



DESIGNING A PRODUCT SERVICE SYSTEM: DOES CONGRUITY ADD VALUE?

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Product Service Systems (PSSs) are combinations of products and services that are brought together to the market to fulfil consumers' needs (Goedkoop et al., 1999). When using PSSs, consumers experience product and service elements as one. Consequently, consumers' evaluations of the total offering are based on the integration of the product and service elements that encompass it. However, the intrinsic differences between products and services may complicate the successful integration of these elements and create incongruities. This research studies the influence of (in)congruities in the evoked symbolic meaning on consumers' evaluations of a PSS. Results of this study suggest that congruent offerings can create assurance with consumers (i.e., reduce the perceived risk), resulting in a more positive evaluation of the complete offering. This project was sponsored by the Creative Industry Scientific Program (CRISP), which focuses on the design of PSSs as a means to stimulate the continuing growth of the Dutch Design Sector and Creative Industries.

INTRODUCTION

Product Service Systems (PSSs) are combinations of products and services that are brought together to the market to fulfil consumers' needs (Goedkoop et al., 1999). The design of this type of offering is an area of increasing attention for academics and practitioners. During the last decade, academics have studied the benefits for companies relying on this type of offering (e.g., Morelli, 2003; Tukker and Tischner, 2006; Williams, 2007; Tukker, 2004; Baines et al., 2007; Mont, 2002). Similarly, reports from practice suggest an increased interest from organizations, which following the success of market pioneers, have

acknowledged the potential impact PSSs can have on customer retention and satisfaction. An example of a company that has successfully introduced a PSS is Apple. Apple sells the iPod to consumers (i.e., the product) and presents them with the option of buying music and applications online (i.e., the service).

What differentiates PSSs from conventional choices is the significance that both the product and service elements of such offerings have to the consumer. While traditional products often comprise service elements and vice-versa (Shostack, 1977), it is the product (or the service) around which strategies are created. For example, when buying a new television, a consumer may have access to a service warranty. However, this warranty does not considerably influence the interaction between the consumer and the television, or his/her experiences with it. Similarly, a visit to the hairdresser has a high content of service interaction with the employee, where the haircut and service become central to the experience, and where not necessarily a tangible product is purchased. In contrast, when using PSSs product and service elements are both important and jointly influence consumers' experiences with the offering.

The combination of both product and service elements makes the development and commercialization of PSSs an aspect of critical consideration. Products and services clearly have different characteristics (Zeithaml and Bitner, 2000, p. 11). Products are tangible and manufactured. The quality of products is relatively constant and easy to control because products are designed following specifications enabling uniformity among series of the same product. When consumers buy a product its ownership is transferred to them. Consequently, products are available to those who purchase them at all times, and for as long as the product lifecycle permits it. Services, on the contrary, are intangible and cannot be manufactured. A service is an activity with economic value that takes form the moment it is accessed. The interaction between consumer and service provider is recurrent and particularly important for a positive impression formation. The quality of a service can be variable and difficult to control (Zeithaml, 1981) as it highly depends on, among others, employees' behaviour and environment (Parasuraman et al., 1985; Bitner, 1992). Hence, employees are often part of the service organization and are trained to reflect corporate values towards clients.

Despite their intrinsic differences, PSSs bundle products and services into one complete offering. The integration of product and service elements takes place through the system. In the example of the Apple iPod, the system is represented by iTunes. Through this platform, consumers can access the service that Apple provides (i.e., purchase of music and applications), while the product facilitates the interaction between consumers and service provider.

The integration of product and service elements, with different characteristics, may influence the way consumers evaluate PSSs. Consumers make use of different cues to draw inferences about quality. Among others, products' tangibility allows consumers to use materials, shapes, colours or sounds, to assess the value and quality of a product (Schifferstein and Desmet, 2008). For services, consumers may turn to the surroundings to find cues about the service's quality, when the service experience is difficult to assess (due to the service's intangibility

heterogeneity and inseparability; Parasuraman, Zeithaml, Berry, 1985). Booms and Bitner (1981) named those ensembles of cues servicescapes: "the environment in which the service is assembled and in which the seller and customer interact, combined with tangible commodities that facilitate performance or communication of the service" (p. 36). For example, consumers may use the colour and style of the uniform of flight attendants as a quality cue for an airline. Also, chairs' comfort, food, space, or displayed information may influence the service experience and perceptions towards the airline. Consequently, consumers evaluate products and services in an integrative manner by combining the different cues available in their evaluation (Van Rompay et al., 2009; Van Rompay et al., 2010; Mattila and Wirtz, 2001; Bitner, 1992). For PSSs, both product and service elements may become particularly important for consumers' evaluations of the offering. Hence, consumers may not only look at the tangible elements of the product but also turn to elements of servicescapes to draw conclusions about the PSS.

The intrinsic differences between products and services represent a challenge for the successful integration of these elements from a consumer's perspective. The symbolic benefits that consumers experience in the various elements of a PSS may differ or even conflict. For example, a fully customized service element may provide the important symbolic benefit of self-expression because it conveys a person's uniqueness, whereas a standardized product element may fail to do so (Mugge, Schoormans, and Schifferstein, 2009). Failure to provide a congruent experience can be expected to confuse the consumer, and ultimately, damage the user experience.

Despite the relevance of developing congruent PSSs that are perceived as one total offering, research on how consumers experience PSSs is limited. This research contributes to the literature by investigating how consumers experience and evaluate these particular offerings. Specifically, we explore the influence of congruity with respect to the conveyed symbolic meaning (i.e., by both the service and product elements) on consumers' evaluations of the PSS.

Congruity in PSSs

The term congruity refers to the extent to which two or more objects (e.g., products, brands, people, images, companies, text, groups), correspond to each other. The correspondence can take different forms: meaning, functionality, usability or shape can all influence congruity. Past research has studied the effect of congruity on consumers' perceptions and evaluations of products or services (e.g., Bitner, 1992; Mattila and Wirtz, 2001; Patrick and Hagtvedt, 2011; Bosmans, 2006; Van Rompay, 2010). Van Rompay et al. (2010), for instance, studied congruity effects for services purchased through a website. In their research, congruity was defined by the resemblance in (symbolic) meaning, elicited by the different elements depicted in the website (i.e., text and product image). Thus, a picture advertising a hotel that is cosy should be accompanied by describing text reflecting the same attributes. Conversely, a picture-text combination that does not share the same attributes can create negative effects on

the shopping experience. Other studies have found similar findings for different scenarios (Bitner, 1992; Bosmans, 2006; Mattila and Wirtz, 2001; Patrick and Hagtvedt, 2011), and confirmed the importance of congruity when designing consumers' experiences towards products and services.

In summary, past research has investigated the effect of congruity for services or products separately. We contribute to the literature by exploring the effect of congruity when both product and service elements are combined into one complete offering (i.e., PSS). The intrinsic differences between products and services may complicate the evaluation of PSSs. Accordingly, a potential discrepancy between product and service elements may look unreliable in the eyes of consumers and negatively affect their evaluations. In contrast, a high level of congruity between the product and service elements may reduce the associated risk of the PSS and thus facilitate consumers' purchase decisions (Van Rompay, 2010; Campbell and Goodstein, 2001). In other words, when congruity is present, consumers feel confident and safe about the offering and dissociate perceptions of risk from it. Congruity thus provides assurance to consumers, which will positively affect their attitudes towards the PSS. Our research assumptions are summarized in Figure 1.

Figure 1. Conceptual Model



METHOD

In this research, we focus on achieving congruity through the symbolic meaning that is evoked by both the product and service elements of a PSS. Particularly, we focus on the 'professionalism' represented by both elements. This symbolic meaning is often included in products and services, and is shown to positively affect the quality perception of the offering (Mugge, 2011, *in press*). Moreover, we use a web-based 'system' to manipulate the product and service elements because PSSs often make use of online environments to promote and get in touch with consumers.

Design and participants

One hundred and twenty-nine participants took part in this study. Participants were Dutch citizens in the age range of 19 to 73 (50% male, mean age = 32.91, *SD* = 9.08). We created a website for a fictional rental car company, Renta Flex, as stimulus material. Rental car service companies are often mentioned as an example of PSSs in the literature (e.g., Baines et al., 2007; Williams, 2007), and therefore, appropriate for this research. Moreover, for rental

car services product and service elements are both considerably important in the evaluations of consumers.

The product element was represented by a picture of a car with a company logo on it, while the service element was represented by a service description accompanied by an employee photo. Four versions of the website were created, which varied in the level of congruity (i.e., professional product and professional service, professional product and non-professional service, non-professional product and professional service, non-professional product and non-professional service). Two pre-tests were conducted to confirm the appropriateness of our manipulations and selection of stimuli. Pre-test 1 focused on the selection of pictorial representations of product and service elements, while Pre-test 2 focused on the written description of the service.

Pre-test 1: Car, logo and employee image

Car, logo and employee image were pretested using separate questionnaires for the same participants ($N=50$, 44% male, mean age = 24, $SD = 2.40$). To create a more and less professional version of a car, both the colour of the car and the size of the company logo were manipulated. Volkswagen Golf was chosen as the stimulus product as it is a type of car that is often used by rental car companies around Europe. The Volkswagen Golf was presented in six different colours (i.e., black, yellow, dark blue, red, grey, and light blue), which were obtained from the official Volkswagen website to guarantee realism. All pictures made use of the same product view and image quality to guarantee consistency. Participants were asked to rate all six cars on their professionalism on a three-item, seven-point semantic differential scale (i.e., (not) professional, (not) business-like, (not) serious). Moreover, the attractiveness of the car was checked for confounding effects on a one-item, seven-point scale, anchored by unattractive and attractive. The cars in the colours grey ($M = 5.47$, $SD = 1.02$; $\alpha = 0.87$) and light blue were selected ($M = 3.25$, $SD = 1.02$; $\alpha = 0.77$), as the professional and non-professional car, respectively. These cars differed significantly on the perceived professionalism ($p < 0.001$), while no difference for the perceived attractiveness of the cars was found ($p > 0.05$). Both analyses were conducted using Bonferroni as post hoc test.

A trained designer created a fictional logo for the rental car service company. Professionalism of the company logo was manipulated by changing the size and position of the logo on the car, and pre-tested using the same professionalism scale as previously reported. Five logo variations were presented to the participants. We selected the logos with the highest and lowest scores on the professionalism scale as stimulus material ($M = 5.41$, $SD = 0.91$; $\alpha = 0.79$ versus $M = 3.15$, $SD = 1.1$; $\alpha = 0.75$; $F(4, 180) = 54.92$, $p < 0.001$). The selected cars and logos were combined (i.e., professional car and professional logo vs. non-professional car and non-professional logo), making use of photo-editing software to create the two product variations (See Appendix A and B).

Finally, to select employee pictures with either a more or less professional image, twelve pictures of a person varying in pose (e.g., thumbs up, crossed arms, extended hand) and

formality of clothes (e.g., suit and tie, only tie, no tie or jacket), were created and pretested. Participants were asked to rate all employee pictures on the three-item professionalism scale. The employee pictures with the highest and lowest scores on professionalism as stimuli ($M = 5.53$, $SD = 0.80$; $\alpha = 0.77$ versus $M = 3.80$, $SD = 1.10$; $\alpha = 0.88$, $F(11, 517) = 38.96$, $p < 0.001$) were selected.

Pre-test 2: Service description

Two service descriptions were created, where tone and wording were changed in either a more or less professional text. The structure and meaning of the text were kept consistent across conditions. Forty participants (75% male, mean age = 22, $SD = 2.39$) were asked to rate one of the two service descriptions (i.e. twenty each condition) on the three-item professionalism scale ($\alpha = 0.83$). An independent samples t-test revealed significant differences in the perceived professionalism between both descriptions ($M = 5.47$, $SD = 0.68$; vs. $M = 3.77$, $SD = 1.17$, $t(38) = -5.62$, $p < 0.05$), confirming the success of this manipulation. These service descriptions were combined with the selected employee images (i.e., professional service description and professional employee vs. non-professional service description and non-professional employee), to create two service variations (See Appendix A and B).

Final Stimuli: Picture of a Website

The selected stimuli, product and service elements, were brought together in a picture of website. The website promoted the Renta Flex company and enabled consumers to identify the location of a car and book the offering. This resulted in four different pictures: two conditions in which the product and service elements were congruent and two conditions in which the product and service elements were incongruent. The pictures were created making use of professional photo editing software and were standardized in terms of size and quality (See Appendix A and B).

Procedure and Measures

Four online questionnaires were created, one for each of the conditions. Participants were contacted via email and assigned randomly to one of four conditions. To encourage participation, a small monetary incentive was offered to every third respondent. Participants were first asked to imagine themselves as potential Renta Flex customers. In this scenario, participants were asked to imagine themselves as owners of a small business, who do not possess a car themselves, and who contact Renta Flex expecting them to be a good representation of their own businesses. As such, participants would have a scenario in mind where social approval was needed (i.e., risk). Subsequently, they were shown the picture of the website and were instructed to observe and read the content carefully. The image of the website was made available to participants throughout the questionnaire.

We measured attitude towards the PSS by means of a three-item, seven-point differential scale (i.e., bad/good, unfavourable/favourable, negative/positive), inspired by the work of Campbell and Goodstein (2001). We measured assurance with three seven-point Likert scales: “I consider Renta Flex’s offering to be a safe business decision”, “I would feel confident if my clients saw me using the Renta Flex offering” and “I would feel assured about Renta Flex’s support when needed”. The scales were anchored from 1 (strongly agree) to 7 (strongly disagree) and inspired by the same work (Campbell and Goodstein, 2001). Finally, we assessed the perceived congruity of the offering with two seven-point Likert scales: “Renta Flex presents a coherent offering to its clients” and “The offered car matches with the service that Renta Flex provides”.

RESULTS

Reliability and Validity of the Measures

The internal consistency and convergent validity of the scales to measure attitude, assurance, and congruity was investigated by performing a confirmatory factor analysis (CFA) on all items of the latent variables using ML-estimation in LISREL 8.72 (Jöreskog and Sörbom, 1993). The results indicated a good fit to the data ($\chi^2 = 26.50$, $df = 17$, $\chi^2/df = 1.56$, $p = 0.07$; GFI = 0.95, CFI = 0.99, RMSEA = 0.066). Convergent validity was indicated by the fact that the items loaded significantly on their corresponding latent construct (all t 's > 2.0) (Bagozzi et al., 1991). Discriminant validity among the scales was assessed as follows. First, a baseline model (in which the correlations between pairs of constructs were freely estimated) was estimated for each possible pair of scales. Next, we compared this baseline model to a series of alternative models, in which the correlations between pairs of constructs were constrained to unity (Anderson and Gerbing, 1988). In each case, the constrained model exhibited a statistically increase in chi-square ($\Delta\chi^2(1) > 3.84$), providing evidence of discriminant validity (Bagozzi and Phillips, 1982). Furthermore, the reliability of each scale was explored by computing the reliability coefficient or Pearson’s correlation ($\alpha_{\text{attitude}} = 0.88$; $\alpha_{\text{assurance}} = 0.83$; $r_{\text{congruity}} = 0.45$). Together, these results indicated a sufficient degree of reliability and validity of the scales.

Manipulation and Confounding Checks

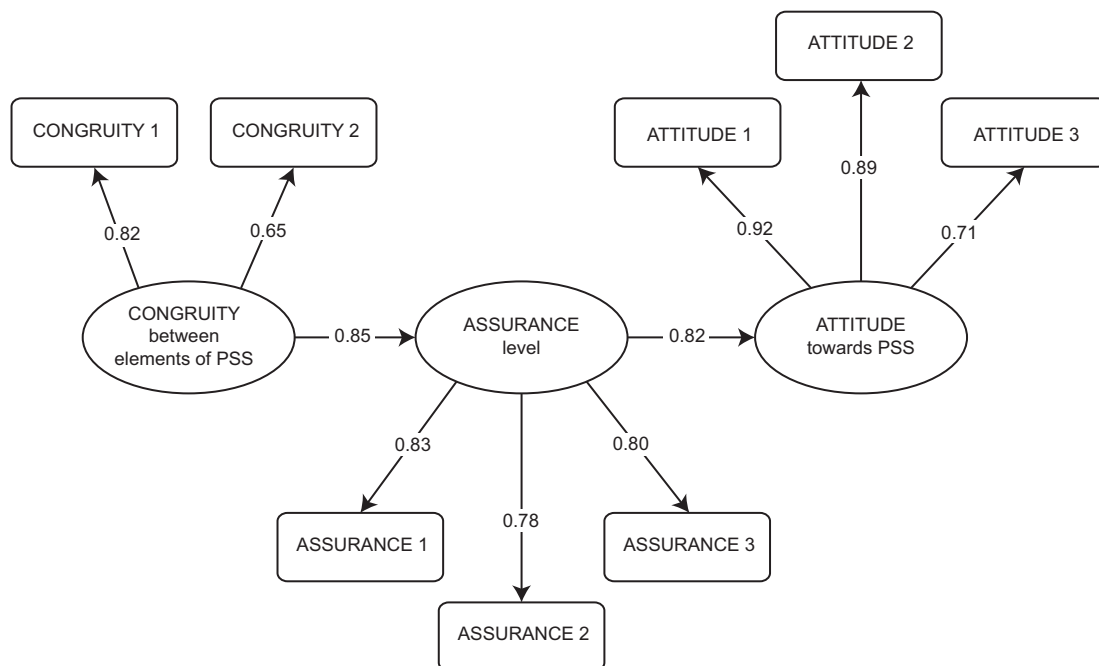
Based on an exploration of the boxplots for the variable congruity, three outliers were removed from the dataset. Next, an analysis of variance showed that the manipulation of congruity between the product and service elements of the PSS was successful and resulted in variations in congruity. As intended, a significant interaction effect between product and service was found on congruity ($F(1, 111) = 7.51$, $p < 0.01$). Specifically, participants who were presented with the professional product, perceived the PSS to be more congruent when the service had a professional image than when it had a non-professional image ($M_{\text{prof}} = 4.30$, $SD = 1.25$ vs. $M_{\text{non-prof}} = 3.78$, $SD = 1.08$, $t(67) = 1.80$, $p = .08$). In contrast, participants who

were presented with the non-professional product, perceived the PSS to be more congruent when the service had a non-professional image than when it had a professional image ($M_{\text{prof}} = 3.98$, $SD = 1.04$ vs. $M_{\text{non-prof}} = 4.58$, $SD = 0.76$, $t(44) = -2.27$, $p < .05$). No other effects were found.

Test of the Model

In order to test our conceptual model (see Figure 1), we estimated the structural equation model with latent variables in LISREL 8.72. The fit statistics for this model indicated a good fit ($\chi^2 = 26.58$, $df = 18$, $p = 0.06$, $\chi^2/df = 1.48$, GFI = 0.95, CFI = 0.99, RMSEA = 0.061). This model explains 67% of the variance in consumers' attitude towards the PSS. The results provided support for our conceptual model. Specifically, the degree of congruity between the product and service elements of a PSS had a positive effect on the perceived assurance of the offering ($b = 0.85$, $p < 0.05$). Furthermore, the perceived assurance positively affected consumers' attitude towards the PSS ($b = 0.82$, $p < 0.05$). The estimated model is presented in Figure 2.

Figure 2. Results of the Structural Equation Model



DISCUSSION

In this study, we have explored the role that congruity in the elements of a PSS plays on consumers' evaluations of the PSS. Our results suggest that consumers who evaluate a PSS value the congruity of meaning between product and service elements. Furthermore, following the work of Campbell and Goodstein (2001), we have found evidence suggesting

that congruity can reduce the perceived risk associated to online transactions and unknown offerings. When confronted with new PSSs, congruent offerings can evoke assurance with consumers, resulting in a more positive evaluation of the complete offering. Previous research has studied the effects of congruity for products or services separately (e.g., Bitner, 1992; Mattila and Wirtz, 2001; Patrick and Hagtvedt, 2011; Bosmans, 2006; Van Rompay, 2010). Our findings add to these theories by exploring these effects for offerings where both products and services are important to consumers. Moreover, literature on how to design PSSs is scarce (for an exception see Morelli, 2006). As such, we give a first step in understanding how consumers evaluate PSSs, in order to create new guidelines for practitioners on how to successfully design and market these new offerings.

Our findings have several implications for practitioners. First, differences between the service description and attributes of the product have not passed unnoticed by participants. Designers and marketers need to pay close attention in defining the message the PSS should convey, and match such impressions with those of the product and service elements that define it. Thus, product and service elements should not be developed separately. An overall view of the total offering should to be created, where consumers' experience with the PSS is clearly defined. Second, practitioners should clearly establish the perceived risk associated to their offerings. In new PSSs where perceived risk is often high, congruity between product and service elements could reduce that perceived risk, and positively influence consumers' evaluations towards the total offering.

Our research leaves some open questions for further research. First, our study has primarily focused on the congruity based on a single element: the symbolic meaning of professionalism. Other aspects, such as functionality, usability or shape can have congruity effects on the evaluation of PSSs as well. Further research is therefore needed to better understand these phenomena and the relative importance of these factors. Second, we have opted for an often-mentioned PSS in the literature (i.e., rental car service company) with a relatively high social risk and a low grade of ownership. The nature of the interaction between consumer and service provider, and the perceived risk associated with the purchase, can differ considerably between PSSs. For example, NikePlus, a PSS that encompasses a product to track running distances, provides a web-based system where consumers can store their data, look at development graphs, and get in touch with other NikePlus' users. In this case, consumers are actively involved with the service and have continuous contact with other users. Consequently, the community becomes a much more important aspect of this particular PSS than for a rental car service company. Moreover, the perceived risk associated with the purchase could lie in other aspects, such as functionality or performance, and could thus have different effects on consumers' evaluations of the PSS. Further research should set out to explore the role of ownership, interaction (e.g., community dynamics), and perceived risk of (diverse) PSSs, in order to fully understand the effect of congruity on consumers' evaluations of PSSs. Finally, our research used a picture of a website to characterize PSS.

Future research should make use of more realistic settings where consumers can experience the service elements first hand, thereby enhancing the external validity of their evaluations.

APPENDIX

A. Stimulus material: Professional product and professional service



The screenshot displays the Renta Flex website interface. At the top, the Renta Flex logo is on the left, and a navigation menu includes 'Home', 'What we offer', 'What it costs', 'How does it work?', 'Car options', 'Client service', and 'About us'. The main content area features a grey hatchback car on the left. Below the car are two buttons: 'Find car location' and 'Reserve'. To the right of the car, there is a text box with the following content: 'Customer satisfaction is the most important objective of Renta Flex's ambition. Therefore, we provide our clients with a 24 hours assured help-desk and car-maintenance service in all our business proposals. We are there to *effectively*-support your company's activities. Your business is our success.' Below this text is another text box: 'Contact our business specialists to obtain professional advice on all our specialized rental plans.' A small image of a man in a suit is positioned to the right of this text. At the bottom right, a contact number is provided: 'Contact us: +31 (0) 15 286 000'. The browser's address bar shows 'http://tudelft.nl/onderzoek/' and the system tray at the bottom indicates 'Local intranet | Protected Mode: Off', 'EN', '14:04', and '15-6-2011'.

B. Stimulus material: Non-professional product and non-professional service



The screenshot displays the Renta Flex website interface, similar to the one above. The navigation menu is the same. The main content area features a grey hatchback car on the left, with the Renta Flex logo on its side. Below the car are two buttons: 'Find car location' and 'Reserve'. To the right of the car, there is a text box with the following content: 'Looking for a handy car rental service with cheap prices, available all around Europe? Renta Flex is the fantastic solution you're looking for! Our cars can be found in all big cities, which have been carefully located to give you easy access and a trouble-free experience. There're more than 3000 cars waiting for you...'. Below this text is another text box: 'Rental Flex is here for your enjoyment. Therefore, we offer you a 24 hours guaranteed help-desk and car-maintenance service in all our deals. We want you to *happily*-complete your daily activities. When you win, we win!'. Below this text is a third text box: 'Get in touch with us now! Our operators are eager to give you personal advice on all our amazing rental deals.' A small image of a man in a white shirt is positioned to the right of this text. At the bottom right, a contact number is provided: 'Contact us: +31 (0) 15 286 000'. The browser's address bar shows 'http://tudelft.nl/onderzoek/' and the system tray at the bottom indicates 'Local intranet | Protected Mode: Off', 'EN', '14:04', and '15-6-2011'.

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