

MOBILE SERVICE EXPERIENCE PROTOTYPING: A holistic view of the service experience

Teresa Sarmento

Phd Student

Faculdade de Engenharia da Universidade do
Porto

Rua Roberto Frias

4200-465 Porto

Portugal

+351225081719

teresa.sarmento@fe.up.pt

Lia Patrício

Assistant professor

Faculdade de Engenharia da Universidade do
Porto

Rua Roberto Frias

4200-465 Porto

Portugal

+351225082154

lpatric@fe.up.pt

ABSTRACT

Prototyping is a well-established practice in New Product Development. The increasing importance of New Service Development [NSD] and customer experiences has created a significant interest in Service Experience prototyping [SXP]. However, further research is still needed to better define SXP and how it differs from traditional views. This paper presents the results of an empirical study comparing traditional interface prototyping and SXP. Study results reveal significant differences in the inputs gathered from the two prototyping processes.

Mobile Service Experiences bring new challenges to NSD and require an awareness of all the mobility aspects, especially for customer-journeys within self-service situations. Designers cannot control the entire experience as they cannot control all the service process. Some authors propose to take social interaction as a starting point and explore co-experience with prototypes. Though experience prototyping is a rather new method with relevant potential its application to services has not been fully explored. There is also authors who advocate that companies can promote trial experiences, involving simulated activity in a simulated setting, thus enabling customers to assess value-in-service. SXP is a form for testing that enables developers and customers to gain first-hand appreciation of a future service. It differs from the conventional prototyping tools, as service experiences should be seen through a holistic outlook, considering the different service encounters in space and time.

This paper presents the results of an empirical where two prototyping processes were implemented and compared - Service Experience Prototype and Interface Experience Prototype. This exploratory study was made with five groups of students from NPD/NSD courses. The experiment consisted on prototyping and testing, the same mobile service with the same set of tasks. Participants worked in groups over two related storyboards, where the same tasks of the mobile service were sketched with the different focus. Participants had to decode service tasks into service experience factors, and over the storyboards create a movie script. Subsequently participants were invited to develop the screenplay and perform it. One group evaluated the service experience focusing on the service interface and the other tested the service experience from a more holistic perspective, involving the service process,

people and serviscape, and the different service encounters. Study results indicate that no prototype is best to evaluate all service experience components. The qualitative results revealed that SXP participants were able to create an overall representation of the service experience, highlighting service design issues that could not be so easily discovered by the UXP groups, such as people and social context within which the mobile service is used. On other hand participants of the UXP group could test and evaluate in more depth the tangible dimensions of the service interface.

The quantitative results corroborated the qualitative results, as the different experimental situations also provided different inputs to the process. Whereas UXP groups we better able to evaluate and indentify improvements regarding ease of use and learn-ability, 'SXP groups were felt more able to evaluate and identify improvements regarding the overall service offering, involving physical and social context aspects of the service experience. These results show that the SXP does not substitute, but rather complements UXP, as it considers different goals.

The resulting feedback helps to determine advantages and disadvantages of each method on assessing a more holistic approach to SXP and helps designers and service developers to enhance superior service experiences. Prototyping the mobile service experience requires testing the service mobile interface, but it should consider all the elements of the service offering in a continuous contextual change. This research provides a new perspective on SXP, highlighting its contributions to the NSD process, in particular to the increasingly pervasive mobile services where customer experience, is a crucial differentiator.

INTRODUCTION

The service sector has emerged as world economies have shifted from product-driven markets to information-based service-driven markets. In this context, the ongoing development of new products and services is critical for competitive survival (Johnson and Menor, 2000).

General debate on mobile service delivery needs to go beyond the confined and functional understanding of mobility, to capture multiple dimensions of service experience including mobility and social interaction. Some authors refer the challenges in innovating and co-creating and valuable experiences when the service provider is not present (Kakihara and Sorensen, 2001, Sandstrom et al., 2008) Therefore, testing and evaluating service experiences is crucial when developing mobile services, as they differentiators in a crowded market.

Service Experience Design (SXP) has gained increased attention in the recent past, but extant research in this area is still scarce. The difference between SXP and other forms of prototyping is not yet clear, and the specific contributions of these different approaches to the design of mobile service experiences are not well understood. It is therefore important to understand the contributions each approach may bring, as well and the situations to which they are best suited.

Previous literature has addressed mobile interface prototyping, referring the need to understand the emotional response of the user to better evaluate the quality of design. Mobile interface prototyping is important to reach a deep assessment of the look, feel, and sound, ascertaining how a mobile device looks and feels in the hand of the user (Bolchini et al., 2009). From the service design perspective, service prototype aims to verify what happens when some external factors interfere during the service delivery, which are not possible to verify during the preceding tests in the laboratory but that have a great impact on the user perception and experience (Saffer, 2007). User experience prototyping [UXP] is the experiential aspect of whatever representations needed to successfully (re)live or convey an experience with a product, space or system (Buchenau and Suri, 2000).

These different forms of prototyping provide different views that are important for evaluating and improving different aspects of mobile service design. However, a more holistic approach is need to prototype service experiences. With the intention of integrating these different approaches, we define Service Experience Prototyping [SXP] as a form for testing and evaluating a service experience. Therefore involving the different elements of service design (people, process and physical evidence) in context, as well as the different touchpoints of the service experience. SXP allows for a more holistic outlook, considering the different service encounters in context and time.

This study presents a comparison of SXP with UXP, based on an experiment with 72 participants. In this study, whereas UXP concentrates on the mobile and web interface of the service, the SXP adds the service context, such as the physical context and social context within which the mobile service is used. This study allows for better understanding the different contributions these two approaches may bring to the design of mobile service experiences.

Within an empirical ground this paper aims to contribute with ways to prototype mobile service experiences and include relevant experience factors when testing a new service. The research involved the prototyping of a new mobile service application that supports the management of loyalty programs. The study encompasses an experiment that compares traditional interface prototyping with service experience prototyping SXP. Data gathering involved 72 NSD and new product development [NPD] students.

Next section presents extant research on service experience factors and service experience prototyping. In the methodology section describes the main features of the mobile service, the subjects performing the experiment, the experimental context and the design of the experiment. The results section presents the comparison between the two experimental groups. Finally, we present our research contributions, managerial implications, and suggestions for further research, especially to encourage more comprehensive empirical studies to explore the complementarities of SXP.

SERVICE EXPERIENCE FACTORS

Service experience is an increasing concern. Service oriented studies have been advocating the importance of experience centric services combining several aspects in order to reach an overall perspective of this dimension (Verhoef et al., 2008, Zomerdijk and Voss, 2009). On the other hand, interface researchers have also been employing a variety of methods to evaluate the influence of systems on emotional experiences in human-technology interaction (Mahlke and Thüring, 2007). Pullman and Gross (2004) support that an experience occurs when a customer has any sensation or acquires knowledge from some level of interaction with the elements of a context created by a service provider.

Verhoef et al (2008) advocate that customer experience is holistic in nature and involves customer cognitive, affective, emotional, social and physical responses. This experience is created not only by factors that the retailer can control (e.g., service interface, retail atmosphere, assortment, price), but also by other elements that are outside its control (e.g., influence of others, purpose of shopping).

In what mobile service experience is concerned some authors have already unfold new elements such as ‘contextual quality’, even considering that, service quality, value and satisfaction have a simultaneous direct effect on behavioral intentions. (Vlachos and Vrechopoulos, 2008).

Several factors have been identified as determinants of the service experience. Trialability is an important factor for the experience with technology-enabled services. Not only must customers change their behaviours, but in a self-service situation, they must also become co-producers of the service, with responsibility for delivery of the service and for their own satisfaction (Meuter et al., 2005, Khalifa and Shen, 2008, Rogers, 1995).

Accessibility is recurrently mentioned on mobile service research (Kleijnen et al., 2007). Convenience is a major attractor for mobile technology use, in addition to task fulfillment, ease and speed of achieving a task in a effective and convenient manner, as consequence of its portability (Pura, 2005). Ease of use comprehends the ease to learn and recognition of the service features. Usefulness started to be defined by Davis (1989) as “the degree to which a person believes that using a particular system would enhance his or her job performance”. However, other service studies have identified usefulness (Patrício et al., 2008) and informativeness (Wolfenbarger and Gilly, 2003) as service experience factors.

There is no universal definition of privacy, the concept is highly complex and involves different perspectives and dimensions. In western cultures definitions of privacy tend to involve management of personal information. Generally, users do not like being observed by

other people therefore this type of problem reduces the users perceived levels of privacy, personal space and safety (Littlea et al., 2005). Security and privacy issues are also often referred on Internet-based services being consumers keenly aware of their need (Wolfenbarger and Gilly, 2003). Sarmiento and Patrício (2010) have identified several experience factors taking into account the mobile services use, and advocate that prototyping incorporates this construct in order to reach an evaluation and consequent improvements through a more holistic view of experience.

Table 1 Experience dimensions for Mobile Services

Experience Factors Construct	Reference
Awareness/Trialability	Meuter et al. (2005) Khalifa and Shen (2008), Rogers (1995)
Accessibility/Convenience	Kleijnen et al. (2007)
Usefulness	Davis (1989)
Ease of use	Kaasinen (2008)
Security/Privacy	Wolfenbarger and Gilly (2003) Littlea et al. (2005)
Social Environment	Verhoef et al (2008)

PROTOTYPING THE SERVICE EXPERIENCE

Testing new products through a prototype is a well-established practice in New Product Development [NSP]. The increasing importance of NSD and the study of customer’s experience has created a significant interest in SXP (Ostrom et al., 2010). However, applying prototyping techniques to intangible services, such as mobile services, are scarcely studied and perceptibly different from those implemented in product development. The main challenge in the process is dealing with the intangibility of services, since we cannot simply put a service in a box and ask customers what they think about it (Stickdorn et al., 2010).

Mobile service experiences bring new challenges to NSD and require an awareness of all the mobility aspects, especially for customer-journeys within self-service situations (Meuter et al., 2005). Designers cannot control the entire experience as they cannot control all the service process (Saffer, 2007). Battarbee and Koskinen(2008) propose to take social interaction as a starting point and explore co-experience with prototypes. Though experience prototyping is a rather new method with relevant potential (Buchenau and Suri, 2000) its application to services has not been fully explored. Edvarsson and Enquist (2009) advocate that companies can promote trial experiences, involving the simulated activity in a simulated setting, thus enabling customers to assess value-in-service. These same authors emphasize the importance of managing the total customer experience and recognizing clues related to functionality and clues related to emotions.

Safer (2007) defines service prototype as a tool for testing the service by observing the interaction of the user with a prototype of the service put in the place, situation and condition where the service will actually exist. A particular prototype does not necessarily represent the solution, but only one possible solution. Several prototypes are usually built to create a single product. When it comes to evaluate experiences, a simulation of the service experience foresees some of its performances through the use of the specific physical touch-

points involved. The experience prototype allows designers to show and test the solution through an active participation of the users_(Buchenau and Suri, 2000).

To prototype and evaluate a mobile touch-screen interface, Bolchini et al (2009) suggest that not only the appearance of the interface but also the physical holding, feeling, manipulating, and touching of the device are important factors in determining the quality of the user experience.

METHODOLOGY

This section describes the empirical context, how the experiment was designed and conducted, and how the raw data was collected. The study describes an experiment where two prototyping processes for a mobile service experience were implemented and compared. The study compared the capability of service experience prototype [SXP] and interface prototype [UXP] to evaluate and suggest improvements to a new mobile service. These two prototypes were assessed in how they enabled participants to evaluate and identify improvements regarding experience factors connected to the interface, the service and the mobility aspect, such as context of use and social interaction.

Design - The tested variable of the experiment was the experimental situation, consisting of two treatments (interface oriented [UXP] vs. service oriented [SXP]). It was assumed that there would have differences between these two circumstances. Hence, the two versions should lead to distinctions with respect to the capacities for the prototype to diagnose problems and suggest improvements for the service under investigation.

Participants

The experiment involved 5 groups of master degree courses: Mechanical Engineering [7], Informatics Engineering [16], Innovation and Technological Entrepreneurship [12], Product Design, [15] and Service Engineering and Management [22] in a total of 72 participants. All students had previous knowledge on fields related to NPD and NSD.

Stimuli - The experiment consisted on prototyping and testing the same mobile service with the same set of tasks. In each experiment the participants were randomly divided in two groups. Participants worked over two similar storyboards, where the same tasks of the mobile service were sketched with a different focus. Whereas the SXP storyboard represented the service process, people and servicescape, along the different service encounters, the UXP storyboard only represented the mobile or computer service interface. Storyboard 2 therefore focused on the interface while the storyboard 1 provided a more holistic view of the service experience, including the spatial and social context. The objective of the treatment was to orient half of the participants to evaluate the service experience looking at human-technology interaction while the other half tested the service from a more holistic perspective. These procedures always took place on separate rooms but with the same conditions: a computer and a mobile phone with Internet connections. Participants had to build the service story on different storyboards with different inputs [Fig1, 2]. They had to describe experience factors associated to the service tasks they were seeing in each sketch.



Figure 1 Storyboard for Service experience prototyping



Figure 2 Storyboard for Interface experience prototyping

Procedure. The experiment took an average of 120 minutes. At the beginning participants had to decode the same service tasks into service experience factors, and create a movie script over the storyboards. Subsequently participants were invited to develop a screenplay and perform it.

This process was followed by debrief phase, where participants answered to a questionnaire built-in two parts. Part I was qualitative with two open-ended questions:

- Which problems did you identify on the mobile service experience through this prototype?
- Which proposals for the improvement of the service experience did you identify through this prototype?

Part II had 25 statements considering the prototype capability to evaluate the service experience and to identify improvements through five point likert scales. At the end of the experiment the differences between the storyboards were revealed to both groups and the prototyping results were discussed.

Table 2 Statements on Prototypes Capabilities

<i>By means of this prototype I could evaluate:</i>	<i>This prototype allowed me to identify improvements:</i>
<i>Service features</i>	<i>Innovative features</i>
<i>Easiness to learn de service</i>	<i>Interface improvements</i>
<i>Easiness to use the service</i>	<i>Ease of use improvements</i>
<i>Service accessibility</i>	<i>New ways of use</i>
<i>Service security</i>	<i>To conceive other security issues</i>
<i>Service privacy</i>	<i>To conceive other privacy issues</i>
<i>Use environment</i>	<i>Informativeness and promotion issues</i>
<i>Service impact on other customers</i>	<i>Store environment improvements</i>
<i>Service impact on store assistant</i>	<i>Service context of use</i>
<i>Service visual interaction</i>	<i>Visual interaction improvements</i>
<i>Service tactile interaction</i>	<i>Tactile interaction improvements</i>
<i>Service real context of use</i>	<i>Global service experience improvements</i>
<i>Service global experience</i>	

The combination of the two methods (qualitative and quantitative) was used to gather information and evaluate SXP capacities. Building upon extant research, several mobile service experience factors were taken into consideration *Awareness* is the extent to which the service is widely known by potential customers and is easy to try, in face of its innovativeness (...). By *accessibility* we considered time convenience and portability, which are characteristics of mobile services. *Security* comprises context of use security, data security and privacy. *Usefulness* involves completeness of functionalities, informativeness, and data management. The *ease of use* is the dimension usually connected with the HCI studies, being in this study the most oriented one to the interface's test. By this fact it reflects the easy of learn and interface appeal and recognition. To address the holistic view of service experience the study also tested *social environment* by assessing how the two prototypes enabled the evaluation of the service impact on other customers and store assistant.

RESULTS

The qualitative and quantitative results allowed for an in-depth comparison of the two prototypes.

Qualitative results

The answers to the open ended questions of the questionnaire were qualitatively analyzed to categorize the problems and improvements suggested by participants after the experiment. Answers were coded according to the experience factors previously described as shown in Table 3.

Table 3 Coded experience factors

	Awareness	Accessibility	Usefulness	Ease of use	Security	Social environment
Interface Group / 32	12 - 36%	13 - 40%	13 - 40%	25 - 78%	14 - 43%	13 - 40%
Service Group/ 30	17 - 56%	16 - 53%	18 - 60%	26 - 86%	14 - 46%	22 - 73%

The preliminary results indicate that ease of use was the most cited factor for both groups. Even when diagnosing problems or suggesting improvements, *ease of use* was highly mentioned. Statements such as: *Too much information [is required] when you register and it seems you need to be connected to facebook...* indicates the importance of the interface usability.

The study results indicate that the SXP groups were more open to cultural and social factors, such as store context and interaction with friends. During the experiments we could also observe that UXP groups remained seated while using the mobile or computer interface. SXP groups tended to move around the experiment room, while role-playing to perform the eight predefined tasks. On the other hand UXP groups were always engaged to effectively accomplish the tasks as if it was a heuristic evaluation.

Regarding the problems and solutions identified, *usefulness* was more referred by the SXP groups (60%-40%). However, while SXP groups focused on overall usefulness of the service, such as the number of loyalty programs supported, UXP focused on interface functionalities, such as displaying the credit card bar code on the mobile phone, or being automatically identified when entering a store. This difference is illustrated with the statements of the participants of the different groups:

There is no credibility specially when you are near the store assistants; The service should support more cards (SXP participant)

You could enter the store and be automatically identified by Bluetooth or RFID (UXP participant)

Quantitative results

The results of this second part of the experiment are summarized in Tables 4 and 5. For analyzing our data, we applied t-tests with the experimental situation as the independent variable.

<i>Prototype capability to evaluate the service</i>					
	UXP		SXP		
Evaluation Factors	Mean	STD	Mean	STD	Mean difference
C1 service functionalities	3.61	.871	3.03	.883	0,58 ***
C2 Easiness to learn	3.39	1.050	3.00	1.016	0,39
C3 Easiness to use	3.41	.892	3.13	.907	0,28
C4 Accessibility	3.26	.950	2.94	.948	0,32
C5 Security	2.18	.999	2.17	1.053	0,01
C6 Privacy	2.18	.983	2.13	1.106	0,05
C7 Use environment	3.41	.925	3.64	.783	-0,23
C8 impact on customers	3.09	1.215	3.33	.924	-0,24
C9 Impact the store assistant	2.38	1.237	3.38	1.238	-1 ***
C10 visual interaction	3.58	1.273	3.21	1.038	0,37
C 11 Tactile interaction	3.74	1.024	2.91	1.201	0,83***
C12 real context of use	2.88	1.225	3.39	.989	-0,52*
C13 global experience	3.26	1.010	3.24	.792	0,02

Table 4 Construct means scales in a 1-5 scale;
Prototype Capability to: 1 - totally disagree; 5 – totally disagree
 *** Statistically significant at p<0.01 ** Statistically significant at p<0.05 * statistically significant at p<0.1

<i>Prototype capability to suggest improvements</i>					
	UXP		SXP		
Evaluation Factors	Mean	STD	Mean	STD	Mean difference
M1 Innovative features	3.81	.786	3.74	.666	0,07
M2 Interfaces	3.91	.853	3.39	.998	0,52**
M3 Ease of use	4.14	.762	3.78	.792	0,36*
M4 Ways of use	3.67	.894	3.74	.994	-0,07
M5 Security issues	3.47	1.207	3.06	1.153	0,41
M6 Privacy issues	3.47	.971	3.06	1.059	0,41*
M7 Informativeness	3.37	.942	3.76	.855	-0,39*
M8 Store environment	2.85	1.202	3.52	.834	-0,67***
M9 Visual interaction	3.72	.815	3.19	.965	0,53**
M10 Tactile interaction	3.69	.856	3.06	.998	0,63***
M11 Context of use	3.50	1.080	3.81	.946	-0,31
M12 global experience	3.56	.969	3.67	.540	-0,11

Table 5 Construct means scales in a 1-5 scale;
Prototype Capability to: 1 - totally disagree; 5 – totally disagree
 *** Statistically significant at p<0.01 ** Statistically significant at p<0.05 * statistically significant at p<0.1

This analysis allowed examining the prototype capabilities as well as the difference between the experimental environments for all the above-mentioned dependent variables. UXP groups felt significantly more capable to evaluate service functionalities $t(67) = 2,75$ $p=008$ and tactile interaction $t(64)=3,02$ $p<.004$ regarding improvements, UXP were also more capable to propose for interfaces $t(66)=2,31$ $p<.024$ ease of use $t(66)=1,89$ $p<.062$, privacy issues $t(67)=1,68$ $p<.097$, visual interaction $t(66) =2.47$ $p<.016$ and tactile interaction $t(65)=2.78$ $p<.007$

SXP were significantly more capable to evaluate impact on store assistant $t(59)=-3,14$ $p<.003$ and real context of use $t(59)=-1,86$ $p<.074$ Regarding improvements SXP felt also

more capable to to propose for informativeness $t(66)=-1,81$ $p<0.74$ and store environment $t(64)=-2,61$ $p<.01$

In the service 'functionalities' and the 'tactile interaction' the prototype was rated to be easier to test by the interface group. The impact of the 'store assistant' has significant value for the service group. This group considered the prototype more capable to evaluate this variable than the other team, having a mean difference of 1 in a scale of 1-5.

In what concerns the identification of improvements on the service through the prototypes - 'interfaces', 'visual interaction' as well as 'tactile interaction' were recognized to be easier by the interface groups. Finally the 'store environment' suggests more improvements to the service groups.

When reducing statistic significant to $p<0,1$ other variables reveal to be important. The service' group could better evaluate the service 'real context of use' and could also identify increased improvements to service' 'informativeness'. The 'ease of use' and 'privacy issues' were where the interface' group considered its prototype to have potential to suggest improvements. These quantitative results revealed significant differences between the two prototype approaches. Though we can consider that both experimental situations are complementary combining experience factors more easily tested in this way.

These differences were more significant regarding the ability to identify improvements that to evaluate the mobile service experience. SXP groups felt more capable to evaluate the 'store assistant impact' and the real 'context of use', while the group's interface oriented felt more capable to evaluate components such as the tactile interaction.

DISCUSSION and IMPLICATIONS for FUTURE RESEARCH

Study results indicate that no prototype is best to evaluate all service experience components. The qualitative results revealed that SXP participants were able to create an overall representation of the service experience, highlighting service design issues that could not be so easily discovered by the UXP groups, such as people and social context within which the mobile service is used. On other hand participants of the UXP group could test and evaluate in more depth the tangible dimensions of the service interface.

The quantitative results corroborated the qualitative results, as the different experimental situations also provided different inputs to the process. Whereas UXP groups we better able to evaluate and indentify improvements regarding ease of use and learn-ability, 'SXP groups were felt more able to evaluate and identify improvements regarding the overall service offering, involving physical and social context aspects of the service experience. These results show that the SXP does not substitute, but rather complements UXP, as it considers different goals.

These results have relevant implications for prototyping mobile service experiences. Indeed what is considered to be a useful approach for SXP depends a great deal on what aspects of service design are considered important. Prototyping the mobile service experience involves not only the interaction with the mobile technology, but also its context of use and other elements of the service offer, such as social interaction, physical evidence and process which are constantly changing: in one hand there is a contact with the service through its user interfaces, on the other hand there is also interactions with service in a boundless context (B.H.Booms and Bitner, 1980, Johnson and Menor, 2000). Therefore, SXP and UXP should be used in complementary ways to support these different levels of mobile service design. The more holistic view of SXP is useful to test the overall mobile service experience,

involving the service physical and social context. UXP provides a more detailed view of the technology enabled interaction aspects of mobile service experiences.

The resulting feedback helps to determine advantages and disadvantages of each method on assessing a more holistic approach to SXP and helps designers and service developers to enhance superior service experiences. However, the present study is based on a sample of 72 participants, which should be extended. Further research is also encouraged in order to better analyze other variables when comparing SXP and UXP. This research provides a new perspective on SXP, highlighting its contributions to the NSD process, in particular to the increasingly pervasive mobile services where customer experience, is a crucial differentiator..

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