everything should fit together in a system.

The market for PSS innovations is growing and the awareness towards sustainability is increasing. However, the topic of sustainability at universities is mostly limited to the discussion of material sciences, material resourcing, life cycle, and recycling, without much emphasis on social innovations. The failure of complete comprehension of the concept of sustainability is also demonstrated in how most sustainable design tools underperform in a pillar of sustainability (Ahmad, Wong, Wong, & Tseng, 2018). To establish a firm grasp of sustainability facing global concerns, we should include the design for poverty and people living at the BoP. Thus, it is important to measure student comprehension of PSS education.

### **Research Approach and Methods**

To understand the students' position in the introduction of PSS in developing countries, a qualitative approach was used in this study. The participants were seven volunteers from the third (final) years in the bachelor's degree of Industrial Product Design. All third-year students were approached to participate since they were tacitly posited to have sufficient knowledge and skills in the field of Product Design. The students were invited to participate via emails and posters on news bulletin boards around the School of Product Design at one university in New Zealand, from mid-March to mid-April 2020. Interested students then contacted the researcher via email, and a time for interviewing was arranged. Before the interview, participants were provided with a sheet containing all the information about the study along with a consent form to sign. This study was conducted in accordance with the Declaration of Helsinki and the protocol was approved by the Human Research Ethics Committee of the University of Canterbury. The method of data collection was a semi-structured in-depth interview, conducted in two parts, with the assistance of visual research tools, inspired by IDEO Human-centred Design Tools: Conversation Starter Cards and the Jakarta Context Board. Conversation Starter Cards contain examples of design solutions specifically targeted at the poor in various regions of the globe. The Jakarta Context Board included examples of PSS found in Jakarta and highlights how they were unique geographically. Visual research tools such as cards help "break the ice" between the interviewer and the interviewee and therefore smooth the interview and keep the topic on point. Cards, as an informal and friendly mode of communication, espouse more casual responses from the participants (Muratovski, 2016). At the beginning of the interview, participants were given a short introduction about the topic and the progression of the interview. They were then handed a series of A7-sized Conversation Starter Cards (Figure 21.1). One side of the card illustrated an image of the intervention and the other presented the name of the product along with a brief explanation. The images were borrowed from 15 design projects. Some of them were in the form of stand-alone products while others were PSS innovations. Most of them were from a cluster of projects called WASH (Wash, Sanitation, and Hygiene) by UNICEF. As



Figure 21.1 Examples of conversation cards.

well as projects conducted by [IDEO.org](http://IDEO.org). The rest were identified and collected by the researcher. Most of them were first introduced in the past 20 years but still operate today. This indicates their high success rate. For instance, the Hippo Roller, a water transportation tool for rural communities which was first introduced in South Africa in 1997, now has expanded to 51 countries.

Participants were given approximately five minutes to observe the cards and then solicited their opinion. This discussion took approximately 25 minutes. Some of the questions asked at this stage were:

- What do you think of these design solutions?
- Which one is your favourite? Why?
- Some of these solutions were crafted due to the weak socio-economic status which prevents people access to basic services, such as sanitation. Do you think these solutions are really necessary?

After participants observed the cards, the interviews were then directed to the context of Jakarta. One of the reasons for this was to present contrast between different regions of the world and consequently seek out if the participants think the examples can be implemented in the Jakarta context. Here, the participants were presented with an A3-sized board (Figure 21.2) that contained 11 examples of PSS innovations found in Indonesia.

Each PSS innovation shown on the board was accompanied by a short description and participants were given five minutes to observe. Participants were then probed about the context and their comprehension of PSS design. This took approximately 30 minutes for each participant. The following are some of the questions asked:

- What do you think of the Jakarta and Indonesian context?
- What do you think about PSS design?
- How do you compare the design of products alone to the design of a combination of products and services?



Figure 21.2 The Jakarta and Indonesian context.

The interviews were carried out until concrete themes emerged, as the answers became repetitive and no more new information was being added (Muratovski, 2016). Thus, the data collection process was concluded after interviewing seven students.

## **Results and Discussions**

As a result of the thematic analysis technique, five different themes were identified.

### *Cultural and Economic Context*

The importance of context was recognized by the participants. Culture has a significant impact on whether a product or service is accepted by stakeholders and thus deemed successful. A product designed to fit a particular demographic may not be as successful when implemented as others. The cultural and economic context holds a significant impact on the appropriateness of the solution. Understanding the target demographic is key to finding solutions that will not go to waste and can survive for a longer time (Murphy, 2016). Designers must immerse themselves in the community to understand the particular group of people that they are designing for (Martin & Hanington, 2019; Muratovski, 2016), as pointed out by three participants.

The examples provided in the Jakarta and Indonesian contexts (Figure 21.2) were unique to the Indonesian and Asian contexts. They were typically in the form of servicemen or -women taking their business to the street, offering various products (e.g., food and beverage, produce, and water) and services (e.g., cobbler, solder, and tailor) to people with lower socio-economic status. They were identified to be PSSs, which focus on customer satisfaction rather than exchanging product ownership (Aminoff & Kettunen, 2016; Bonvoisin, 2016; Clark et al., 2009; Niemann, Tichkewitch, & Westkämper, 2009).

After observing the examples of service providers in Indonesia, participants were asked whether they could acknowledge any difference between the Indonesian context and the culture they were living in. Distinct from developed countries, where the argument for PSS is towards efficiency, sustainability, and the environment, the proliferation of PSS in developing countries is largely due to the lack of affluence.

Several Indonesian PSS innovations are smartphone app-based solutions such as ride-sharing apps (e.g., Go-Jek and Grab), which have been diversifying their services to other areas such as meal and grocery delivery. Diversification of services denotes a successful PSS innovation (Spangenberg, Fuad-Luke, & Blincoe, 2010).

Participants' responses indicate a discrepancy in a "one-size-fits-all" approach to product design. No one solution can be offered to different situations, with different cultures and economic situations. It can also be highlighted that the participants share the global concerns towards different cultures and the context of developing countries. When managing stakeholders, designers should be cognizant of those variations, because doing so can affirm the value of human dignity (Buchanan, 2001) as well as the attempt to see the world from the eyes of the stakeholder (Abrams, Maloney-Krichmar, & Preece, 2004; Hanington, 2017). It is futile trying to create one universal solution that works for everybody, every time. Realistically,

there are no solutions, only trade-offs (Sowell, 2019) the stakeholders are willing to consider. This is why designers should properly identify the type of community and its values first before commencing a design activity (Ceschin & Gaziulusoy, 2017).

### ***Philanthropy or Market-Based?***

On the topic of the poor, participants were asked how poverty should be addressed. What proper method is best to address poverty? The interviewer laid out two different approaches in addressing the poor: philanthropy and a market-based approach. They were then asked which method would work better. Participants acknowledged the shortcomings of a pure philanthropic approach by highlighting how the act of philanthropy could create a dependency on people at the receiving end and only perpetuate the condition. Most agreed that in the long run, philanthropy was not very effective. While philanthropy could help for a short period, their main concern was its sustainability and how to maintain it for a longer period. Studies show that forms of developmental aid do not contribute to long-term economic growth and even damage the development of economic markets (Bourguignon & Sundberg, 2007; Prazeres, 2010). Thus, such solutions cannot be classified as a successful product design because they fail to address the root cause of the problem and benefit the stakeholders in the long run (Easterly & R., 2006).

The balance between the two approaches is often recommended. Participants can relate to the idea that the philanthropic approach is inherently materialistic as it is leaning towards providing products alone without any kind of community engagement. On the other hand, market-based solutions are perceived to be an investment to the community as well as affirm its autonomy (Polak & Warwick, 2013). Adding a service also means putting local people into employment, which is beneficial for economic growth.

The topic of self-sustainability, how a community should be able to sustain itself independently without outside intervention, was also addressed. This is an element of the topic of sustainability that is often overlooked. This contributes to individual self-esteem (the next theme) and gives the individual an optimistic view of life.

### ***The Question of Individualism and Control***

Participants were asked to compare product and a PSS to draw reasoning behind different implications of offering a product alone or a PSS. A conflict of power was acknowledged. In one scenario, a product changes ownership and with it the transfer of authority and control. Thus looms a possibility for the product to be misused. In the other scenario of PSS, there is no ownership transfer and, thus, no transfer of control. The provider retains control and can uphold product use as it is intended. However, the latter scenario can undermine unfair or oppressive cultural inclinations that may exist in particular communities.

The proliferation of PSS innovations in the last decade begs the question of individuality because ownership transfer does not occur. Providers maintain ownership but left the benefit of the product to the clients. This is a shift in the realm of individualism

because ownership of certain properties can indicate certain status for the individual. Owning certain products can mean happiness to certain individuals. Products can serve as an expression of identity and a social marker (Douglas & Isherwood, 1996). Ownership of certain objects can also develop to be a part of an extended self (Belk, 1988; Crewe & Gregson, 1998). Freud coined the term “narcissism of small differences” to explain how communities with adjacent geography and similar way of life are most likely to ridicule and make feuds with each other (Freud, 2002). Similarity, relatedness, and uniformity can drive the individual to break out from conformity. A propensity to separate from others is a way to preserve a sense of self.

Classical liberal scholars recognized property as an economic resource that encouraged individualism, natural possessiveness, entrepreneurship, and self-reliance (Turner, 2008). Hayek (1962, 2013) argues that any infringement upon property entails the kernel of totalitarianism with the statement “where there is no property there is no justice”. Von Mises and Greaves (2005) echo this by stating the property is the soil in which the seeds of liberty are nurtured and in which the autonomy of the individual and ultimately all intellectual and material progress are rooted.

People prefer to buy products that induce emotional attachment to their owners (Livette, 2006; Schrader, 1999) and appreciate ownership of products that deliver value and project meanings about themselves (Barone, Shimp, & Sprott, 1999; Belk, 1988). This indicates that consumers expect more than just functionality from a product (Catulli, Cook, & Potter, 2017). PSSs, therefore, restrain the struggle for individualism because they lower attachment to the product (Bardhi & Eckhardt, 2012; Moeller & Wittkowski, 2010). Nevertheless, this does not entirely diminish the possibility of attachment to the product (Chen, 2008) because other kinds of relationships with the product can happen. It only indicates that personal ownership is being gradually replaced by more sharing platforms. Participants were able to point out several things that could have been transformed into PSSs to avoid inefficient use of resources. Therefore, it is important to identify consumer identity in the diffusion of sustainable consumption solutions such as PSS (Catulli et al., 2017).

### ***The Expansion towards PSS Design***

A PSS can be defined as a marketable set of products and services capable of jointly filling a user’s need (Goedkoop, van Halen, te Riele, & Rommens, 1999). Therefore, the field of Product Design is being expanded through the integration of services. Product Designers are required to widen their horizons to see the “big picture” and with it, the implicating complexities. Since its conception, the Product Design field has only been concerned with matters like aesthetics, ergonomics, and manufacturing. The integration of services adds many coinciding factors to be considered. The participants were asked if they were aware of this transformation in the Product Design field. They affirmed the potential complexities of service integration and were perfectly aware that it affected the field of Product Design. This expansion was welcomed as it was comprehended to be a better way to engage the stakeholders. This attitude can be traced back to education on sustainability, which encourages us to perceive everything in terms of systems and not overlook

the impact of one chain link with other links in the strand. Given the larger scope of PSS, it requires better insights into the context of design and innovation (Reinders, Diehl, & Brezet, 2012) as well as stakeholder value chains (Ceschin & Gaziulusoy, 2017). The integration of services can lead to a better relationship with the community and, therefore, improve the product and services. By engaging the community, designers can offer more effective products that the community wants and needs. Participants acknowledged this is an opportunity for designers to engage more closely with the community as well as obtain feedback from them and, therefore, update, upgrade, and maintain the product where necessary.

### ***PSS, Sustainability, and the Future***

Participants hold the view that sustainability can be achieved regardless of geographical constraints. Most participants also acknowledged that PSS follows the concept of sustainability, especially in terms of the decrease in materiality through sharing the benefit of products and services collectively (Clark et al., 2009; Kang & Wimmer, 2009). Users benefit from a cheaper buy-in and providers have an opportunity to make profits. PSS offers advantages over offering products alone, including the success rate of implementation and related economic growth. The community can become involved with the product and services. By integrating a service, trained specialists can disseminate product usability and benefits to the target users as well as maintain the product to operate optimally.

In microeconomic theory, an implicit cost is a type of opportunity cost that equals something a company already owns and does not pay rent for (Lipsey, 1975). This is an area on which many PSS innovations are focusing. For instance, a man who drives his car to work daily and lets the car sit stationary the whole time he is at work is suffering from an implicit cost by not offering the car to be rented, making a profit for the owner. This leverages owners to commercialize the benefits of a product that they own. By doing so, more people benefit from a single product instead of the owner alone. This reduces the material needed to satisfy a particular need.

By designing systems rather than products alone, product designers are on the path of the pursuit of sustainability because collaborating with organizations, businesses, policy-makers, and community members are some of the quickest paths we can take to achieve sustainability (Wright & Ceroni, 2017). Participants agreed that the transition to PSS design would be unavoidable and already happening organically.

### **Conclusion**

Studies demonstrated the shift of focus to PSS design when addressing the poor. This is largely due to the failure of traditional approaches and their underwhelming results. PSS design as an alternative approach enhances community engagement and affirms human dignity. Literature shows how various demographics perceive PSS. This study aimed to build on these previous findings and further examine how industrial product design students comprehend PSS design and present its current standing in academia.

The results section began with the discussion of the importance of cultural and economic context in regards to PSS design and the part that followed touched on how PSS design reframes the poor as enterprising people with a lot to offer. How a lack of ownership in a PSS can be a detrimental force to the human psyche was discussed, reinforcing various studies that confirm people still regard the value of ownership quite highly (Bardhi & Eckhardt, 2012; Catulli, 2012; Cherry & Pidgeon, 2018; Moeller & Wittkowski, 2010). This also presented a conflict between control and proper product use. The shift to PSS was discussed at the end along with the transformation of the design field. Finally, the viability and future of PSS education were raised in close association with the overarching concept of sustainability.

The development of PSS design can be linked with the increasing awareness of the concept of sustainability worldwide and how people are increasingly striving to be more sustainable. This can be interpreted as an achievement for the Sustainable Development Goals set by the UN. In any case, the market for sustainable products and services is growing more than ever before.

The literature review showed the lack of focus on PSS comprehension in the case of industrial product design students. This study addresses that gap through the discussion of various themes and the aspects of PSS design with the students. The evidence suggests that students were able to identify characteristics of a PSS and its impact as well as map PSS in the bigger scope of sustainable design. Students were able to list the advantages of PSS innovations and, therefore, were deemed capable of building a compelling case for it.

This study explored how students perceive PSS design, along with its characteristics and implications. The study has revealed students' perception of the product design field that is evolving to embrace sustainable approaches to address the needs of people living in poverty. Students understood the scope of sustainable design and the connection between PSS and sustainability was established.

### Limitations and Future Research

This study is limited to the scope of one university and lacks an extensive review on the input of PSS design education, e.g., the amount of PSS content in the curriculum or the number of lecturers well-versed in the subject. Future research could investigate a larger scope and such research could present a more impactful insight to design pedagogy.

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