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DESIGNING MOBILE
SERVICE EXPERIENCES
FROM UNDERSTANDING AND CONCEPTUALIZING
TO PROTOTYPING THE CUSTOMER EXPERIENCE

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DISSERTATION SUBMITTED TO FACULDADE DE ENGENHARIA DA UNIVERSIDADE DO PORTO
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Abstract

An experience is a complex phenomenon. Nevertheless, it comprises every aspect of a service offering, from customer care quality to its usefulness, surrounding environment, and reliability. Hence, it is a challenge to incorporate improved experiences into the ebullient context of mobile services. Service innovation requires new concepts, new approaches, and new techniques, by recognizing and taking advantages of the interactions between the customer and the service provider. Tackling mobile service experiences through a design thinking path contributes to New Service Development and is the main impulse for this study.

This research design is based on two pillars of knowledge: a behavioural-science paradigm to understand and evaluate customer experiences through different levels of detail; and a design-science paradigm to promote service research through practice. Service design research generates artefacts, methods and tools, thereby endorsing new concepts.

The research followed a design thinking approach with an application to the conception of a mobile service for managing loyalty programs, actively taking part of the development process from exploration, ideation, reflection and implementation. Starting with an exploration stage, the understanding of customer experience was ascertained through a qualitative study along three phases of service adoption and a quantitative study. Fostering a holistic view of experience, this research identified service experience factors (EF) and measured their impact on experience outcomes (EO) such as cognitive and emotional assessments. Through an Ideation stage, the research articulated these studies with an effective and practical action research, in the company, monitoring the service development across its different activities. The final reflection stage involved prototyping the service experience, contributing to the understanding of how experience is evaluated and particularly how experiences become more tangible supporting the service design in the mobile context.

Resumo

Uma experiência é um fenómeno complexo. No entanto ela está em cada detalhe de uma oferta de serviço desde a assistência ao cliente à utilidade, ao contexto envolvente ou à confiança. Deste modo, incorporar melhores experiências no contexto emergente dos serviços móveis é um desafio necessário.

A inovação dos serviços requer novos conceitos, novas abordagens e novas técnicas reconhecendo e tirando partido da interacção entre o cliente e prestador de serviços. A experiencia com os serviços móveis integrada num processo de Design Thinking é o mote para o presente estudo.

A investigação assenta em dois pilares do conhecimento: no paradigma da ciência dos comportamentos – para compreender e avaliar a experiencia do cliente a vários níveis de detalhe – e no paradigma do design como ciência promovendo a investigação nos serviços através da prática. A investigação no design de serviços gera artefactos, métodos e ferramentas e desta forma novos conceitos.

Empregando o Design Thinking acompanhou-se a concepção de um serviço móvel de gestão de programas de fidelização. Assim, a investigação tomou parte activa no processo de desenvolvimento, na exploração, concepção, reflexão e implementação. Na fase de exploração, o estudo da experiência do cliente foi realizado com base num estudo qualitativo ao longo de três momentos da adopção do serviço, posteriormente confirmado num estudo quantitativo. Uma visão holística da experiencia foi construída com este processo identificando as percepções da experiência e medindo o seu impacto nos seus resul¬tados tais como reacções emocionais ou cognitivas. Na fase de concepção a investigação articulou estes estudos com uma efectiva e prática acção- -investigação numa empresa de serviços móveis monitorizando o desenvolvimento do serviço através de diferentes activi¬dades. A fase final de reflexão implicou a prototi- pagem da experiência do serviço e contribuiu para compreender como a experiência de serviço é avaliada e particularmente como é que as experiências se podem tornar mais tangíveis apoiando o design de serviços no contexto móvel.

Resumé

Une expérience est un phénomène complexe. Cependant, elle est présente en touts les détails de la prestation de services, dès la qualité du traitement aux clients, à son utilité, à son contexte, et à sa fiabilité. Ainsi, intégrer l'amélioration des expériences dans le contexte effervescent des services mobiles est un défi. L'innovation des services exige de nouveaux concepts, de nouvelles approches et de nouvelles techniques, en reconnaissant et en tirant parti de l'interaction entre le client et le prestataire du service. L'envisagement des expériences des services mobiles à travers le 'Design Thinking' contribue pour le développement de Nouveaux Services et constitue la principale motivation de cette étude.

Ce projet de recherche repose sur deux piliers de connaissance: le paradigme de la Science des Comportements pour comprendre et évaluer l'expérience du client à travers différents niveaux de détail, et un paradigme du Design en tant que Science en tant que moteur d'une investigation du service à partir de sa pratique. La recherche en Design de services génère des artefacts, des méthodes et des outils, et à travers de ceux-ci, elle génère de nouveaux concepts.

La recherche a suivi une approche révélant du 'Design Thinking' pour la conception d'un service mobile de gestion de programmes de fidélisation, en tenant part active au processus de développement de l'exploration, idéation, et la mise en œuvre. A partir d'une phase d'exploitation, la compréhension de l'expérience du client a été apurée au moyen d'une étude qualitative sur trois phases d'adoption du service et au moyen d'une étude quantitative. Favoriser une vision holistique de l'expérience a permit identifier des facteurs de l'expérience du service et mesurer ces impacts sur les résultats de l'expérience tels que les évaluations cognitives et émotionnelles. À travers une étape d'Idéation la recherche a articulé ces études avec une action pratique et effective de recherche dans l'entreprise, surveillant le développement du service sur toutes ses différentes activités. Le stade de réflexion finale a impliqué le prototypage de l'expérience du service, contribuant pour la compréhension de la façon dont l'expérience est évaluée et, particulièrement, comment les expériences deviennent plus tangibles de manière à constituer un soutien pour le service du design dans le contexte mobile.

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List of Acronyms

CFA – Confirmatory Factor Analysis
DT – Design Thinking
EF – Experience Factors
EO – Experience Outcomes
EFA – Exploratory Factor Analysis
HCI – Human Computer Interaction
MOBSERV –the studied Mobile Service – Cardmobili
MSX – Mobile Service Experience
NSD – New Service Development
SD – Service Design
SEM – Structural Equation Model
SXP – Service Experience Prototyping
UXP – User Experience Prototyping
SEB –Service Experience Blueprint
SEM – Structural Equation Model
UX – User Experience

1. Introduction

In today's established service economy people tend to pay more for experience and usage than for building and owning physical goods (IBM, 2007). Customer experience has increasingly gained more importance as they become crucial for differentiating and adding value to products and services. As such, designers have increasingly focused on integrating customer–centric experiences in ser–vice innovation (Ostrom et al., 2010).

After the challenges mentioned by D. Norman (2004), on using emotions through the Design discipline, many opportunities have appeared every time technology and its interfaces are the issue. Rich Gold(2006) on his vision about the world of creativity and innovation, claims "woe to the designer who forgoes the opinions, desires and needs of the users to rely only on his visions and dreams";

For the present dissertation there is a design research standpoint that is impor–tant to assess and validate (Hevner et al., 2004). Design supports a problem–solving paradigm that continuously shifts perspective between design processes and designed artefacts (Laurel, 2003).

Designing for mobile service experience is challenging as it involves studying both experience and mobile service processes. But in spite of previous research on user experience requirements, designing for service experiences is still poor–ly understood (Evenson and Dubberly, 2010, Battarbee and Koskinen, 2008, Zomerdijk and Voss, 2009).

Bill Mogridge, IDEO co–founder, (2007), went back to the routs and created a new perspective where Service Design (SD) starts precisely from the idea of a service offering, recalling the classic interaction of people with a smart device since the early days of telephone:

> *The telephone service is one that many of us take for granted, having used it everyday for most of our lives. But is it designed?*
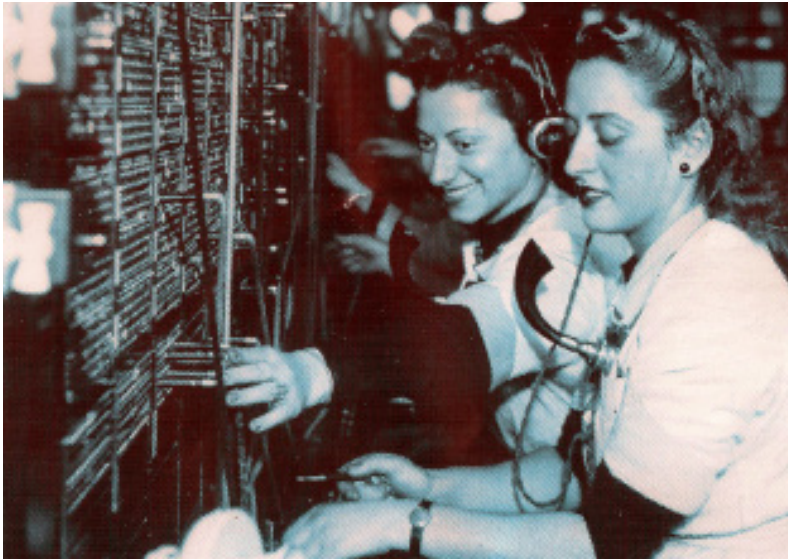
The mobile phone is undoubtedly a powerful tool in connectivity and many other functions; it's like a Swiss army knife (Ballard, 2007). It reaches much further than voice communication (R.S. Subramanya, 2007). Mahlke and Thüring(2007), in view of this context, explain that people prefer some mobile systems to others due to factors such as aesthetic qualities and emotional experiences that play an important role in addition to instrumental aspects.

The mobile service industry is an important area in the communications field, and Portugal is no exception. Portuguese mobile operators have been develop–ing product knowledge as well as building their own labelled products, which has led to an additional increase on research investments. Another indicator of the above (RCM, 2007) is the consistent number of times that the country started to appear in scientific papers referring this topic. The Portuguese mobile phone services have reached 12.2 million subscribers with a penetration rate of 115.7 per cent (ANACOM, 2008).

Taking into account this structure and the multidisciplinarity of the subject, this dissertation considered the main theoretical backgrounds: Services, Service Ex–perience, Service Design and Mobile Interaction.

1.1.1. Challenges posed by Mobile Services Experiences

As a new world of opportunities for mobile services has emerged, one needs to identify the drivers of experience with personal communication devices and their services, supporting the co-creation value through the dedicated design of new particular and interactive applications, interfaces and its specific mobility. Customer experiences have become increasingly important as well as challenging too, differentiating and adding value to products and services. Value is co-created by customers through their interactions with service providers, as it used to be in the telephone operator's time, resulting in a unique contextual outcome (Vargo and Lusch, 2004).

However, it is more challenging to create valuable service experiences when the company is not present. Mobile services require an awareness of all the mobility aspects with customer-journeys within self-service situations.

To design successful mobile services, it is crucial to understand these customer experiences while integrating viewpoints of designers and technology. To accomplish this integration, it is important to identify experience attributes to which customers give more importance, incorporating them into service design. Experience aspects, in this case, cannot be dissociated from the physical, the technological contexts, the social environments or even the emotional sphere. As such, it is important to understand customer experiences from a holistic view, involving both cognitive and emotional assessments. While improving core technologies, developers must also focus on providing end users with a rich and satisfying Mobile Service Experience (MSX).

The phenomenon of mobile technologies for service provision is more than ever unavoidable but still misunderstood. Paraphrasing R. Gary Bridge, from Cisco Systems (Ostrom et al., 2010), three trends are contributing to this situation: more of what people want and need is embodied in digital content or managed by digital processes; mobility allows communications to be released from fixed times and devices, and data is deconstructed and reassembled in cloud computing arrangements, enabling cost-effective content delivery on any device, anywhere, anytime (Ostrom et al., 2010). These are new challenges to New Service Development (NSD) as our knowledge of quality in services needs to be expanded (…) and services aren't designed correctly (Edvardsson and Olsson, 1996).

Some research has been undertaken on mobile service experiences but further research is still needed (Verhoef et al., 2009, Edvardsson and Enquist, 2009, Patrício et al., 2004, Oulasvirtaa et al., 2011).

Building upon the existing methodologies for studying service mobile user experience, this research aims to better understand the designed elements that affect user perceptions and to improve the methods for translating experiential factors into design characteristics. Integrating frameworks from design, engineering and services, the present study aims at tackling the ever-increasing mobile consumer goals. This understanding is crucial to support conception, generation, and development of mobile services.

Figure 2
The experience with mobile services is complex and comprises numerous factors (Author)

1.1.2. Challenges posed by Service Design Thinking

Service Design (SD) is an emerging research area, grounded in user-centred methods. Agencies, academics, industries and public service throughout the world now successfully apply SD methodologies in order to improve and create innovative services (King and Mager, 2009).

The challenge for design researchers is to inform managers of the capabilities and impacts of new technological artefacts. However, swift advances in technology can invalidate research results before they are implemented effectively in the business environment or, just as importantly to managers, before adequate payback can be achieved by committing organizational resources to implementing those results (Hevner et al., 2004).

Nevertheless, SD is a timely and useful approach in the sense that it is a means to cover the multidisciplinary fields transversally. Design methodologies have to address the service changes on time and space, as they follow companies' agendas. But being an emerging area of research, its methods for mobile services are still scarce.

Research Objectives

Having these challenges and opportunities in mind, the dissertation objectives are two-fold: First, the dissertation aims to better understand the customer experience with mobile services and more specifically to identify the drivers of service experience that can then be used to design the services.

These objectives lead to the following research question:

- What are the drivers of mobile service experience (experience factors) and how do they influence experience outcomes such as cognitive and emotional responses?

Second, the dissertation aims to improve service design methods to better incorporate experience factors in the design of mobile services. This second purpose leads to the following research questions on what design practice is concerned with, more specifically:

- How can EF be incorporated along the different phases of the project design and implementation?

- How can mobile service experiences be prototyped?

The objectives and research questions provided the framework for the research design, which involved the application to a mobile service start-up company, referred to as MOBSERV. The research project has also actively helped the conception and implementation of this mobile service.

1.1.3. How this dissertation is structured

The present dissertation according to Figure 3 followed a design thinking (Zimmerman et al., 2007, Brown, 2008) approach and attained the proposed objectives, by cyclical working phases, exploration, ideation and reflection and it is organized into eight chapters. Chapter 2 begins by laying the theoretical foundations of the research, and looks at how experience is considered in literature from several multidisciplinary viewpoints. The conceptual background also covers extant literature on designing for experience in mobile services.

Chapter 3 describes the research methodology starting by the integration of design research with social science research. The research framework follows a Design Thinking (DT) process, as already mentioned. Therefore, this section includes the research design and frames the conceptual model into three fundamental parts of the DT process worked on in the present research: Exploration, Ideation and Reflection, as presented in Figure 3. Chapter 4 – Exploration – lays the investigation and understanding of characteristics that surround the mobile service experience. It joins and describes the qualitative and quantitative studies that were made with mobile service customers throughout the MOBSERV development. Chapter 5 – Ideation – describes the constructive design research within the MOBSERV Company and the use of design creative methods to incorporate MSX's together and iteratively with MOBSERV developers' team.

Chapter 6 – Reflection – assesses the evaluation of design, and assembles the EF and EO studied in the first place. This chapter also presents a new Experience Prototyping method, which was developed and tested through a set of experimental studies. Chapter 7 discusses the Research contributions and is followed by the final conclusions and future work in Chapter 8.

Yellow stands for experience, the object of study. Blue stands for exploration, involving all the deeds in the way of understanding customer experience. In the explorative stage the field of study was defined giving inputs to the other stages. Green stands for ideation and the active process of incorporating experience in the service design. It was a generative stage in the sense that many future ideas were worked on. Finally, red combines prototyping experience methods. At this stage an experimental study was developed to evaluate the mobile service experience.

Similar to online services, mobile services can be viewed as another interface through which organisations interact and provide services to their customers.
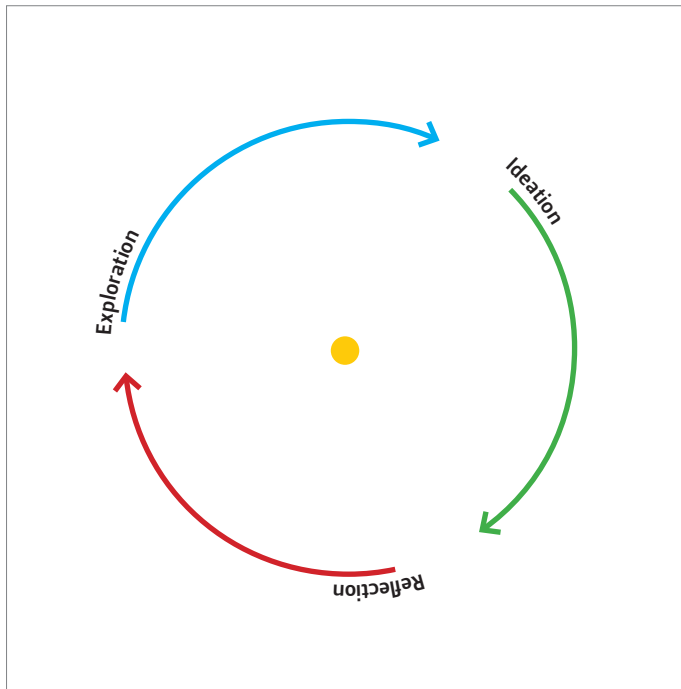
Figure 3
Research Framework,
making use of Design
thinking methods
(Zimmerman et al.
2007, Brown 2008)

Following Vargo and Lusch's definition of service (2004), mobile services can be defined as the application of competences for the benefit of another party with the support of mobile technologies, supporting customer activities such as context aware information gathering (e.g. nearby restaurants), purchases (e.g. mobile payment and usage of promotions), among others.

Mobiles services can be created as standalone offerings, but they are frequently part of a multi-interface service that combines other interfaces such as web or face-to-face. However, mobile services are not simply another channel. Mobility has a profound impact on service provision and customer experience, due to its ubiquity and constantly changing context, requiring further research. Therefore as the research adopts a service perspective, a broad conceptualization of customer is used, defined as a person or organization to whom the service is provided, whether that person or organization pays the service or not. As such, this broad definition of customer also encompasses users as defined in the Interaction field. In the design field, the term client often refers to the organization who pays for the service design project, and which then provides the service to its customers or users. As we adopt a service perspective, this organization will be referred to as service provider (see Appendix G).

2. Conceptual Background

The better understanding of customer experience with mobile services has been a challenging target. The research aimed at improving mobile service design through an iterative incorporation of experience factors. This has, as well, instigated the need to the current SD approach profiting from improved experiences in the mobile offers.

To this aim, the literature review on customer experience assembles previous work for studying service experience drivers, and mobile service quality. Literature review also covers design for services, design thinking process, and specific research on mobile services.

2.1. Customer experience concept

Since Pine and Gilmore (1998) supported that a new era of Experience Economy was starting, the concept of 'experience' has received increased attention and its focus has also evolved to a more multi-dimensional and holistic approach (Gentile et al., 2007). Even if fifteen years have passed, there are still some companies that simply wrap experiences around their traditional offerings in order to sell them better (Pine and Gilmore, 1998).

Experience has been described as "the internal and subjective response customers have to any direct or indirect contact with a company" (Meyer and Schwager, 2007). The term, as many other expressions within SD, travels between marketing and interaction design vocabulary. Its regular appearance in literature reflects a transition to a different way of thinking, a change of paradigm characterized by some authors as a shift from object-centred design to experience-centred design, extremely relevant for the services matter (Buxton, 2007, Zomerdijk and Voss, 2011, Lockwood, 2010). This means to look beyond a limited definition of 'use' requirements to include the whole range of human experience in all its facets and scales (Meroni and Sangiorgi, 2011). These experiences "occur when a customer has any sensation or acquires knowledge from some level of interaction with the elements of a context created by the service provider" (Pullman and Gross, 2004).

The term "user experience" has a wide range of meanings, and no cohesive theory of experience exists for the service or interaction design communities. However, there is great interest in the subject, and there have been initial efforts to create theories for the use of experience (Forlizzi, 2004).

A core aspect of product usability is service physical evidence.

'Affordances' (Gibson, 1979), as well as 'Evidence' (Shostack, 2001), can result in tangible touchpoints through which the customer can create his or her experience. This 'evidence' helps to recognize and to instruct how the service should be understood (Schifferstein and Hekkert, 2008, Norman, 2008). Donald Norman advocates that service designers need to provide clues because people need something to understand the service, some sign of what it is for, what is happening, and what the alternative actions are.

According to Buchenau and Suri (2000), "the experience is a very dynamic, complex and subjective phenomenon. It depends on the perception of multiple sensory qualities of design, interpreted through filters relating to the contextual factors". Experience has been a concern and a core topic with multidisciplinary approaches, but further research on service experience is still demanded (Stuart and Tax, 2004, Zomerdijk and Voss, 2011).

However when designing a particular service, many experience factors may have influence, even if the experiences cannot really be designed (Mager, 2008).

2.1.1. Experience levels

New Service Development (NSD) concerns all the activities involved in realizing new service opportunities, including SD. Innovative technology provides important opportunities for new service development. In this contemporary service paradigm, value is co-created by customers through service interactions in a relational exchange. However, for SD, experience is still considered the least understood topic (Edvardsson et al., 2000, Mager, 2008, Zomerdijk and Voss, 2011, Vargo and Lusch, 2004, Patrício et al., 2008). The NSD process may depend on the type of service and involves careful planning of tangible and intangible service elements (Zomerdijk and Voss, 2011).

Service experience encompasses a total experience, including search, purchase, consumption, and after-sale phases of experience, involving the arrangement of multiple channels (Lockwood, 2010, Verhoef et al., 2009, Patrício et al., 2008). Beyond this temporal understanding, an experience is also a composite unit of a number of nuances.

The overall experience is, then, decomposed into several service experiences; these being the outcomes of the customer interactions for a specific service encounter and of the operations associated to it. Consequently, service systems should start to be thought of from a general spectrum and finish with specifications and details, with the goal of promoting value co-creation (Vargo and Lusch, 2004).

Patrício et al. (2011), advocate a multilevel understanding of customer experience in order to design the service offering. They suggest a layered approach to experience, that helps an increased perception of the subject towards the use of adequate tools in its design. Three hierarchical levels are therefore established: the value constellation, the service system, and the service encounters.

Following figure 4, each level has specific characteristics and portrays deeper service experience details:

The value constellation experience is the structure within which suppliers, partners and customers stay for a generic creation and fruition of experience (Normann and Ramírez, 1993). The roles and relationships among this constellation have influence in an overall service experience (e.g., value constellation involves the experiences associated with a general intention like shopping on sales).

In the intermediate level, service experience is enhanced, according to the positioning the company has in the customer value constellation. This includes the services offered and the links and partnerships with other organizations (Patrício et al., 2011).
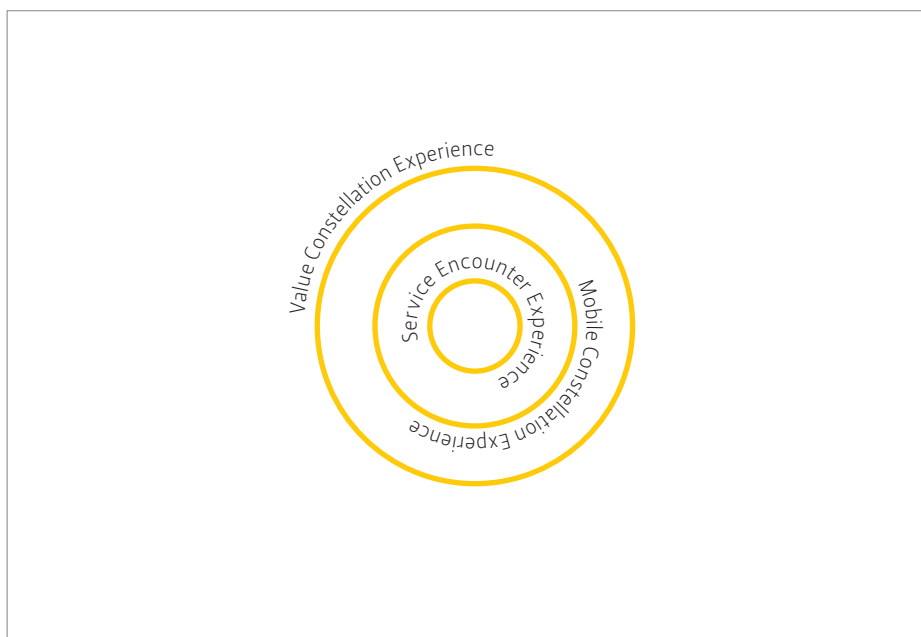
Figure 4
Service Multilevel Experiences adapted on Patrício, Fisk et al. 2010

Consequently, the service concept can be regarded in order to fit customer experience requirements (Maglio et al., 2006). At this level, Patrício, Fisk et al. (2011), emphasize the customer interface with several interaction contexts.(e.g., the mobile service experience to search promotions), The authors mention the importance of experience on how the different interfaces are grouped and how they are presented to the users.

According to Patrício, Fisk et al. (2011), the service encounter is the lower level, where experience is co-created through customer interactions at a given service interface for a service task, such as getting information on a promotional campaign through their own mobile phone. When thinking of experience, the customer journey and the several service encounters are important steps and a deeper understanding is demanded for its use, reflecting the diversity of touchpoints.

This perception of the service experience reinforces the density and interest when designing for the service mobile context (Ling, 2004, Kakihara and Sorensen, 2001, Jones and Marsden, 2006). This perception of the service experience reinforces the density and interest when designing for the service mobile context (Ling 2004, Kakihara and Sorensen 2001, Jones and Marsden 2006).

2.1.2. Conceptual model of customer experience

In spite of its complexity, in the past, research has not considered customer experience as a separate construct. Instead researchers have focused on measuring customer satisfaction and service quality. For Wolfinbarger & Gilly (2003), "It is the customer's total perception of the outcome which is the service, that forms the perception of quality and determines whether the customer is satisfied or not. The main task of service development is to create the conditions for the right customer outcome."

More recently, Verhoef et al. (2009) on this topic, advocate a total view of the experience. These authors propose and build a conceptual model of customer experience, and examine the need for management strategies to take these elements into account. They stress that the customer experience is holistic, covering cognitive, affective, social and physical responses to the service provider (Figure 5).
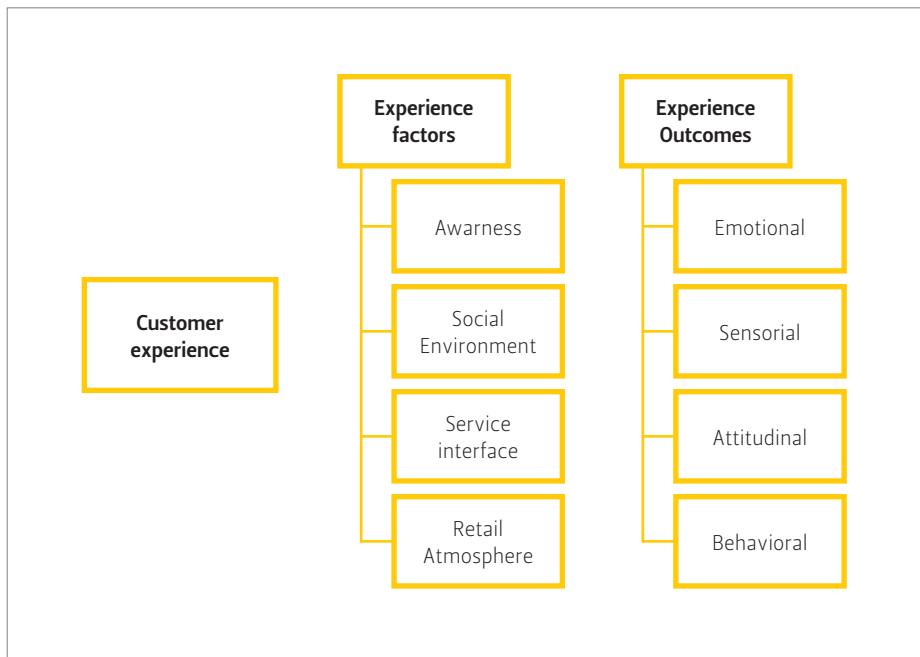
According to their definition, "This experience is created not only by those elements, which the retailer can control (e.g., service interface, retail atmosphere, assortment, price), but also by elements that are outside of the retailer's control (e.g., influence of others, purpose of shopping)".

Nevertheless, customer expectations are increasing specifically considering online businesses (Ding et al., 2011). Rather than interacting with employees in a physical space, customers interact with businesses in virtual spaces. Therefore these services offer unique capabilities with the online medium to provide interactivity and personalized experiences, content, increased product selection and information (Gentile et al., 2007). Bearing in mind the mobile services and the antecedents and outcomes of the customer experience, this new construct comprises aspects that need further research.

2.1.3. Experience Factors

Experience Factors, (EF's) – can be defined as customer perceptions of service attributes such as usefulness, or social environment, that drive the customer experience by generating experience outcomes such as satisfaction or emotional responses (Carreira et al., 2013a, Patrício et al., 2008). EF's can be used by designers to define the clues, affordances or signifiers that companies can orchestrate to collectively meet customer needs and expectations (Berry et al., 2002, Norman, 2008). EF's are customers' perceptions that can be reinterpreted by designers as experience requirements, guiding the design process.

Vargo and Lusch (2011), recommend EF's, as important design elements

> *"(...)largely focused on operant resources with which the firm is constantly striving to make better value propositions than its competitor."*

In order to better define EF coverage and according to Verhoef's model to ascertain a more holistic view of experience, the research theoretical background covered different EF dimensions.

The *Service Atmosphere* aims to provide good sensorial stimuli, such as sight, hearing, touch, smell and taste, thus arousing aesthetical pleasure, satisfaction, sense of beauty, adapted to the surrounding service interface (Mahlke and Thüring, 2007). Bitner (1992) coined the term serviscape to denote the environment in which a service is realized and experience created. This author suggested that serviscape has three dimensions: ambient conditions such as temperature, air quality and noise; space function such as layout equipment and furnishings; and signs and symbols. Service Atmosphere tends to emphasize physical artefacts and environmental factors that affect customer behaviour.

The *Social Environment* derives from the service ability to enhance social self-concept (Sweeney and Soutar, 2001). The service promotes consumption together with other people and leads to the creation of a community or a tribe of fans. It can contribute to creating social identity, inducing either a sense of belonging or distinction from a social group (Vargo and Lusch, 2004).

The *Service Interface* is the physical or virtual collection of points of contact between customer and the service provider to support the specific service activities (Zomerdijk and Voss, 2009). It is the place where the service provider tries to

manage a relationship with a customer, whether through people, technology, or a combination of both (Rayport and Jaworski, 2004). In the field of HCI, interface is a tool and concept that refers to a point of interaction between components, and is applicable at the level of both hardware and software. Preece et al. (2006) describe interface types focused with function (e.g. to be intelligent, to be adaptive, and others focused on the interaction style (e.g. command graphical, multimedia).

Ease-of-use is the "degree to which a person believes that using a particular system would be free from effort" (Davis, 1989b, Schifferstein and Hekkert, 2008), and has been pointed out as one of the main drivers of technology adoption. Ease-of-use can be broken down into efficiency, learnability and memorability (Preece et al., 2006). It is a usability factor and many authors are consistent on defending that ease-of-use may be a differentiator when designing technology-based services (Mahlke and Thüring, 2007, Candi, 2010, Norman, 2004),

The service *Usefulness* is also a key requirement (Davis, 1989a). It reports the service effectiveness and its recognized value (Gallouj and Weinstein, 1997). It is the ability to be used advantageously (Forlizzi, 2004), and can also be related operations completeness. In HCI context it is, " the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989a). Usefulness has to do with a pragmatic component that includes, but is not fulfilled, by the concept of usability.

Some EF's are not in direct control of the service provider, such as service social environment, although they are components of the service offer (Verhoef et al., 2009, Carreira et al., 2013a).

Recently, Helkkula (2011) reports that 'service experience' has been fairly mentioned and studied as a process-based, as an outcome-based or as a phenomenon. However, it has been mainly studied from the customer point of view, and so there is still scarce investigation on experience drivers from the companies' side. In fact, although earlier empirical studies have considered these EF's to some extent, they do not study these aspects as part of a holistic view of the experience offered.

2.1.4. Experience Outcomes

Experience Outcomes (EO) represent the customer's responses to all attributes of interaction towards the service (Carreira et al., 2013a), such as satisfaction or emotional responses. The EO's can also be understood as an effect driven by EF's, as mentioned by Verhoef (2009). These reactions are sensorial, cognitive, emotional or behavioural.

The cognitive outcomes of experience are extremely relevant as they are connected with thinking and awareness, the mental process and perceptions. Norman (2004) establishes perception levels. For this author it is only on a reflective level that consciousness of feelings, emotions, and cognition reside. At lower visceral and behavioural levels, there is only affect, but without interpretation.

The perceived value, quality assessment and satisfaction are experience outcomes, again driven by EF's. These cognitive EO's are regularly identified in empirical research (Patrício et al., 2003, Dagger and O'Brien, 2010, Ding et al., 2009, Hayes, 1992, Voss et al., 1998).

Customer senses may be affected by the service atmosphere, as well. The physical environment, in which experience is created, is often considered a key variable influencing experience outcomes (Zomerdijk and Voss, 2009). Within technology-based services this sensorial impact is also crucial. Fenko, Otten, & Schifferstein (2010) suggest that sensorial descriptors depend on the period of technology usage. Actually, service interactions at different stages of usage determine which sensory modality dominates experience at each stage.

The Emotional Component is a key characteristic of the service centred on the user. Emotions have a full impact on service experience. Richins (1997) developed a scale measuring emotions in consumer experience. This author reinforces the importance of emotions on the sphere of consumer behaviour. It is an encouragement to loyalty, creating emotional connections through engaging, compelling, and consistent contexts (Patrício et al., 2003, Norman, 2004). The emotional dimension is referred to as "a resource for understanding and communicating about what we experience" (Gentile et al., 2007). Emotions colour the experience and, more importantly, they determine how the experience will be remembered (Forlizzi, 2004, Pullman and Gross, 2004).

Researchers have been mainly focused on cognitive assessments, such as quality and satisfaction with the service usage (Wolfinbarger and Gilly, 2003, Patrício et al., 2004). In spite of a recognizable effort to understand customer experience from a holistic perspective, few studies have addressed it empirically to identify a comprehensive set of outcomes, involving cognitive, sensorial, social and emotional aspects.

2.1.5. Customer experience in the mobile context

There is an enormous growth of the mobile service market, raising the need, in this context, for a better understanding of the customer experience. Mobile technology inherently influences the context and temporality of these customers (Buchenau and Suri, 2000).

According to Jones and Marsden (2006), mobile experience would concern a design's message to the user – the way it makes him/her feel and act – and they state the need to extend that influence of interaction design beyond the technology itself to the whole package: "The marketing, customer care, charging plans … the aim is to present the user with an experience that is solid, distinct, understandable, trustworthy and satisfying." But then again, mobile customers do not always recognize this message, they change their behaviours and they become co-producers of the service. Often they have responsibility for the delivery of the service itself and for their own satisfaction (Meuter et al., 2005). Mobile service delivery, even in situations of problem solving, may lead customers to use their creativity.

Hence, the particular field of customer experience within the mobile context is dense and demanding. However, whether from HCI or service marketing research, studies on MSX concept are scarce, and studies that address the mobile service experience from a holistic perspective are still lacking (Tables 1–4).

The mobile service EF's in literature tables 1 and 2 represent the mobile customer perceptions of service attributes such as usefulness. Designers can assume these EF's to guide the design process.

Table 1
Research related to mobile EF on HCI and Engineering

Mobile EFs	Study
Usefulness	Pagani,(2004) Bouwman, Bejar, and Nikou (2012) Oulasvirtaa, Wahlstro, and Ericsson.(2011)
Accessibility	Pagani,(2004) Pagani,(2006)
Awareness, (Trialability, innovativeness)	Rogers,(1995) Bouwman, Bejar, & Nikou (2012) Joo (2011) Nova et al. (2006)
Communication qualities;	Pagani,(2004) Pagani,(2006) R.S. Subramanya (2007)
Content suitability (e.g., functions provided)	Pagani,(2004) Pagani,(2006) Jung, Persson and Blom (2005)
Aesthetics/ Design/Image	Pin Luarn(2005) Mahlke & Thüring,(2007)
Ease of use / Ease to learn / Usability	Pagani,(2004) Mahlke & Thüring,(2007) R.S. Subramanya (2007) Jones and Marsden (2006) Theo Dunnewijk (2007) Kaasinen (2009) Nielsen and Budiu (2013) Sá and Carriço (2011)
Efficiency	G. Peevers (2008)
Intent to adopt	Lua, Yao, & Yu, (2005) Pagani,(2006) Kleijnen, Lievens, Ruyter, & Wetzels, (2009) Kaasinen,(2009) Smura, Kivi, & yli,(2009)
Security/Privacy	Pagani,(2004)
Social Environment	Lua, Yao, & Yu, (2005)
System qualities (e.g., speed, network connectivity)	Pagani,(2006) Mahlke & Thüring,(2007) Abebe (2009) CHAE, KIM, & RYU (2002) Jung, Persson & Blom (2005)
Time convenience	Karapanos et al.(2009)

Table 2
Researches related to mobile EF on Services Marketing

Mobile EFs	Study
Usefulness, Content suitability (e.g., functions provided)	Wolfinbarger & Gilly, (2003) Kleijnen, Ruyter, & Wetzels, (2007)Methlie and Pedersen (2007) ..Nysveen, Pedersen, and Thorbjørnsen (2005)
Awareness, Trialability	Meuter, Bitner, Ostrom, & Brown, (2005)
Aesthetics/ Design/Image	Wolfinbarger & Gilly, (2003) Kleijnen, Ruyter, & Andreassen,(2005)
Ease of use / Ease to learn / Usability	Wolfinbarger & Gilly, (2003) Kleijnen, Lievens, Ruyter, & Wetzels, (2009) C. Lopez-Nicolas et al. (2008) Methlie and Pedersen (2007) Tojib and Tsarenko (2012)
Intent to adopt	Herbjørn Nysveen, Pedersen, & Thorbjørnsen (2005) Pura,(2005) Kleijnen, Ruyter, & Wetzels, (2007) Kleijnen, Ruyter, & Andreassen,(2005) Vlachos & Vrechopoulos, (2008) Meuter, Bitner, Ostrom, & Brown, (2005)
Multi-channel offer	Kleijnen, Ruyter, & Andreassen,(2005) Meuter, Bitner, Ostrom, & Brown, (2005), Patrício, Fisk, and Cunha (2008)
Security/Privacy	Wolfinbarger & Gilly, (2003)
Service Atmosphere	Bitner (1992) Pullman & Gross,(2004)
Service interface	Wolfinbarger & Gilly, (2003), Patrício, Cunha, and Fisk: (2008)
Social Environment	Kleijnen, Lievens, Ruyter, & Wetzels, (2009)
System qualities (e.g., speed, network connectivity)	Methlie and Pedersen (2007)
Time convenience	Kleijnen, Ruyter, & Wetzels, (2007) Tojib and Tsarenko (2012)

Service design aims at orchestrating experiences that are functional, purposeful, engaging, compelling, and memorable (Nysveen et al., 2005a). But, being technology-based services, the mobile experience concept challenges the understanding of aspects such as technology awareness or a self-service impact (Reinders et al., 2008, Meuter et al., 2005).

When thinking about the mobile context, the design of clues and stimuli should follow EF's all along space and time. There is a demand to go beyond the confined and functionalistic understanding of mobility and to capture multiple dimensions of mobilisation of our social interaction (Kakihara and Sorensen, 2001),

In Mobile HCI literature, aspects such as ease-of-use or usefulness of mobile technology have a major importance. Nonetheless, Pagani (2004) has studied awareness, accessibility, content and communication qualities as well as security. The Technology Acceptance Model (TAM) considers the interaction with customers built on three experiential aspects: perceived value, perceived ease-of-use, and trust (Kaasinen, 2009). Actually, TAM has helped to examine the mediating role of perceived usefulness and perceived ease-of-use, their relationships with information systems and the propensity to use. Therefore, studies have also used TAM as a starting point of analysis of EF's on mobile services.

From the service point of view there is some literature considering EF's, often in view of usability aspects as well (Kleijnen et al., 2007, Methlie and Pedersen, 2007).

In order to understand the determinants of adoption of mobile services, Pagani (2004) had also defined a hierarchy of importance, concerning the critical factors influencing this stage based on the importance of ratings. However, the analysis of extant literature reveals that an empirical perspective of mobile EF's, through all moments of the service process, is in need of further research. This is relevant because MSX dimensions might have different degrees of importance along the different stages of service adoption and therefore, it is necessary not only to clearly understand them, but also to evaluate when they may be more critical. These mobile customer experiences can be articulated with their interactive effects, so companies can develop better strategies to foster customer loyalty behaviour (Helkkula, 2011).

Table 3
Research related to EO on HCI and Engineering

Mobile EO	Category	Study
Attitudinal	Perceived value (e.g., innovativeness, Expressiveness)	Pagani,(2004) Kaasinen,(2009) Malhotra & Malhotra (2013) Lua, Yao, & Yu, (2005) Sterling &Zimmerman (2007)
	Satisfaction	Smura, Kivi, & yli,(2009) R.S. Subramanya (2007)
	Perceived Quality	Pagani,(2006) Mahlke & Thüring,(2007) Smura, Kivi, & yli,(2009) Malhotra and Malhotra (2013)
Behavioural	Loyalty	Pin Luarn(2005)
Positive Emotions	Trust	Pin Luarn(2005) Margharita Pagani,(2006) Mahlke & Thüring,(2007) Kaasinen,(2009) Chena & Katz,(2009)
	Confidence	Hsu,(2008) Sterling & Zimmerman (2007)
Negative Emotions	Risk	Pagani,(2006) Mahlke & Thüring,(2007)
Sensorial /Physiological	Touch	Mahlke & Thüring,(2007)

Table 4
Extant researches related to EO on Service Marketing

Mobile EO	Category	Study
Attitudinal	Perceived value (e.g., innovativeness, Expressiveness)	Pura,(2005) Kleijnen, Ruyter, & Wetzels, (2007) Nysveen, Pedersen, & Helge Thorbjornsen, (2005) Zampou et al. (2012)
	Satisfaction	Herbjørn Nysveen, Pedersen, & Thorbjørnsen(2005) G. Peevers (2008) Kleijnen, Ruyter, & Andreassen,(2005) Vlachos & Vrechopoulos, (2008) Tojib and Tsarenko (2012)
	Quality Assessment	Wolfinbarger & Gilly, (2003)Nysveen, Pedersen, & Helge Thorbjornsen, (2005) Herbjørn Nysveen, Pedersen, & Thorbjørnsen(2005) G. Peevers (2008) Vlachos & Vrechopoulos, (2008)
Behavioural	Loyalty	Nysveen, Pedersen, & Helge Thorbjornsen, (2005) Zampou et al. (2012)
	Trial	Pura,(2005) Meuter, Bitner, Ostrom, & Brown, (2005) C. Lopez-Nicolas et al. (2008)
Positive Emotions	Trust	Pura,(2005) Zampou et al. (2012)
	Confidence	Pura,(2005)
	Enjoyment	Herbjørn Nysveen, Pedersen, & Thorbjørnsen(2005) Nysveen, Pedersen, & Helge Thorbjornsen, (2005) Pura,(2005) Tojib and Tsarenko (2012)
Negative Emotions	Risk	Pura,(2005) Meuter, Bitner, Ostrom, & Brown, (2005)
	Fear	Pura,(2005),
Sensorial	Touch, vision	Yang & Lee,(2010)

Some mobile services empirical studies have focused on the experience outcomes as cognitive assessments and other reactions driven by EF's (see tables 3 and 4).

Attitudes and the overall assessment of quality are the most studied aspects in both Mobile HCI and Marketing fields (Nysveen et al., 2005b, G. Peevers, 2008, Vlachos and Vrechopoulos, 2008, R.S. Subramanya, 2007, Smura et al., 2009a).

The perceived value is also particularly studied. It is related with the end users and the relevance they feel through the subjective experience of their interaction with the mobile service and technology (Nysveen et al., 2005a). This value is the most mentioned and measured outcome for mobile offerings (Isomursua et al., 2011, Kaasinen, 2009, Pura, 2005).

Other studies have considered behavioural intentions, such as loyalty to consume mobile services (Nysveen et al., 2005b). Positive perceptions of the mobile service converge to behaviour of adoption and loyalty as final desired outcomes (Pin Luarn, 2005, Pura, 2005, Smura et al., 2009a).

Verhoef (2009) advocated the emotional outcomes to his model of customer experience. This way, on mobile service literature, some authors have also made reference to this emotional dimension on measuring the impact of an overall experience (Pura, 2005, Sandstrom et al., 2008). Their aim is to understand what the user looks at, feels and hears, while using a technology–based–service, and go beyond the concrete sensorial responses (Buchenau and Suri, 2000, Chena and Katz, 2009).

Methlie and Pedersen (2007) reinforce it, referring social norms and intrinsic motives such as enjoyment, as important determinants of intention to use mobile services. These authors explain the existence of a normative pressure and expressiveness, which can be different among genders.

The sociological dimensions, security and privacy are also important attributes for mobile services as they may act as inhibitors of trialability (Kleijnen et al., 2009, Lua et al., 2005, Meuter et al., 2005). Some authors also include in their outcome models the social dimensions, as a consequence of the rising social networks and the sense of image that have impact on adoption intentions (Nysveen et al., 2005b). Some studies recognize social explanations as a research gap, affecting the use surrounding mobile services, which can be of great relevance to improve mobile experiences (G. Peevers, 2008, Vlachos and Vrechopoulos, 2008).

Even if there have been some mobile service studies on the identification of service quality and on cognitive assessments, other elements are less studied. Research does not address the service as a whole, combining the sensorial, cognitive, emotional or behavioural reactions (Verhoef et al., 2009, Carreira et al., 2013a). These missing perspectives guide research to the necessity of listening to customers with multidisciplinary approaches, and leveraging technology to advance services as the theme of MSX suggests (Jones and Marsden, 2006).

2.2. Designing Mobile Services

Design for service experience was born from the interest in using design thinking to create better products or services fulfilled by qualified events. The service designer does not create experiences but there is an interest for him/her to be present from the beginning and to involve users in the design process (Sandstrom et al., 2009, Edvardsson et al., 2006).

2.2.1. Service Design

In 1969 Herbert Simon gave his definition that design is the "transformation of existing conditions into preferred ones (1996). Three years later product designer Charles Eames gave his similar definition of "Design" –

> *A plan for arranging elements in such a way as to best accomplish a particular purpose.* And, when asked about whether – *Design was ephemeral,* he answered – *Some needs are ephemeral. Most designs are ephemeral*, in (Ed Annink 2003).

Designing for experience was somehow implicit in a sense that it was meant for the ephemeral. Design always had a human centred process but in the late 90's to many designers like Gui Bonsiepe (1999), the interface became a central concept of intervention, being responsible for the structural coupling of the user with the object of interaction. Action and environment turn out to be the focus of design. Following a change in the paradigm and moving away from visual symbols and things, designers and design theorists try to understand products inside the experience of human beings, making use of their social and cultural environments (Buchanan, 2001). Designers had on their hands a new disciplinary area – "interaction design" – focusing on how human beings relate to other

human beings through the mediating influence of products (Buchanan, 2001).

Along with digitization, there was a detachment from the linear Design Thinking (DT) process to reach a variety of numerous interests and user needs. Nowadays, design is a huge, largely worked concept. Many people defend DT as a valuable tool to address problems and issues that do not necessarily involve a manufactured product (Zimmerman et al., 2007). The radical innovation of meanings is presented as the major benefit when driven by Design (Verganti, 2009).

Service Design (SD) foundation starts with Shostack (2001). This author proposes an integrated design of material components (products) and immaterial components (services). He advocated a rational service design approach through a system of visual description – a service blueprint. His proposal was to represent and model the service in order to experiment and manage its innovation.

According to Lovelok (2001), service is

> *"an economic activity offered by a party to another, that would employ time-based performances to bring about desired results in assets for which purchasers would have responsibility. In exchange for their money, time and effort, service customers would expect to obtain value from the access to goods, labour, professional skills, facilities, networks, and systems; but usually, they wouldn't take ownership of any of the physical elements involved."*

Ben Reason, from Live|work (first SD consultancy firm), poetically described service as a natural system that has always been around and that is provided in nature like rivers or atmosphere, living in a very symbiotic relationship (Moggridge, 2007).

Vargo and Lusch's definition for services is the

> *"application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself"* (2004).

Other descriptions present services as activities or events that form an offering through an interaction between the customer, any mediating technology, and representatives of a service organization. Services are also defined as performances, choreographed interactions, created at the point of delivery, the visible

front-end of a process that co-produces value, utility, satisfaction and delight (Evenson and Dubberly, 2010).

Hence, a service has specific characteristics. It is intangible as it cannot be stowed in a drawer and it exists in time but is also perishable as its resources are assigned for delivery during a definite period in time so it cannot be consumed twice. A service is also inseparable from the service provider or their service consumers. The service is rendered and consumed during the same period of time; this is an attribute of simultaneity. Each service is unique. Even though the term "service" is common in interface design discourse, the co-created value between customers and service organizations is an outcome of an SD process (Holmlid, 2007),

Manzini (2003) describes a shift in design focus '... from designing (and selling) physical products only, to designing (and selling) a system of products and services which are jointly capable of fulfilling specific client demands, while re-orienting current unsustainable trends in production and consumption practices. SD therefore became the project of intangible experiences that reach people through many different touchpoints that happen over time.

Product design has contributed with a greater amount of tools from which SD has inherited several methods and techniques. Recently, new tools specifically for SD practice, have been able to face the higher level of complexity and to communicate also the immaterial aspects of the project, such as time and experience (Tassi, 2009).

Today,

> "Service designers visualize, formulate, and choreograph solutions to problems, they observe and interpret requirements and behavioural patterns and transform them into possible future services. Service design stands in a tradition of product and interface design, but essentially employs analytical and creative design methods and tools for service conception and offering", (...)"Even if these fields of study are still primarily oriented around designing human-machine interfaces, parallels have emerged in theoretical and methodological development, in the search for factors to be noted and influenced when designing an experience, though experience cannot really be designed, only the conditions that lead to experience" (Mager, 2009).

SD is nowadays recognized in service management and design fields. It is a multi-disciplinary field as it links social, technological and cultural dimensions, and does not rely only on a technological understanding of the industrial artefact. SD combines the skills of understanding digital technologies with the ability to design the consumer experience (Lovlie, 2009). Therefore, it is described as a human-centred approach as well. It entails understanding customers, different stakeholders and their contexts, and translating this understanding into the orchestration of the different service design elements (Evenson and Dubberly, 2010, Lovlie, 2009, Mager, 2008). By being human-centred, SD enhances the lives of people and helps organizations to better connect with their existing stakeholders, while discovering new opportunities to co-create value (Holmlid, 2007).

2.2.2. Service Design process

Guilford (1950) defined creativity within two types of thinking: divergent and convergent thinking – the divergent would be regarded by fluidity, flexibility and originality. A creative thinking was meant to produce original ideas – The originality of ideas would be evaluated by the rarity of the solution. However, the merit of design comes about not only by the final solution but also by the richness of its process.

DT has become a central topic in the contemporary design discourse: there is a demand to have designers involved in a big picture of socially innovative design, beyond the economic bottom line; design's collaborative effort is spread among diverse participating stakeholders and competencies (Sangiorgi, 2011); designers are requested to put ideas to be envisioned (Bjögvinsson et al., 2012)

How designers think and proceed has raised interest from other disciplines, such as HCI and management. DT is now a discipline that uses designers' sensibility and methods to match people's needs, with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity (Burdek, 2006).

Tim Brown (2008) supports (…)

> *Design process results as hard work augmented by a creative human-centred discovery process and followed by iterative cycles of prototyping, testing, and refinement.*
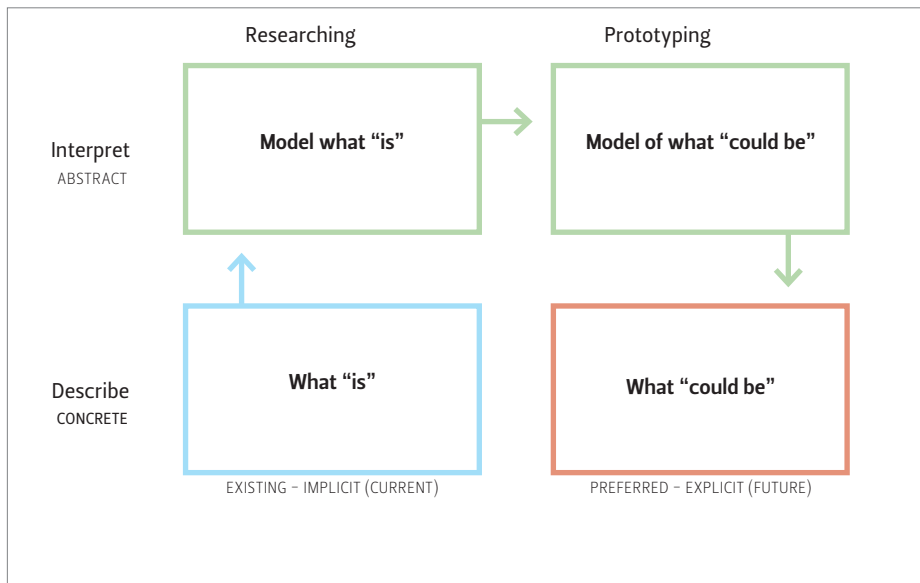
Other authors support the design process is iterative and nonlinear since its differ-ent stages may be repeated several times before reaching a solution (Stickdorn et al., 2010, Kumar, 2012)

According to Donald Norman (2011), designers should afford users with appropriate conceptual models to deal with the complexity of products and services. As this au-thor settles, humans are always looking for explanations, always seeking to under-stand what is happening.

Design moves deeper into the human sciences, but the universal propositions of the behavioural and social sciences do not lead directly to the specific, to particular fea-tures of successful products (Buchanan, 2001). Therefore, they look for explanations on conceptual models, built for the understanding of their experiences (Norman, 2011).

Like an extension to Guilford's creative thinking, the Bridge Model (Figure 6) intended to bridge the gap between analysis and the synthesis – How design moves from a concrete problem to a preferred explicit solution (Dubberly et al., 2008).

The core of designers' intervention is precisely, according to these authors, the way they move from the abstract to the concrete. Therefore, the bridge model intends to make the role of modelling in the DT approach more explicit. On one hand, by encour-aging team members to understand and agree on the elements of a system and how those elements interact with each other and the environment. On the other hand, by making the elements and interactions visible, they reduce the likelihood of overlook-ing differences in points of view, promoting multidisciplinary approaches.
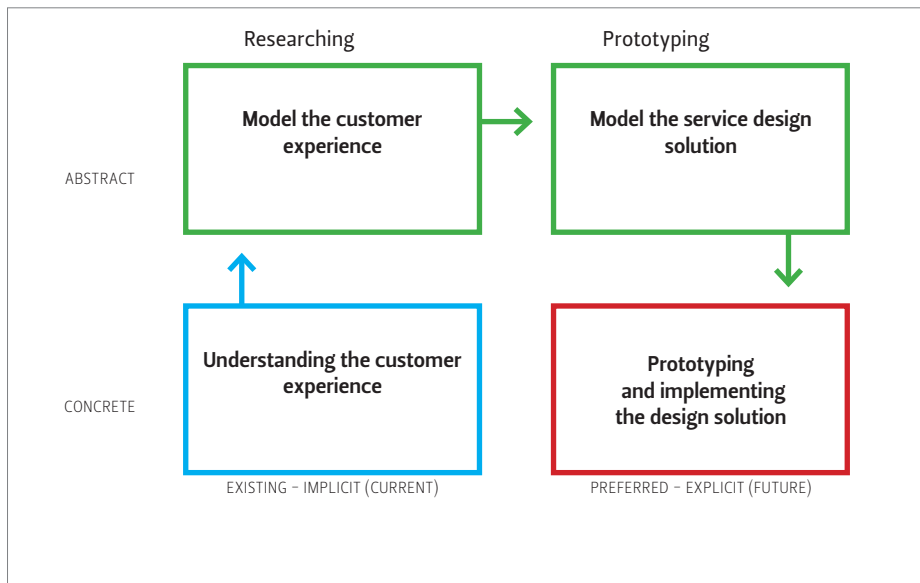
Figure 7
The Bridge Model, adapted to Service Design, from Patrício and Fisk's version (2012)

The bridge model can be adapted to service design (Patrício et al., 2013, Dubberly et al., 2008). From this perspective, the service design process starts with understanding the customer experience in the current situation (Figure 7). Based on that understanding of customer experience, new preferred service solutions are modelled to provide an abstraction that helps focus on the most relevant service aspects and enable the design team members to 'play' as they explore and test new service solutions. Then design returns to the concrete world, converting models into prototypes before implementing the final solution (Koskinen et al., 2011).

Companies expect a service designer to help create ideas that better meet customers' needs and desires and create memorable experiences (Holmlid, 2009).

DT represents an approach to idea generation and problem solving that both designers and non designers can develop and apply (Meroni and Sangiorgi, 2011). Service designers are focused on the systematic use of their methodologies (Lockwood, 2010). Their Human-centred practice is exploratory, generative and evaluative; so their methods result in outcomes of the service systems interaction (Brown, 2009, Mager, 2009).

Therefore, this DT process comprehends the above common stages: First there is Exploration to gain multiple perspectives on a problem – it involves insight – go out, observe and understand users and their actual experiences and their context, the service providers and their social practices; it entails studying the stakeholders who will be involved in the project, their behaviours and context, in a human–centred design approach. As suggested by Brown (2009), ideas are more likely to be triggered by observing the odd practices.

Therefore this stage is followed by Ideation, promoting enlightenment, developing new ideas that may lead to service solutions. At this stage, it is crucial to include all the main stakeholders and work with multidisciplinary teams (Patrício et al., 2013). Participants should be open to go through divergent and convergent ways of thinking (Brown, 2009, Guilford, 1950). Ideation comprehends searching for a broad set of opportunities but also deciding among alternatives to move forward.

Then, Reflection entails prototyping the service concepts previously created and testing them with potential users. Since services are intangible performances, prototyping is important so customers and the design team can have a more concrete idea of the service concept. Finally, Implementation leads to planning, implementing and reviewing the changes necessary to put into practice the new service concept and offer it to customers (Brown, 2008, Patrício et al., 2013).

As mentioned, these stages involve an understanding of users and their context, service providers and social practices, as well as transforming this knowledge into the development of evidence and interaction through an iterative process (Rohrer et al., 2008). The Iterative role of this process has major importance in refining the concept with increasing fidelity and reflection (Brown, 2008). Although in practice this cyclical process tends to be flexible and pragmatic as well (Moggridge, 2007),

SD is a research priority and can create a difference in the strategies of implementing technology–based services (Patrício et al., 2013). It can also provide an opportunity to close the gap on a specific level of analysis and move forward through time to a next desired state, developing updated new features (Ostrom et al., 2010).

2.2.3 Designing Services in the mobile context

Designing for the mobile space is an unavoidable reality even if it might be complex. It is challenged by "The Carry Principle" based on the fact that the mobile phone or any personal related device is always with the user (Ballard, 2007). The Nielsen Group (2013) has published studies of mobile usability based on extensive empirical research around the world that reinforce the need for improved design in mobile interfaces.

When looking for literature on detailed design processes and practices, recommendations to service conception within these ever-changing contexts are scarce. However, designing services changed once technology enabled them to become ubiquitous. Moreover, the latest developments in mobile computing and contextually aware devices have given weight to a transition from the HCI's early obsession with usability to the social and emotional impact services have, and their ability to improve people's lives (Forlizzi et al., 2008, Norman, 2011).

The notion of mobility brought an expanded perspective that goes beyond the functionalistic understanding of the term itself (Kakihara and Sorensen, 2001). Rohrer Evenson et al (2008) stressed that creating highly usable products, with great look and feel, would not be sufficient to sustain business growth, unless they meet customer requirements.

Achieving high levels of usefulness can actually disguise the importance of challenges with improved experiences and desirability, since business success is still attainable. This way, designing mobile services implies an understanding and articulation with other channels of service delivery. Even the marketing field is only recently beginning to look at this channel as a service interface.

2.2.4. Prototyping Experience

Testing new products through a prototype is also a well-established practice in mobile HCI (Suri and Marsh, 2000). Mobile interface prototyping is important to reach the deep assessment of the look and feel, ascertaining how a mobile device feels in the hand of the user (Bolchini et al., 2009, Jones and Marsden, 2006, Lua et al., 2005).

A prototype is an early sample or model built to test a concept or process or to act as a thing to be replicated or learned from.

Bill Buxton (2007) set up prototyping as being didactic, descriptive; helpful with refinement and answering, so it assists in resolving problems. Prototypes are more specific than sketches as well as more representative. They are essential instruments within the design practice to get feedback (Buxton, 2007).

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. 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. These authors add that experience goes beyond a "concrete sensory".

Research and design practitioners have been employing a variety of methods, such as scenario building, to evaluate the influence of systems on emotional experiences in human–technology interaction (Mahlke and Thüring, 2007). So when it comes to evaluating experiences, a simulation of the experience foresees some of its performances through the use of the specific touchpoints involved. The experience prototype allows designers to show and test the solution through an active participation of the users (Sarmento and Patrício, 2010c).

> User experience prototyping (UXP), is *the experiential aspect of whatever representations are needed to successfully (re) live an experience. (Buchenau and Suri 2000).*

This experience representation intends to explain, explore or communicate what it might be like to engage with a product, space or system being designed.

Bjögvinsson et al. (2012) support a shift to a designed object assembling a social component. This shift leads to a design process based on working ethnographies and other ways to focus on the users' understanding that become even more central. But the most significant shift, according to these authors,

> *It is the replacement of systems descriptions with engaging hands-on design devices, like mock–ups and prototypes and design games that helped maintain a family resemblance with the users' everyday practice and supports creative, skilful participation and performance in the design process.*

Other recent empirical studies have confirmed that production and rapid visuali-zation of multiple ideas, through low-fidelity prototyping, allows practitioners to reframe failure as an opportunity for learning, supports a sense of forward pro-gress, and strengthens beliefs about creative ability (Gerber and Carroll, 2011).

Buchenau and Suri (2000) emphasized the concept of experience prototyping as being a representation required to successfully convey the interaction with a product, space or system. Nevertheless, experience prototyping is still barely in-vestigated and its application to services has not been fully explored. In the ap-plication of user experience prototyping to services, it is unclear which specific elements of the service experience should be tested. Several authors suggested that customers' assessment of services such as a website quality includes not only experiences during their interactions with the site but also post interaction service aspects (Samalionis and Moed, 2009). Although others (Parasuraman et al., 2005), argue that measuring experiences in terms of intensity is unhelpful as it fails to designate the long-term efficacy – and potential durability – of the experience itself.

Prototyping a service typically involves creating scenarios based on the service encounters outlined in the service blueprint and acting them out with clients and stakeholders, playing out as in a theatre (Chapman, 2005). The theatrical performance for the creation of emotional effects and social interactions in ser-vices is important, just as it is in the movies (Saffer, 2007, Zomerdijk and Voss, 2009). To prototype services, it is important to take into account the duration, the sequence and the evolution of the scenes. The commonly used technique: role-playing, refers to role training, where people rehearse situations in prepa-ration for a future performance and to improve their abilities within a role (Bu-chenau and Suri, 2000, Stickdorn et al., 2010, Fisk et al., 2008). So, role-playing constitutes another significant technique of service prototyping. Only through performing can designers really determine how the service will feel (Fisk et al., 2008).

Service prototypes may not be physical but, on the other hand, they must be tangible (Koskinen et al., 2011). Usually some form of mock-up of the service system will be created. The prototype can vary greatly in terms of complexity, but the general aspect will be the ability to test the service solutions being pro-posed in something approaching a "real-world" environment.

Stickdorn et al. (2010) defines service prototypes as

> *"Simulations that can range from being informal role-play style conversations, to more detailed full-scale recreations involving active user-participation, props, and physical touchpoints".*

The prototype will generally be evaluated and repeated iteratively, with suggestions and refinements being constantly incorporated. Pictures help in the understanding of what it is learned through prototyping, and videotape allows to recognize the performance of prototyped services (Buchenau and Suri, 2000).

Prototyping experience has become a key SD component but its application to the mobile service context has not been addressed.

Furthermore, the different standpoints on experience prototyping and service prototyping do not integrate a conceptualized view of the service's EF's. The understanding of contributions that each approach may bring and the identification of the situations to which they are suited demand a synthesized picture for Service Experience Prototyping.

2.3. Conclusions of the conceptual background

Recent years have witnessed an increased interest in the experience concept. The issue has also grown in importance in light of mobile service evolution, where integrated systems with revolutionary business models made a radical innovation of meanings (Verganti, 2009).

There has been some research made on customer experience so far, but it does not empirically identify a holistic set of attributes that are specific to mobile services. Whereas service research has focused on a conceptual understanding of the customer experience, interaction design has focused on empirical studies and application, without an in-depth conceptualization of the phenomenon.

These missing perspectives guided this research to understand experience with social sciences support, whilst developing and building new methods through a DT approach, leveraging technology to advance services, as the theme of MSX suggests. A DT approach in this context aimed at reducing the probability of neglecting points of view while promoting multidisciplinary approaches.

Furthermore, prototyping experience has become an SD key component but its application to the mobile service context has not been addressed. Research to date has approached experience prototyping and service prototyping from different viewpoints. However the understanding of each approach demands a particular view. This research therefore aimed to understand MSX from a holistic perspective and to incorporate this understanding into a user centred, iterative process of Service Design.

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3. Methodology

The present dissertation adopts a strategy built upon using behavioural sciences research and design research. The research follows an abductive reasoning with a set of observations resulting iteratively into the likeliest possible explanation throughout the research process (Martin, 2009):

On one hand behavioural sciences would involve the systematic analysis and investigation of human behaviour through observation and disciplined scientific experiments in this case following their use of mobile phone services. This would involve cognition but also other human processes of decision.

Thus, Behavioural–science research supported the understanding of the MSX concept. On the other hand there was a design research that was the other pillar of knowledge: it promoted conception of a new mobile service through several iterations and endorsed the development of new methods: – The research design follows a DT process, broadly described before in the literature review section, and framed in its three main stages: Exploration endorsed the study of mobile service EF and EO. Ideation followed the mobile service development; Reflection involved experimental studies to improve MSX prototyping. For each stage several methods were iteratively used.

3.1. Integrating Design research with Social sciences

The ideas of Herbert Simon (1996) about the science of the artificial motivated the development of research on designing and a scientific approach to design activity and its methods. A line of research from this period sought to scientifically describe this way of thinking and these modus operandi. As an example, Nigel Cross relates: *their designerly ways of knowing* (Cross 2001).

Ken Friedman (2003) suggests that

> *"since design knowledge grows in part from practice, design knowledge and design research overlap. The practice of design is one foundation of design knowledge. Even though design knowledge arises in part from practice, however, it is not practice but systematic and methodical inquiry into practice, that constitutes design research, as distinct from practice itself. ".*

Buchanan (1992) is attributed a shift of the concept of design thinking away from a cognitive style toward an intellectual approach to problem framing and

problem solving that acknowledged the social aspects of design work.

More recently, Kimbell (2009) reinforces the idea that in practice, in a theoretical-design approach all stakeholders, including end-users, are an operative part of the design action. Therefore, their contributions are also part of the design outcomes. Without missing this integrative logic, design-research and behavioural-science were assembled in this research dissertation. These two approaches happened along the already mentioned iterative research cycle of place and time (see Figure 7).

With a more classical approach, Hevner (2004) defends that the design-science has its roots in engineering and is therefore a problem-solving paradigm. It seeks to create innovations, practices, technical capabilities through which the analysis, design, implementation and management can be effectively and efficiently accomplished. However, Hevner calls attention to behavioural science significance reflecting on how people employ artefacts, and reporting on the benefits and difficulties encountered when a technology is implemented.

To Fallman (2008), design research is drawn up in between three extremes: "practice," "studies," and "exploration"; the combination of the three activities distinguishes the field from other fields with related interests, including Human-Computer-Interaction (HCI), Anthropology, Sociology, Philosophy and others.

Taking Fallman's conception, this research dissertation stands on design practice taking a mobile application for validation of the proposed approaches to a mobile service company. On one hand, as suggested, the design researcher did not work as an outside observer but as a team designer. On the other hand, the design researcher was involved in analytical work, taking part in and contributing to ongoing discussions and to a body of knowledge on design theory and methodologies. However, the research was not explorative in the sense that it did not necessarily answer questions like Fallman's suggests some uncertainty ("What if...?"). The researcher approached the mobile service through an exhaustive inventory of concepts that helped to formulate wicked problems (J.Rittel and Webber, 1973).

Behavioural-science research supported the understanding of the MSX concept. The qualitative methods, like listening to users and watching them, were used to ascertain their testimonies, casting a wide net of experiences to gradually refine the outcomes.
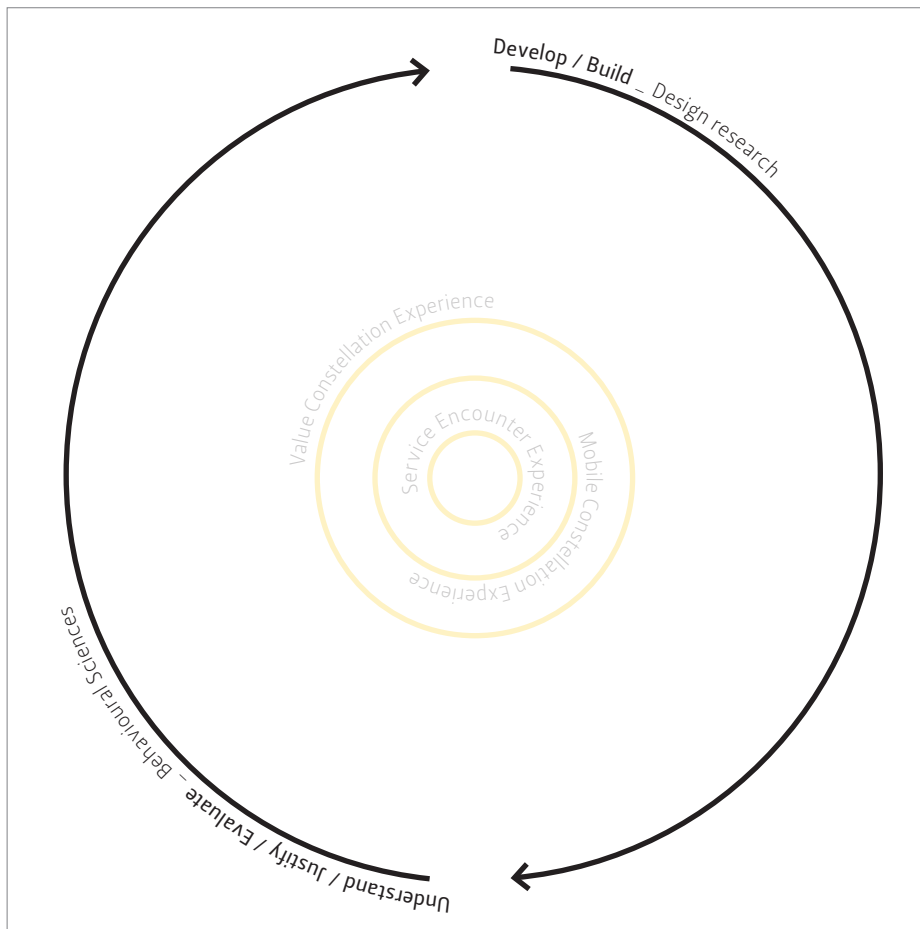
The quantitative research helped to confirm and validate the service concept and the previously founded experience dimensions.

This approach helped to define a measurement model for EF's and measure their impact on EO's. On the other hand, design research has assisted in evaluating and communicating experience at the different moments of the service development.

Following Figure 8, a behavioural–science approach was used to understand, evaluate and find explanations to mobile service experience dimensions; Observations, semi–structured interviews, focus groups, task analysis, and a survey were used to understand mobile service users and their experiential requirements. These methodologies were taken right from the beginning of the service concept and iteratively were defining experiential dimensions, narrowing and validating the outcomes (Laurel, 2003).

This work, as demanded, undertook a keen understanding of people, patience and an open attitude (Laurel, 2003). Then Design–research took advantages from this knowledge, and iteratively, as well, developed tools and built methods for the mobile service under development. Design research helped in the build–up of innovative models

and other design tools combining them into a transversal language and understanding. Each field of knowledge informed and challenged the other (Buchanan, 2001).

Along with the investigative process the new mobile service was followed as an empirical ground, throughout its conception and development – the MOBSERV – This mobile service supports the management of loyalty programs through a mobile application (see figure 9). Loyalty programs are activities designed to encourage purchasing through a marketing process (usually through cards) and the distribution of its rewards. The application provides for digitizing and storing these loyalty and membership cards, allowing their barcodes to be scanned directly from the device screen. However, the idea of using users' data has always counteracted because it would come into a clear conflict with the idea of service security. Here information for loyalty programs would stay with the clients – the loyalty programs' service providers. Through the several iterations, the research contributed to an improved definition of the service concept and its position on the customer value constellation. The methodological approaches mentioned above have helped in this process.

In the beginning of this research the service concept was fairly new. Although the service could run in almost all mobile phone models, there was not yet a habit of installing service applications within these devices and make use of them. The work of studying customers' experience was a first goal and all the research would be driven by these findings. However, there were singular aspects concerning the mobile platform as a central channel. Moreover, there was the understanding of a service as a whole, with dimensions beyond usability aspects of the interface.

In the present dissertation there is a recognized imbalance between the length of the description dedicated to the understanding of experience dimensions and the length of developing and building new methodologies.

Figure 9
MOBSERV is a service for loyalty programs management through a mobile application

This disparity has mainly to do with time comprehensiveness for each phase. Since the core of the research dissertation is the understanding and applicability of service experience, it plays a nuclear role.

3.2. Research Design

As graphically represented in Figure 10, the research project involved three main stages of exploration, ideation and reflection, combining design research and social science in a Design Thinking (DT) process. These three stages were performed in an iterative process, applied to the design of MOBSERV.

The first stage was the study of the customer experience. However, instead of developing a single large study, several studies were made in each iterative cycle of exploration, ideation and reflection, enabling deeper understanding of the customer experience along this process.
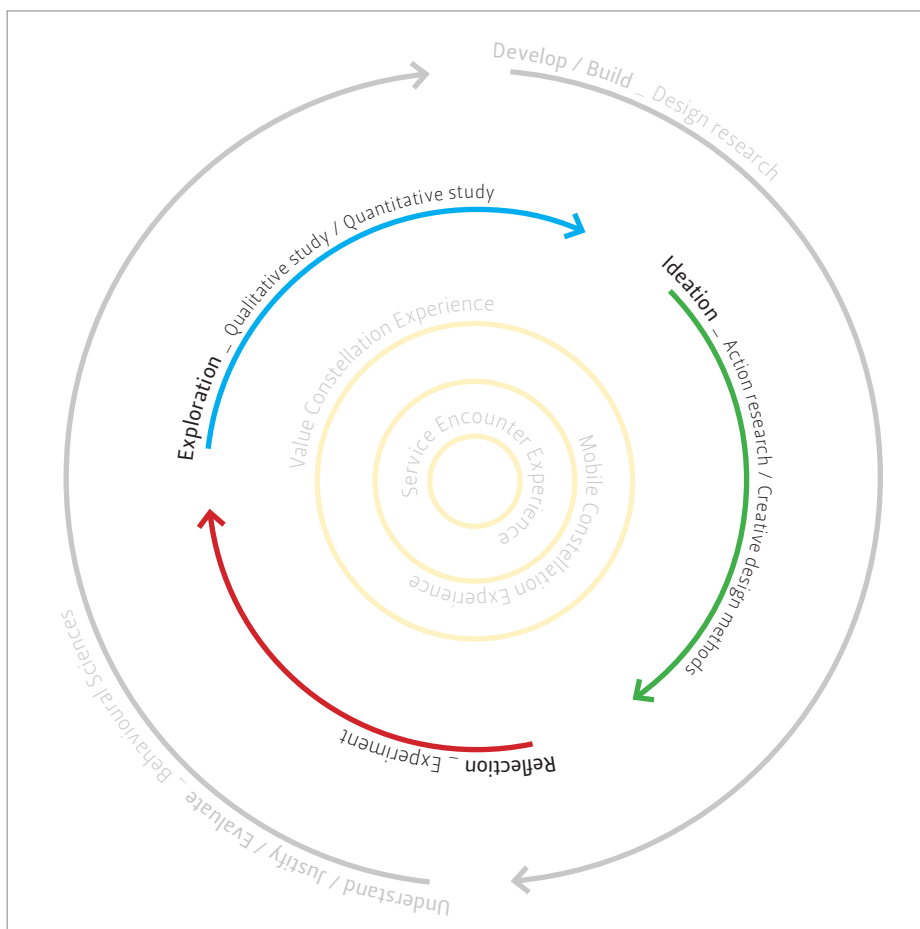
Figure 10
Research Stages

Patrício et al. (2011) service experience design levels were analysed and taken into consideration (referred in 2.1.1) – The first level outlines the service value constellation that was framed by exploration of experience around the use of loyalty programs and mobile phones.

Upon release of the service in beta version by MOBSERV, a second level was reached to investigate the experience with the actual service. Detailed service tasks were also studied later, at the service interaction experience level. Therefore, at the research framework centre, these service experience levels were used as SD tools, according to target coverage (Dubberly et al., 2008, Patrício et al., 2011, Patrício et al., 2013).

The design research provided grounds for the research process and outcomes. As previously described, the research process involved an iterative cycle of understanding the customer experience through behavioural–science, creation of service concepts and methods through design research, and validating both methods through customer studies as well as incorporating EF's in mobile service with the development team.

Through an active ideating, iterating, and discussing potential solutions with the service developers, this study was a continual reframing of the problem and an attempt to make it concrete, framing and articulating it to a preferred state (Forlizzi et al., 2008, Dorst, 2008).

The research project also followed a design research approach since it aimed at producing design artefacts, by providing a deeper understanding of the customer experience and by creating and validating new methods for SD, such as service experience prototyping (Moggridge, 2007, Koskinen et al., 2011).

According to figure 10 of the research dissertation, organised into the three DT main stages, it did not cover the implementation stage seeing that the path to market was not the focus of the research project (Brown, 2008). Despite running concurrently with the development of the study, an implementing stage was not directly linked to the research process, and it was only followed by the study as a way of validating the study results.

The research adopted a creative human–centred discovering process through behavioural–science methods, as mentioned. Clearly a new topic, it started by collecting data through the Exploration of experience on potential service users.

This way, the understanding of mobile experience dimensions involved qualitative and quantitative methods of data collection and analysis (Bryman, 2006).

At the Ideation stage, possible solutions were framed with the service developer's team. Research was made side by side with developers and was also driven by the customer experience study results (Collins, 2010).

The Reflection aimed at exploring new methods to prototype the MSX, testing ideas and conditions through experimental research. This build–and–evaluate loop was iterated several times before a final model was generated, as advised by many authors (Brown, 2008, Patrício et al., 2013, Stickdorn et al., 2010).

Exploration stage

The exploration stage aimed at understanding the mobile customer experience according to the established methods of behavioural sciences. This stage therefore started with an immersive understanding of mobile service experiential aspects through qualitative approaches from social research (Neuman, 2005).

The first qualitative study was undertaken at the first stages of MOBSERV development, when the service had not yet been launched. The qualitative results iteratively articulated with ideation and reflection stages contributed to the design of the first release of the service. However, several more iterations were made throughout the research project. The results of each qualitative study were incorporated in the design of new MOBSERV releases through ideation, and the dimensions ascertained were also tested in the subsequent reflection stages.

The MSX phenomenon was conceptually underdeveloped. Theory would therefore have to embrace a vast array of data sources (Charmaz, 2006). As such, grounded theory was followed. This method started to stand on the researcher approach to the field without any previous knowledge of the subject under study (Glaser and Strauss, 1967). However, this method has evolved to accept literature review as an analytic tool seeing that it promotes researcher sensibility to the categories or concepts raised (Birks, 2011) (Strauss and Corbin, 1998). A more recent approach to the Grounded Theory was considered suitable since it captured a range of contexts, perspectives and timeframes within the mobile EF topic. This approach enabled capturing richer detail from participants' views and actions, guiding research to an enriched and multidisciplinary perspective

of MSX. As Charmaz (2006) asserts, the credibility of the study would be determined by the relevance, substance, scope and depth of the data.

The aim was therefore to recognize and extract the data from elements with relevance for the emerging knowledge. Following the iterative cycles of exploration, ideation, and reflection of the MOBSERV releases, this qualitative approach had three series of data collection and analysis, as described more in-depth in chapter 4. These series covered from the first exploration of the customer experience before the MOBSERV first release, to subsequent releases and MOBSERV regular use.

The qualitative findings were then combined with a quantitative study that endorsed a multidimensional MSX scale and analysed the impact of the EF's previously identified on EO (Bryman, 2006).

Researchers have been studying behaviours with mobile services to create a picture of attributes that are important to mobile customers, although there are still very few validated measures. Therefore, to also contribute towards the understanding of EF drivers and the important measurement of its impact, a quantitative approach was also undertaken. The quantitative study, developed in the second part of the exploration stage, enabled the identification of mobile service EF's, through the assessment of a multidimensional MSX scale and the analysis of their impact on EO.

Ideation stage

The Ideation stage involved constructive design research within the MOBSERV company and its practical work environment. This stage aimed to incorporate EF's in the SD process, applying the study results to the development of new service concepts and evaluating service design methods. The intention was to bridge the gap between an abstract idea of service to a concrete qualified solution, giving inputs to its conception and implementation (Dubberly et al., 2008). The maturity and autonomy of methods, like scenarios and other cultural probes, have proved that design practice methods can be used for research (Koskinen et al., 2011). Therefore, DT and its instrumental techniques were very useful as they helped, in a creative and constant manner, to learn, communicate and integrate experience knowledge into design.

Constructive design research was considered an adequate method to be used as this part of research involved an active and immersive work done by the researcher within the company environment (Reason and Bradbury, 2008, Koskinen et al., 2011).

During this stage, the researcher had to inform managers and developers of the impact of the experience on the new service. The design researcher's role was to iteratively integrate experience findings in the service development.

This brief request required a clear understanding of the service concept, and as a technological-based service, there were many aspects from adoption to regular use that would be important to be aware of. Implementing constructive design research while committing organizational resources was a challenge.

Reflection stage

Experimental research was adopted in the reflection stage, applying the understanding of customer experience to mobile service experience prototyping.

The concept of prototyping service experience is grounded on extant literature.

Therefore, all the experiment procedures, analyses and results are described in a way that can contribute to a design science body of knowledge.

According to Hevner,(2004)"(...)

> "(...) the result of design-science research is, by definition, a purposeful artefact created to address an important organizational problem. It must be described effectively, enabling its implementation and application in an appropriate domain."

Experience Prototyping has emerged as an important SD tool even if still scarcely used in the mobile service context. Moreover, although there are many reported methods to evaluate services and experiences, there is still not a sustained conceptual definition for Service Experience Prototyping (SXP). This stage therefore enabled an empirical assessment of SXP and User Experience Prototyping (UXP).

The reflection period conceptually explored the SXP components. SXP concerns the overall service offering, involving physical, process and social elements of the service experience. The UXP concerns the service ease-of-use and is more

connected with usability aspects of the mobile service application. Once more, benefiting from exploration and ideation contributions, this stage involved two series of experimental studies in order to compare the relevance of SXP versus the more established methodologies for UXP.

These studies comprised multidisciplinary samples of participants and helped to understand the advantages and disadvantages of each approach.

The full research model in Figure 11, therefore comprehends, at the centre, the MOBSERV experience: represented by the three levels of experience used to understand and design customer experience. Then these levels are surrounded by the three stages of Design Thinking: Exploration, Ideation and Reflection. Each stage has specific goals and methods for this same object of study. These three elements together support the knowledge and incorporation of custom– er experience in the mobile service. Finally, this approach is framed by the paradigms of behavioural science and design science research.
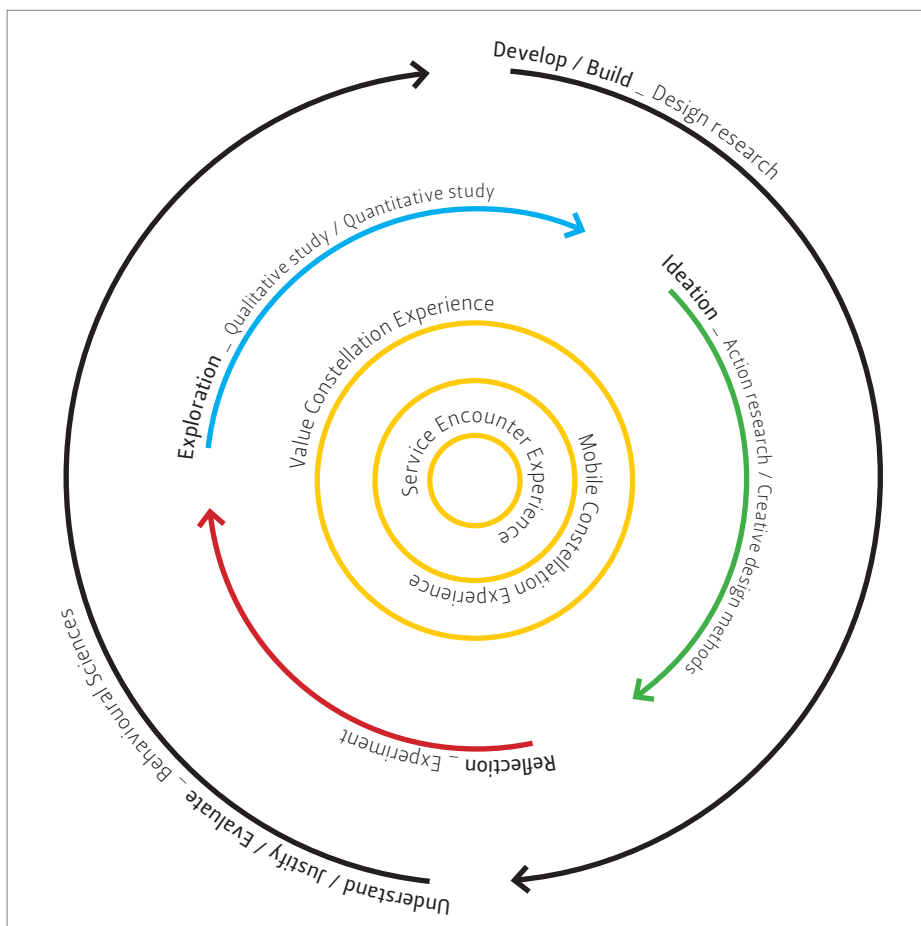
Figure 11
Full research model

4. Exploration

The Experience with mobile services is complex and comprises numerous aspects. This research strategy has been to study it, through the identification of Experience Factors (EF) and Experience Outcomes (EO), understanding and making use of this understanding to promote mobile service design. The conceptual background covering experience in the literature review provided diversified and complementary views from both the human–computer interaction and services marketing fields. Nevertheless, the mobile service experience concept still needs further research. Service marketing has traditionally focused on cognitive assessments of experience such as perceived value, quality and satisfaction (Nysveen, Pedersen, and Helge Thorbjornsen 2005, Vlachos and Vrechopoulos 2008). HCI and engineering have traditionally focused on usability aspects such as ease-of-use and usefulness as the most studied (Pagani 2004, R.S. Subramanya 2007). Several attempts have been made to develop a holistic view of the customer experience considering attitudes, behaviours, emotions and senses. However, empirical studies addressing the customer experience from a holistic perspective are still scarce and literature review revealed that studies specifically addressing the customer experience in mobile contexts were inexistent (Carreira, Patrício, Natal, et al. 2013, Karapanos et al. 2009).

Considering the approaches to this topic from both Human Computer Interaction and Services Marketing research presented in the literature review, there is an increased interest in experience centric services to promote qualified experiences (Zomerdijk and Voss 2009).

Upon studying experience in this mobile service context, a qualitative approach was considered appropriate to the understanding of mobile customer experience in order to capture the topic in all its complexity and breadth.

Moreover, a qualitative study would open the angle since previous research with the desired broad perspective was scarce. Qualitative approaches have been gaining importance in design research. The field has become richer, more refined and more effective over the past decades (Laurel 2003).

Qualitative researchers study things in their natural settings (Neuman 2005). Through participatory methods, consumers can also be involved in the research throughout the development process of products or services (Sanders 2008). Qualitative research consists of a set of interpretive material practices that make the world intelligible.

These practices turn the world into a series of representations, including field notes, interviews, and photographs (Denzin and Lincoln 2005).

The exploration research goal was therefore the understanding of the customer experience with mobile services, focusing on identifying its main drivers or EF's. Application to the MOBSERV remained therefore broad enough to allow for the dynamic nature of the research methods and address the following research question: Which factors influence customer experiences with mobile services?

4.1. Qualitative study method

Three studies were performed to gain a deeper understanding of mobile service experience (MSX). The studies involved 61 mobile service customers in different stages of the MOBSERV development. In a first exploratory stance, the service concept was discussed with users of mobile services and loyalty cards in general before the new mobile service was launched. Then, in a second stage, a qualitative study was undertaken with early adopters of the new service. This was followed by a third stage with a qualitative study with regular users of MOBSERV. Three stages of experience with the mobile service were thereby covered. Making use of this iterative collection process, the study of service experience used grounded theory appropriate for understudied subjects (Charmaz 2006). Research was based on constant comparative analysis making use of inductive and abductive logics until an integrated and comprehensive explanation was reached of mobile service requirements influencing the customer experience (Birks 2011).

4.1.1. Sample design

Following a grounded theory approach, the process of data collection was intended to generate theory whereby research was jointly collecting, coding and analyzing data. Accordingly, one had to decide what to gather next and where to find it in order to develop theory as it was emerging (Corbin and Strauss 1990). Theoretical sampling was used as a process of identifying and pursuing clues during analysis (Charmaz 2006).
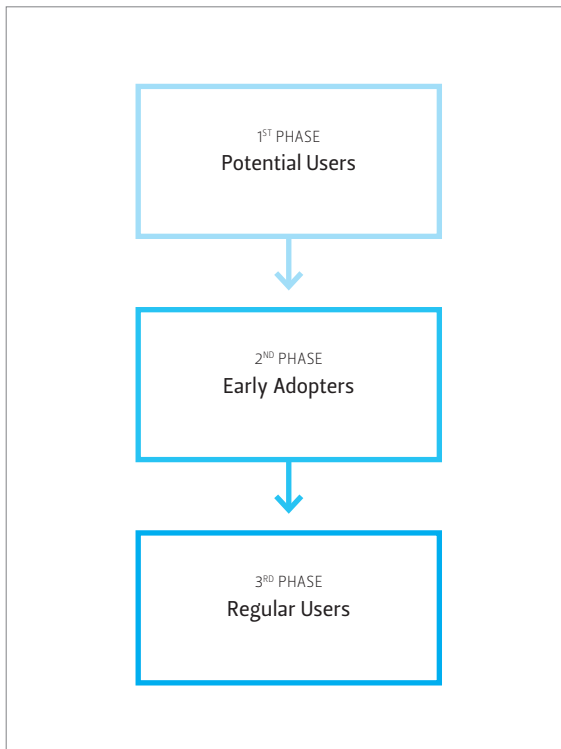
Figure 12
Customer Experience
different Stages of the
present research

Therefore, following theoretical sampling, characteristic of Grounded Theory and as recommended, the purpose of the sample definition covered the new MOBSERV different stages of use, in order to have a richer understanding of the experience requirements as presented in the Figure 12. Sample design listened to three groups of mobile service users in space and time. The first group comprised non–users of MOBSERV, at a time when it was not yet available. Participants in the first stage were considered potential users because they owned mobile phones and were potential bearers of loyalty programs. The second group comprised early adopters of MOBSERV shortly after the first service release. The last group comprised, until then, the first regular service customers, since they had been using the service in several circumstances (Bragge, Tuunanen, and Marttiin 2009, Oulasvirtaa, Wahlstro, and Ericsson 2011). To reach the recommended open stance towards the participants, these interviews were scheduled at a time and location of the participants' choice. (see Appendix A).

4.1.2. Data collection

This framework of data collection was planned considering three levels of the customer experience: the overall customer experience for managing and using of loyalty programs, the service experience with MOBSERV, and the interaction experience with service at different touchpoints (Patrício et al. 2011). The multi-level approach to the study of the customer experience enabled a richer understanding, from loyalty program concept to lower levels of interaction connected with mobile phone use, which would affect the MOBSERV experience. Therefore, special attention would be placed on service EF's and EO's.

Interviews were semi-structured guided by a protocol to systematically identify experience elements and explore them in more depth. The interview protocols included open questions, evolving from a few topics to probing more experiential aspects. This semi-structured approached aimed to provide a good balance between richness and replicability. Individual and group interviews were video and audio recorded allowing not only to register participants' contribution but also to better restore the context of each interview. This enabled research to also access tacit knowledge, not only by taking note of who was talking, but also of who was not talking and what was not said (Charmaz 2006).

Charmaz (2006) acknowledges a requirement for grounded theorists to incorporate reflexivity considering the way in which research is carried out and understanding how the process of doing research shapes its outcomes. Therefore, the process first integrated report analysis after each interview, which was the researcher's brief outlining of the context of the interview and its most pertinent contributions. On the other hand, observation notes clarified the data coding, for example, some of the participants' verbal comments were associated to EF's different from the ones suggested by the data or the literature. Throughout content analysis, interviews were deconstructed, step-by-step, underlying the process associated with the service (Neuman 2005). The development of codes and categories was made iteratively, making use of Nvivo software (release 9), starting from mobile services and regarding the several EF's and EO's along the service journey. Moving between an inductive and a deductive approach, the initial coding of the interviews was essentially open but as the coding was refined, attempts of concept-driven coding were made (Strauss and Corbin 2008) building upon some of the EF's and EO's obtained in the literature.

Hence, these different types of data, the theoretical frames and researcher view-points, allowed a different facet of mobile EF to be explored, to increase scope, and to get deeper understanding. This method allowed for the theory to emerge from the data in order to enhance the understanding of the customer experience with broader perspective along several stages of mobile service usage.

1st Phase: 25 potential users of the mobile service concept

The first exploratory study was undertaken before the new mobile loyalty service was launched, as mentioned in the previous section. At this stage, there were no loyalty MOBSERV customers yet and as such, the study involved users of both mobile services in general and loyalty programs. This study focused on the customer experiences on loyalty programs and mobile services, aiming to provide inputs for the conception of MOBSERV. Participants were invited to collaborate in this study knowing that it would comprise a conversation about a new service application for mobile phones. Due to the proliferation of loyalty programs, participants were expected to concentrate at least on loyalty programs, which was the case.

The study involved two focus groups (one hour each) with 8 and 9 participants, and 8 individual in-depth interviews (lasting an average of 45 minutes each). Each group also followed the suggestion that the number of participants per group should be between 6 and 10 (Tracy 2010, Krueger 1994). The focus groups and in-depth interviews followed the same interview protocol with three key topics covering participants' experience with loyalty programs, their experience with mobile services, and the exploration of a new concept for a MOBSERV loyalty cards management.

- Please tell me how do you deal with loyalty programs?

- Tell me about your mobile phone?

- Do you use some kind of service in your mobile phone?

- What would be your idea of a new mobile loyalty service?

For each topic, further probing was made to understand the drivers of customer experience (with the loyalty programs, mobile phone, mobile phone services). The two focus groups were divided into a group of technology-oriented users (according to their background or smartphone usage) and a group of regular users of mobile phones.

This approach had the objective of keeping the same tune of conversation with each group, avoiding leading roles with some participants.

The participants' average age in this exploratory phase was 32.5 years, 12 being women and 13 men. In this first study, 50% of the users had wireless connections on their mobile phones, although 60% of the sample said they only used it to make phone calls, send text messages, or use its agenda. Interviews and focus groups were video recorded and literally transcribed.

2nd Phase: MOBSERV 21 early adopters

After the first launch of MOBSERV, a new qualitative study was undertaken, six months after the first one. This study aimed to understand the experience factors for early adopters in order to use them for design and improve the service offering through their different experience levels.

This stage involved semi-structured interviews, this time with early adopters of the recently released service. Participants were invited by phone for collaboration through three online communities: http://forum.pplware.com, which provides opinion articles, and in which people interested in technology discuss and explore several topics. www.facebook.com/cardmobili: the MOBSERV page on Facebook and the MOBSERV blogspot http://cardmobili.blogspot.pt/ (this last one is not available anymore).

The reactions came from 9 different cities in Portugal. The sample comprehended 3 women and 18 men who were 35 years old on average. Following the same qualitative methods, interviews were video recorded and covered the three different levels of the experience, this time focusing on the service they already knew: customer experience for managing loyalty programs, the experience with MOBSERV service, and the experience with the mobile interface. Interviews therefore followed a similar protocol with similar questions, covering participants' experience with loyalty programs, their experience with mobile services generically, and what they had witnessed with their exploration of MOBSERV. For the second time, the process of categorization was iteratively used and integrated. (Figures 13.2 and 13.3).

3rd Phase: 15 MOBSERV regular users

The third study aimed at understanding how users were managing the service across its main touchpoints, addressing lower levels of experience, in addition to how they perceived MOBSERV along the service journey.

Consequently, this work enabled an understanding of customers used MOBSERV along different stages and steps of the process. Interviews pursued the same key questions regarding participants' experience with loyalty programs, the experience with mobile services, and the interaction with MOBSERV along its different touchpoints. In this study, participants were encouraged to show how they used the service as they talked about their experience, further enriching the data collection process.

This third study occurred six months after the second study, involving 15 MOB-SERV customers who had been previously invited through the service newsletter and through online communities where the service was being regularly mentioned. Six women and nine men between 24 and 46 years of age, with an average age of 35, accepted the invitation. These interviews were also video recorded. The video recording was made from 3 points of view: one camera covering interview and interviewee, another one covering the user's face and a third camera recording the webpage interface. Participants interactively demonstrated how they interacted with the service digital interface. As customers, they described the process by which they performed tasks with the service webpage and with their own mobile phones. This way, detailed levels of service experience with tangible interfaces could also be accessed.

4.1.3. Data analysis

The analysis method played an important role to better understand and visualize the MOBSERV experience aspects. The analytical process was flexible and driven by insights gained through interaction with data as recommended (Strauss and Corbin 2008). First, the researcher read the statements several times and underlined core words and sentences. Then, an open coding procedure formed initial categories of information that was used subsequently in the data analysis. Sentence by sentence, the researcher considered similar expressions, and drew concepts by underlining and writing notes while analysing statements and having another look at the videos (Corbin and Strauss 1990).

Though these three studies were made in three different stages of the MOBSERV development, data analysis procedures were similar. Overall, the research process allowed for the identification of activities associated with MOBSERV and loyalty programs in general, as well as the most important EF's, which will be described in detail in the next section.

To reach rigour in the qualitative approach, one tried to gather enough data along an appropriate period of time – covering several moments on the service adoption, considering MOBSERV customers to an adequate sample, therefore examining concepts from various angles (Charmaz 2006).

From a design research point of view, the process of conducting interviews in three development phases also allowed for a better understanding on how the experience requirements would be incorporated in the design of services. Therefore, the first study provided inputs for the conception of MOBSERV (since it wasn't yet released), so it covered – in an unstructured way – previous customer experiences with loyalty programs and mobile services. In the second stage of data collection and analysis, one made an effort to be more focused on the selected service, studying its early adopters in order to understand a possible evolution of the EF more in-depth. In the third stage, one made a qualitative identification of how and why some service operations were performed and more used than others, understanding differences on performing tasks and above all, how these performances could affect the service experience.

The three main levels of the customer experience were analysed through the different studies. The first one, as expected, generically covered concepts of service experience on managing loyalty programs and mobile phone use. In the

second one, with early adopters, the service concept became a central aspect. Deeper levels of experience were attained in the third study. While performing the MOBSERV tasks, customers were able to cover in detail aspects from the different service touchpoints.

4.1.4. Qualitative study results – Mobile service experience factors

The three qualitative studies enabled a deep understanding of the customer experience with mobile services, with the identification of a rich set of customer experience factors. By aggregating and renaming the similar concepts, 42 initial categories were first identified. After the three stages of collecting data, these initial categories were aggregated into six dimensions of Experience Factors (EF's), presented in Table 5. These six dimensions characterize the MOBSERV experience drivers. This group covers aspects which identify it as being a service for managing loyalty programs and aspects deriving from the fact of being a mobile technology-based service. The identified EF covered several aspects also mentioned by the extant literature review.

Table 5
Categories iteratively derived from the 3 stages of gathering data

Experience Factors	Category
Awareness	Informativeness
	Trialability
	Innovativeness
Availability	Time convenience
	Accessibility
	Contextual convenience
Usefulness	Store Ability
	Portability
	Data management
Ease-of-use	Easiness
	Ease of learn
	Interface image
Security	Contextual security
	Data security
Social environment	Store assistant
	Other customers
	Other social pressure

However, their combination and definition has resulted from rigorous criteria with data and the required time in the field to attain the sufficient qualitative quality (Tracy 2010). Therefore, each dimension presented is supported by the interviewee assignment and identified according to the data collection stage they belonged to (See also Appendix A).

Awareness

Awareness can be defined as the extent to which customers recognize and know about the service. Awareness is related to information availability about the new service and trialability. Trialability referred by Meuter, Bitner et al. (2005) enables users to observe how technology-based services allow customers to recognize the benefits, understand their role, and have confidence in their abilities. In the present study, Awareness assembles this capacity promoting the desire to be 'tried' but also 'innovativeness' and 'informativeness'.

As mentioned by a female interviewee (with a Nokia E72 – regular user)

> *"because at the mobile.com I saw news about the sandwiches company or sandwich house (using a mobile loyalty program) ... then it was funny even if I'm not very keen... but I tried it because I wanted to try. "*

This participant enunciates her desire to experiment a new service following its promotion, while this has nothing to do with technological innovation.

Participants in the first study did not mention the 'Awareness' factor, because the new service had still not been launched. However, for early adopters awareness became an important issue. Several participants mentioned they themselves often had to explain the service concept to other new customers or to store employees. Lack of awareness from other customers and especially from retail employees made it harder to use the service and was seen as an important inhibitor of mobile service adoption and usage.

Availability

Availability joined the accessibility, 'time convenience' and 'ease-of-access', which are representative experience factors for this specific MOBSERV online connectable. Network connectivity for mobile services was studied by Methlie and Pedersen (2007). Availability and accessibility were also studied by Pagani

(2004) as connected to the perceived main advantages of multimedia mobile services combining the possibility to be contacted any time and place. In our study this dimension has particular importance as they may be connected with the 'convenience' and 'ease-of-access' service.

A woman referred 'Accessibility' (with an IPhone 3GS – regular user – i49) –

> *Sometimes I am at the cashier to pay and I open the application and it takes a lot of time... Here I have WIFI and it is fast, but sometimes at the cashier... and you see that interface icon turning round and round...* (She pointed to the mobile phone with the finger in circles).

Being a mobile service does not mean being convenient because service accessibility can be affected and thereby restrict the quality of the experience.

The three groups of participants generically referred accessibility as an important category, promoting the perception of a service that is always available whenever and wherever you need it.

Usefulness

Usefulness is a commonly found factor for HCI, originally defined by Davis (Davis 1989a) in the Technology Acceptance Model (TAM) as "the degree to which a person believes that using a particular system would enhance his or her job performance." Instead of usefulness, Product Value has been proposed as a wider design target that different stakeholders – including end-users – expect of the product (Kaasinen 2009). In this study, Usefulness considered the 'store ability', the 'data management' and the 'service content' compatibility with features like 'rewards' and 'feedback'. One therefore mainly considered the usefulness of the service concept within an overall experience perspective. Usefulness is therefore defined as the customer belief that using MOBSERV will achieve the service value, enhancing his or her job performance.

As mentioned by a male interviewee, (with an IPhone – early adopter)

> *"And then there was this and that card (...) Suddenly we have our wallet full of cards as if we needed a ladies handbag to put all these cards! – I think the dematerialization that the program allows is a great advantage, even if sometimes it is a little bit slow, but that depends on the software of the mobile phone itself.*

The potential usefulness of the service is more relevant for the potential users as they had not tried the service or they even did not know anything similar. The service idea seemed useful for this group.

Ease-of-use

'Ease-of-use' is also a TAM component (Davis 1989a). Subramanya (2007) suggests that Ease-of-use has to do with features, that are built into the device, to overpass several constraints that stem from mobile phones' small form factor, while also account for devices' cost and complexity.

Therefore 'Ease-of-use' considered interface characteristics like 'recognition', 'ease of learn', or being 'appealing'. Thus, Ease-of-use in this study has comprised the usability aspects of the service digital interface, as presented in Graph 1.

As mentioned by a male interviewee (with a Nokia N86 – early adopter)

> I've registered after reading about it in a magazine... I posted-it as is my habit and when there was an internet access I tried to find the program, I opened the site, I read it, and I saw how it functioned as I wanted to understand the concept – as I hadn't the faintest idea, but I thought it would be something like this. I registered, I received the registration email with a password... and afterwards I've started to develop: At that time I had two cards in my wallet and I uploaded them immediately.

Ease-of-use was the most mentioned EF across all groups as represented in Graph 1. From the interviewees' perspective, the service technology interface should work properly, above all. The early adopters found themselves dealing with problems with the early service system, things that can often occur on beta versions of mobile applications or in the service implementation.

In the third study, regular users also revealed some explanations on deeper levels of service experience particularly with the ease-of-use factor. These being lower levels connected to a service encounter where experience is co-created through customer interactions at a given service interface for a service task: as an example – Iphone users (half of the third sample) had great difficulties to

install the application on Javascript platforms and some blamed the interface. With no solution in sight, they gave up apparently not too displeased, probably because they were confident with their own mobile devices.

Security

Parasuraman (2005) suggested security as the degree to which the customer believes the site is safe from intrusion and personal information is protected while accessing electronic services. Recent studies considering mobile services acceptance combined security in mobile services with confidentiality of personal data, trustworthiness and integrity of the terms of use (Zarmpou et al. 2012).

In the data gathered from these studies, Security comprehended issues such as 'contextual use', as affected by the time and places where the mobile phones were being used; 'data security' and 'privacy', that were referred more often in the first stage of this study by the potential customer (see Graph Figure 5). As an example a female, potential user (with a Samsung U100)

> *I do not trust in those identifiable things from both mobile phones and cards. I have a bit of a persecution phobia... And then, when you lose one you lose everything, it is the same thing when someone steals your wallet After all... hum... single cards are very good ...but if eventually ...these stories of applications for mobile phones... if the mobile phone is lost... you lose your mobile phone...the application loses everything.*

An allusion to security was also made by another woman, then regular user (with Nokia E72)

> *I am not the kind of person who is afraid of entering data in informatics' terms – I think that we should be afraid only of the things that we don't want to be known, which is not my case.*

Security was being less referred to throughout the three different phases of adoption. This may be explained by the lack of knowledge about the service by potential customers. After they started and continued to use the service, concerns about security decreased.

Social environment

Verhoef (2008) advocates the social environment as decisive for customer experience creation. This author raised several issues to justify this argument: such as considering customers' behaviour within groups and their influence on fellow customers' experience; companies' task to foster customers on giving support to other customers; or companies' investment to build, maintain and manage virtual communities. Regarding mobile services, some studies have also advocated that customers learn from the information they obtain from their social network, which influences their use of innovative services (Kleijnen et al. 2009)

For the present study, Social environment integrates categories of social interaction with the store assistant, interaction with other customers and being fashionable. Considering literature, 'Social environment' has gained significant importance as it reveals the consequence of considering the service as a whole and not just the interaction with an application. In the first study, participants referred the social environment as a consequence of the loyalty program use (woman – potential user with a Nokia

> *Quite often it happens when reaching a petrol station, they ask if I have a bonus card; and I answer that I don't. And it seems that everyone is behind us looking at us – that idiot has no bonus card (...)*

However this dimension appeared to be more relevant for the regular users after the service had been launched. This fact is important because users were not so aware of the social impact before using the service, as clearly represented in Graph 1.

A female interviewee stated that (Iphone 3GS – regular user)

> *Suddenly I had this mini-computer that started to be a 'thing central' which I carry with me and so I use it quite a lot. Whenever I enter a store and I'm about to show it to the store assistant, if it happens that I have someone behind me making fun... – here you are with your high-technologies and then it doesn't work... That is what bothers me, since it seems as if I want to sell an image and I am not the least interested in being a big shot.*

In the third study – the social environment – especially the interaction with the store assistant, proved to be a relevant issue for service experience. When talking about the store environment, participants shared situations where the

Graph 1
Extent of participants that mentioned EF for each of 3 stages and in the aggregate sample.

Potential n=25
Early n=21
Regular n=15
Aggregated n=61
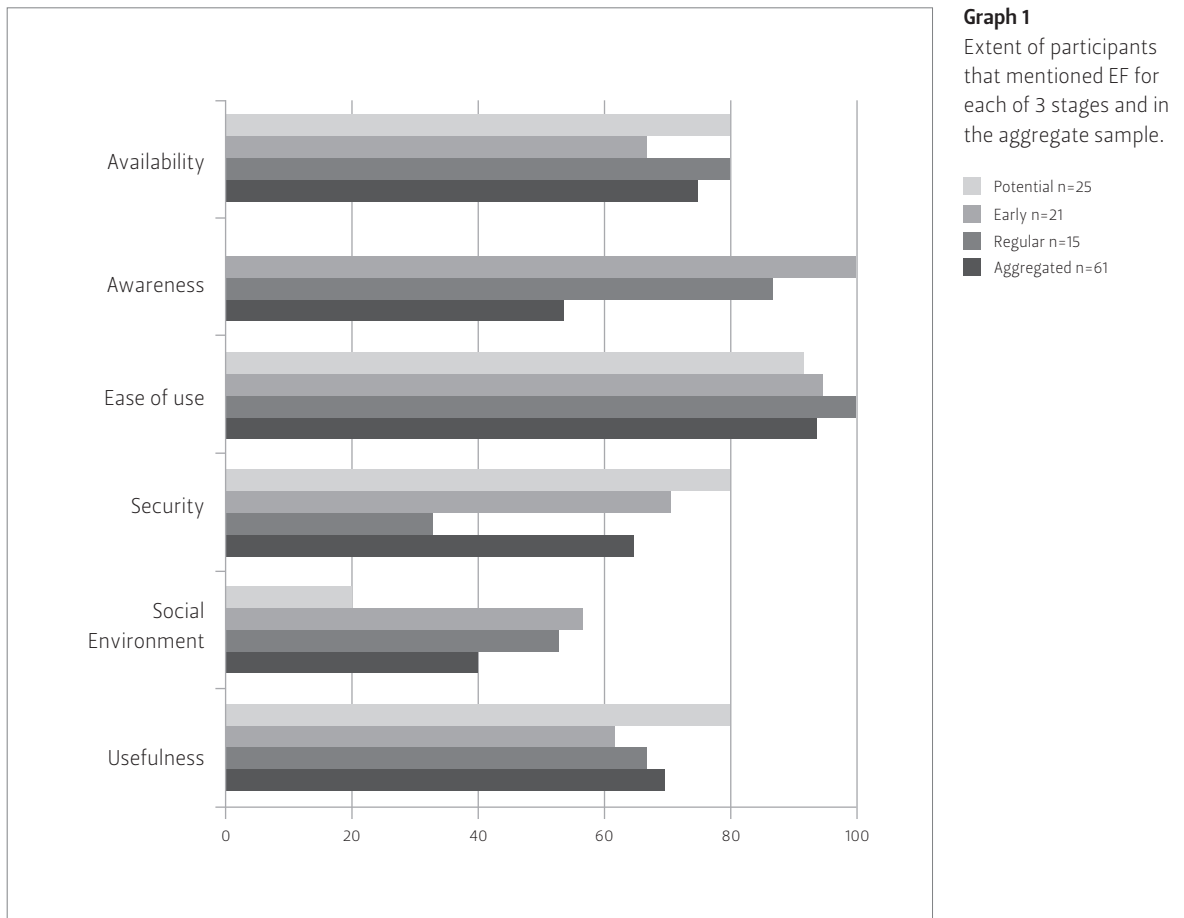
bonus could not be scored due to technical problems and the store assistant was not able to solve them. Interestingly, participants seemed not to be very disturbed by these situations and some of them even revealed understanding of the condition, as the service was new, and revealed they suggested to the store assistant how to solve the problem.

These six factors affecting MSX's were identified through the analysis of the data collected from 61 interviewees. Therefore, the study results reveal that EF's crosscut the different development stages, from service conception to implementation. However, their relevance to customers may change. Awareness was considered less important by the potential customers and became an important key EF especially for the early adopters. On the other hand, Security became less and less important as MOBSERV was being implemented. Though all the EF's affect customer experience, Ease-of-use and all Usability issues are still the most mentioned in all stages of the service adoption (Graph Figure 13). Other statements can be found in appendix B identifying the different categories throughout the three collection stages – potential customers, early adopters and regular users.

4.1.5. Summary of the qualitative study

Six EF affecting MSX were identified through the analysis of the data collected from 61 interviewees who responded to in-depth interviews using a grounded theory approach. The first is 'awareness' assembling the capacity to be known including requirements of 'innovativeness' and 'trialability. Accessibility combined the possibility to be contacted any time and place. This dimension has a particular meaning as it may be linked with the service 'convenience'. The 'usefulness' concept, which is usually considered in HCI mainly oriented to a system, emerges in this study as belonging to an overall perspective of the service utility. Usefulness appears to the interviewees as an aspect of MOBSERV and not as an application or a system characteristic. 'Ease-of-use' however has combined the easiness to use the service and observably included aspects of the digital interface. 'Security' affects MSX following two main branches: privacy in the context of use and data security. Last but not least, the 'social environment' combines 'social interaction' and other aspects such as being 'fashionable'. It thereby presents the service as a whole and not just the interaction with an application.

The methodological implications emerged from this qualitative study of MSX with the grounded theory approach that had previously been only and partially examined quantitatively. The method has thus provided a broader perspective of the phenomena, ranging from the customer experience complexity, the pure service involving its intangible form, to the mobile technology-based offer. At its most basic, the present research provided a theoretical contribution by examining how existent studies and concepts make sense in this MSX singular context.

The EF's ascertained proved to be affected by the interaction with technology as well as sizing up the service through an overall perspective, with other touchpoints beyond the mobile device and different sorts of interaction.

These results highlight the need for considering the service concept through a holistic perspective when conceiving and designing the mobile service. A perfect mobile application for managing loyalty cards could not provide value to their users in retailers that were not aware and did not accept it in their stores. Moreover, a service tailored to customer expectations should involve customers early on in the process and their evaluations on the service concept should be subsequently taken into account.

However, certain EF's could not be widely scrutinized in the beginning; as is the case of Awareness of a service in order to have the intention of adopting it. On the other hand, in the beginning of the MOBSERV development, the potential customer can imagine that he or she will feel unsafe and express lack of trust towards the service, while this reality might have less meaning once the service is in use. Therefore, the emerging experience categories were changing throughout the different phases of customer adoption. Theoretical sampling was thus an essential method responsible for the identification of EF's as they were surfacing (Birks 2011).

To conclude, this first part of the exploration stage points towards a holistic view of experience in mobile services development. This global perspective should be included in the different stages of service implementation with their different service encounters considering users' self-sufficiency. This qualitative research brought about an empirical perspective of the service experience, and more specifically of mobile EF throughout all moments of service development.

The set of identified EF's goes beyond what had already been recognized in previous studies because it is an integrated perspective and considers lesser-studied aspects, as is the case of social environment. Moreover, it is important to reinforce the idea of the significant differences in customer experience requirements through time, reflecting ways of adoption and use from the different participants in the different phases. These degrees of experience with different importance demand a necessary evaluation of when they might be more critical. The identification of EF's within this research allowed them to be used as SD elements and be manipulated to promote better MOBSERV experiences as is presented in chapter 5.

4.2. Quantitative Study

There were scarce empirical studies on the understanding of the customer experience phenomena within the mobile service environment. This study therefore entailed the conceptualization of its domain with literature review and the in-depth qualitative study as described in the previous section. The qualitative study results provided a deeper understanding of the Mobile Service Experience (MSX) and identified a holistic set of EF's. As already mentioned, these EF's are the perceived mobile service attributes that influence the customer experience, particularly EO's, such as the customer cognitive and emotional responses (Patrício et al. 2004, Carreira, Patrício, Jorge, et al. 2013). From a service design standpoint, these EF's can also be seen as Experience Requirements (ER's), as they are attributes that can be acted upon in the design process to enhance the customer experience. Thus, taking a holistic perspective to study MSX provides a fuller view of how to design mobile services, and specifically how to incorporate customer experience in order to promote loyalty behaviours.

Accordingly, this rich set of identified items first served as the basis for an early development EF scale (Churchill 1979). Following scales development procedures, the prior qualitative study ensures coverage of all the possible items (DeVellis 2012). The quantitative study develops and tests the scale considering 241 MOBSERV customers. Finally, an MSX conceptual model proposes relationships between the MSX scale with EF's and an overall assessment of EO's.

4.2.1. From the Conceptual Model to Structural equation modelling

The quantitative research design involved several steps developed from the MSX conceptualization to its measurement model (Parasuraman, Zethaml, and Mal–hotra 2005), as shown in the diagram, Figure 14.

STEP 1
Understanding the domain of MSE
from extant research and qualitative study,
development of preliminary measures

STEP 2
Survey admnistration to a sample
of 241 mobile service users

STEP 3
Scale purification through an iterative
process – Exploratory Factor analysis
Assessement of construct reliability

STEP 4
Confirmatory factor analysis. Measurement
fit and construct validity assessment

STEP 5
Structure Equation Modeling; impact of Mobile
Service Experience Factors on Experience Outcomes.

Figure 14
Scale development
to measure mobile
service experience
adapted from
Parasuraman (2005)

The first step involved the definition of the MSX conceptual domain from which scale items would stand. The survey questionnaire was built upon the rich set of MSX attributes identified in this in-depth qualitative study (Sarmento and Patrício 2011b). In Step 2, the survey was performed online for MOBSERV customers. Data analysis and the scale purification occurred in steps 3 and 4 in a process consistent with scale development procedures in order to develop the measurement model for MSX (Hair et al. 2009). The study involved exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). In areas where little research has been done, such as mobile service experience, EFA is normally required to provide an a priori structure of the underlying dimensions of the constructs to be finalized using CFA (Churchill 1979). Finally, Structural equation modelling (SEM) was used to analyse the impact of the EF's on EO's (Hair et al. 2009).

4.2.2. Definition and domain of MSX and preliminary measures (step 1)

The extant literature and extensive qualitative study suggested that MSX encompasses experience drivers from several phases on customer adoption.

According to Parasuraman, Zethaml, and Malhotra (2005) the service attributes and their evaluations lead to more global assessments at higher levels of abstraction such as overall quality and perceived value which, in turn, influence behavioural intentions and behaviours. Additionally Verhoef et al. (2008), add as mentioned in chapter 2, that the customer experience is formed by customer internal responses (i.e. Experience Outcomes such as attitudes and emotions), that are driven by perceptions of the service attributes (i.e. Experience Factors such as service interface, or social environment).

Following the previous and in-depth qualitative study, the conceptual model was formed considering the constructs obtained as depicted in Figure 15. Therefore, the dimensions and indicators that formed the MSX domain provided the source of data from which items were thought out for the MSX scale development in the following step. This previous approach to the MSX factors identified dimensions with a holistic perspective. Therefore, the qualitative study, reported in the first part of the exploration stage identified six MSX dimensions: "Awareness" as the extent to which customers recognize and know about the service to try it. "Availability" is the way in which it is convenient and easy to access, "Usefulness" is the service utility, beyond the mobile service application.

So, it considers usefulness of the service within an overall experience perspective. "Ease-of-use" has to do with the service digital interface and characteristics like being 'easy to learn' and aesthetics. "Security" is the extent to which the service is secure either for its ever-changing 'context of use' or 'data security' and 'privacy'. Finally, "Social environment" represents social interaction with store assistants or with other customers, as well as being fashionable.
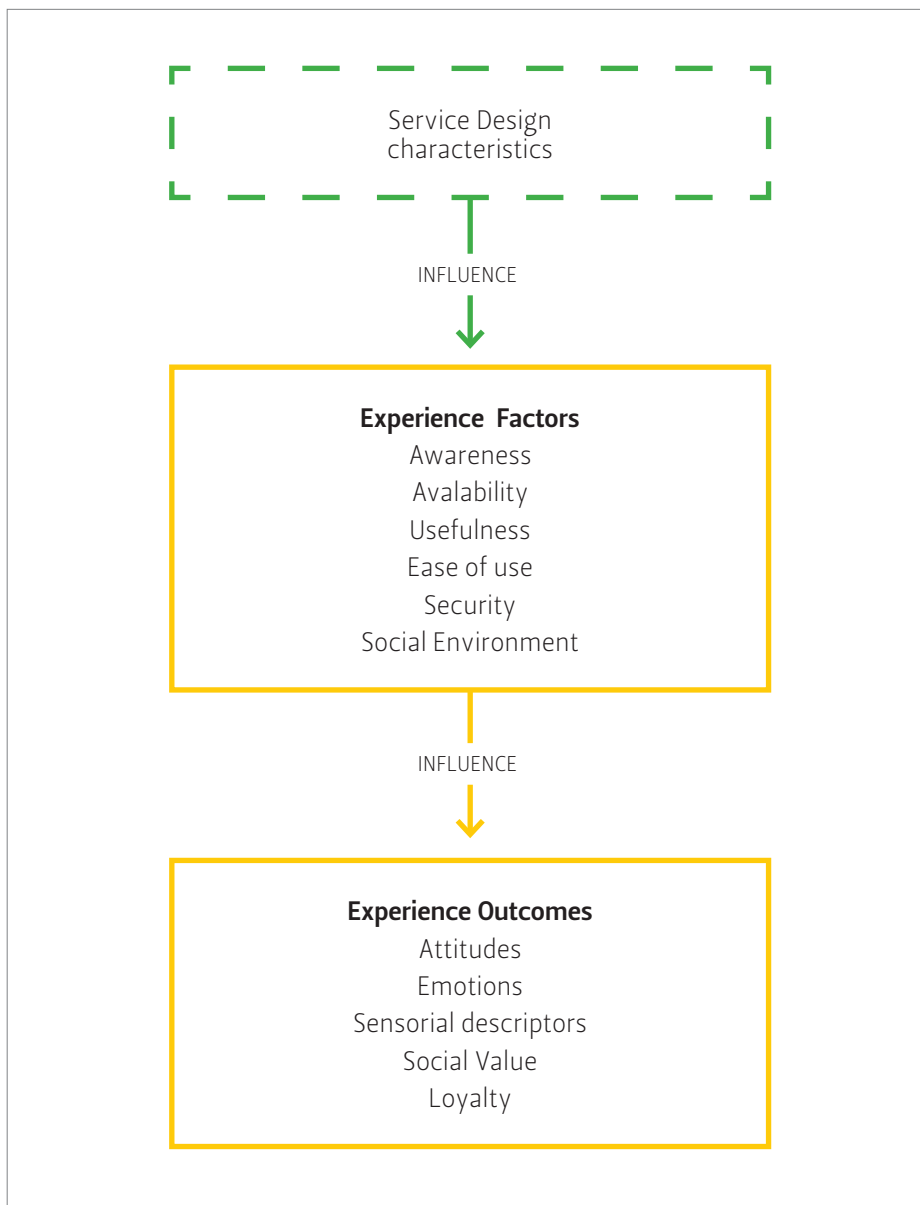
Figure 15
Framework for under-standing the domain and consequences of mobile service experience

Therefore, building upon the literature review and the qualitative study, this list of potential indicators was developed to cover the conceptual domain of MSX with an average of 8 items per experience dimension. Each item was measured through a Likert scale with 7 points as presented in Appendix C, with the end-points "strongly disagree" and "strongly agree" (Hair et al. 2009).

This survey instrument was subject to a qualitative pre-test for further refinement. The qualitative pre-test was administered to a sample of 50 MOBSERV users. A 71-item questionnaire was emailed, gathering 36 participants, enough to evaluate redundancy of some items as well as sentence structure as suggested by Churchill and Iacobucci (2002).

The final survey questionnaire had 66 items. 40 items covered EF, assessing customer perceptions regarding MOBSERV attributes in the experience dimensions. The other 26 items assessed EO, involving attitudinal, behavioural, affective and sensorial responses through previously developed measurement scales. These EO dimensions included 3 items on perceived value, (Pura 2005); 4 items on social value (Sweeney and Soutar 2001); 3 items for positive emotions and 5 items for negative emotions (Richins 1997); 5 items on sensorial descriptors (Fenko, Otten, and Schifferstein 2010); 3 items on attitude towards global quality (Wolfinbarger and Gilly 2003); and 3 items on loyalty behaviour (Pullman and Gross 2004). This aimed at analysing the impact of mobile service EF's on EO's.

Final Survey administration to mobile service users (step 2)

The survey was conducted online, through SurveyGizmo. This final survey stayed online for one month. The MOBSERV Company did not want a direct request to their subscribers. Therefore, the service newsletter was used twice to disseminate the survey. This announcement was reinforced through the company's blog and through Facebook. In the second half of the time that the survey stayed online, an Amazon voucher was raffled to promote participation.

The questionnaire was graphically organized in order to be easily understandable and not to seem too long. There were also two versions: one in English and another in Portuguese (Figure16).

Figure 16
Survey's participants distribution, (according to Surveygizmo output).

Sample Design

Participation in the survey was based on the respondents' own initiative to get in touch with the mobile service newsletter and then access the online questionnaire (see Figure 17). The MOBSERV newsletter was reaching a population of 30 000 registered people. However, through this method of recruitment we collected 500 people who assessed the survey and 266 successful responses from around the world, 20% being in English and the other 80% in Portuguese, with 82% of mobile loyalty customers being men and 18% women (Table 6).

Figure 17
MOBSERV newsletter

Table 6
Final Sample Profile n= 241

Sample		
Age	<=18	1.5%
	19–28	10.6%
	29–38	32.6%
	39–48	30.4%
	49+	19.8%
	NA	5.3%
Gender	Men	82%
	Women	18%
Mobile Operative System	Symbian	13%
	Java	4%
	Iphone	37%
	Windows Mobile	16%
	Android	19%
	Windows Mobile 7	7%
	Don't Know	3%
Education	High School	24%
	College	74%
	NA	2%
Profession	Employed full time	78%
	Employed part time	4%
	Student	9%
	Retired	5%
	NA	4%
Income	Over 40 000$	19%
	Between 12000$ & 40.000$	31%
	Between $ 6000 & 12000$	10%
	Under $6000 & 12000$	4%
	Rather not reveal	35%

4.2.3. Scale purification through Exploratory Factor Analysis (step 3)

The preliminary Missing Value Analysis (MVA) involved the analysis by respondent and by variable. Missing values were found in both analyses. However, none of the analyses revealed significant issues. In the analysis by respondents, 25 respondents were identified with missing values higher than 25%. As such, they were eliminated from the sample of 266 respondents, totalizing a final sample of 241 valid responses as described in table 6. Analyzing by variable, three variables had more than 20% values missing, so they were removed from the analysis. After MVA, the scale development followed with EFA (DeVellis 2012).

EFA was conducted to provide a preliminary check on the number of dimensions and the pattern of loadings. EFA, using principle component with Varimax rotation, was performed on the 37 MSX attributes using SPSS 19.0. Items were retained if (1) they loaded 0.50 or more on a factor; (2) did not load more than 0.50 on two or more factors (Hippel 2002, Hair et al. 2009). In the reliability analysis,

all extracted factors exceeded Cronbach's alpha conventional minimum of 0.7 and indicated an item–to–total correlation of more than 0.50 (Wolfinbarger and Gilly 2003). This process allowed the re–arrangement of the remaining 23 items compared to the theoretical model (Figure 15). This iterative process of scale purification resulted in six dimensions, pertaining to 71.1 % of variance.

Following the EFA analysis, the 'social environment' dimension, which was initially identified in the qualitative study, was changed to 'service in store'. This change was because the remaining construct items after the EFA did not reflect social interaction with other customers, but only store assistants.

Table 7
EFA results for the Mobile Service Experience scale

Items		Ease of USe	Service in store	Awareness	Security / Trust	Usefulness	Availability	Communalities
11	The Web interface of this service is visually pleasant.	.750						.653
10	The mobile interface of this service is visually pleasant.	.737						.610
12	This service is easy to install in my mobile phone.	.732						.654
7	This service is easy to use.	.699				.312		.658
14	The management of data with my cards is easy with this service.	.677						.635
9	This service use is intuitive.	.665				.349	.327	.649
16	This service has a wide range of cards.	.513						.447
36	The store assistants know how this service works.		.895					.872
38	The store assistants know this service.		.878					.861
37	This service is accepted in the majority of commercial spaces.		.803					.732
39	Shop assistants encourage me to use this service.		.789					.643
3	The service is disseminated through the media.			.832				.736
1	This service is well known by the general public.			.767				.663
4	This service is disseminated in commercial spaces.			.762				.677
2	This service is disseminated through Internet.			.631				.528
28	This service doesn't interfere with data privacy.				.830			.811
27	The company that operates this service is trustful.				.829			.837
26	The service is safe.				.788			.747
20	With this service I don t need to carry cards with me.					.747		.672
15	This service is useful.	.343				.736		.716
21	This is convenient as it makes it easy to carry information.	.319				.736		.745
23	This service is always available.						.901	.906
22	This service is always accessible.						.889	.898
Extraction Method: Principal Component Analysis. Loadings <0.30 not shown Rotation Method: Varimax with Kaiser Normalization. 7 iterations – Cronbach's Alpha:		0.869	0.895	0.764	0.877	0.759	0.932	0,897

All MSX scale dimensions, except Availability, included three or more items as suggested by Hair et al. (2009) as a good practice to proceed to CFA. Availability was kept due to its adequate reliability, high loadings, no cross-loadings and theoretical significance.

4.2.4. Confirmatory Factor Analysis (step 4)

After the EFA, the quantitative analysis continued with Confirmatory Factor Analysis (CFA) with the goal of investigating unidimensionality and analysing how well the specification of the MSX matched the mobile service reality (Hair et al. 2009). Each construct was specified through the generated items that would confirm the domains derived from the statistical results of EFA. In the CFA, AMOS 17.0 software was used with maximum likelihood estimation (MLE).

Taking into account the results of CFA, the item "service has a wide range of cards" (item 16 on Table 8) was excluded from the original model because it did not have a clear theoretical relation with the ease-of-use construct and had communalities below 0.5. The item "this service is easy to install in my mobile phone (item 12 in Table 8)" was also excluded, as this usability issue had mainly to do with the initial stage of the service use (installation), and the analysis of modification indices indicated that its removal would lead to a significant improvement in model fit.

The final MSX measurement model comprised the 21 items shown in Table 8. The model showed good convergent validity as all item loadings on their respective constructs exceeded the 0.7 cut-off value and the average variance-extracted of each construct was higher than 0.5 (Blunch 2011). Awareness was the exception with a lower loading of item 2 "disseminated through Internet", but it was maintained due to theoretical relevance (see Table 8). Following Hair et al.'s (2009) suggestion, construct composite reliability was computed.

Table 8
CFA standardized loadings, mean rating values, average variance extracted, construct reability and fit statistics for the MSX scale

Item		loading	mean	AVE	CR
	Ease of use				
7	The service is easy to use.	0.817	5,65		
9	The service use is intuitive.	0.798	5.86		
11	The Web interface of the service is visually pleasant.	0.722	5.58		
14	The management of data with my cards is easy with the service.	0.717	5.5		
10	The mobile interface of the service is visually pleasant.	0.697	5.65	0.565	0.892
	Service in store				
36	The store assistants know how the service works.	0.950	2.67		
38	The store assistants know the service.	0.934	2,64		
37	The service is accepted in the majority of commercial spaces.	0.745	3.24		
39	Shop assistants encourage me to use the service.	0.677	1.94	0.697	0.900
	Awareness				
3	The service is divulged by the media (newspapers, TV, radio).	0.751	3,24		
1	The service is well known by the general public.	0.747	3.30		
4	The service is divulged in commercial spaces.	0.711	2.54		
2	The service is divulged through Internet.	0.596	4.59	0.495	0.795
	Security /trust				
27	The company that operates MOBSERV service is trustful.	0.893	5.56		
28	The service doesn't interfere with the privacy of data.	0.856	5.20		
26	The service is safe.	0.774	5.41	0.709	0.879
	Usefulness				
21	The service is convenient as it makes it easy to carry information.	0.825	6.18		
15	MOBSERV service is useful.	0.793	6.26		
20	With this service I don t need to carry cards with me.	0.612	4.85	0.561	0.728
	Availability/accessibility				
22	The service is always accessible.	0.945	5.58		
23	The service is always available.	0.924	5.65	0.873	0.932
Fit indexes	Degrees of freedom	174			
	X^2 324.946 *** cmin/df 1,868				
	Goodness–of–fit (GFI)	0.892			
	Non–normed Fit index (NNFI or TLI)	0.937	–		
	Comparative Fit Index (CFI) –	0.948			
	Standardized Root Mean Squared Residuals SRMR	0.0540			
	Root mean square error of approximation (RMSEA)	0.060			

All loadings are significant at $p < .001$

All MSX items revealed high internal consistency and reliability with construct reliability that exceeded 0.7. According to scale development guidelines, several indices were used to assess the measurement model fit, as shown on Table 8. The $\chi 2$ values obtained were significant. Goodness-of-fit indices – GFI, CFI, NNFI – globally approached or exceeded 0.9, which indicated that the model satisfactorily fit the data (Hair et al. 2009). Regarding "badness-of-fit measures", RMSEA and standardized RMR also presented good values (Marôco 2010).

After assessing the measurement model, convergent and discriminant validity was assessed. The items converge and share a high proportion of variance in common on each dimension. Considering Fornell and Larcker's (1981) conservative test to analyse the discriminant validity, for five of six factors, the average variance extracted exceeded the squared correlations with the remaining factors. It is symptomatic that ease-of-use had an Average Variance Extracted (AVE) below the security and usefulness constructs. This may be explained because some items may have confused customers. However, Ease-of-use is the factor that our research suggests has the broadest and most varied domain (see Table 9).

Table 9
Squared Correlation between Experience Factors constructs, standard errors and t-values, average variance extracted on the diagonal

	Ease of use	Service in store	Awareness	Security	Usefulness	Availability
Ease of use	.565					
Service in store	.220	.697				
	(.106)					
	2.989***					
Awareness	.331	.448	.495			
	(.097)	(.156)				
	3.913***	5.349***				
Security	.581	.355	.313	.709		
	(.109)	(.144)	(.125)			
	6.294***	4.708***	3.828***			
Usefulness	.728	.270	.259	.583	.561	
	(.138)	(.149)	(.128)	(.156)		
	6.131***	3.406***	3.016***	5.769***		
Availability	.480	.134	.154	.436	.395	.873
	(.125)	(.163)	(.142)	(.155)	(.165)	
	5.605***	1.928*	2.031*	5.458***	4.540***	

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

4.3. Structural Equation Model (step 5)

Six structural models were built using AMOS 17.0. The first five models analyzed the impact of EF's on each EO's dependent latent construct: Attitudes with overall satisfaction, emotions (positive and negative), sensorial descriptors, perceived value and social value, which in turn were mediators of the loyalty dependent latent construct. The sixth model analyzed the direct impact of EF's on the loyalty latent

construct. In addition to the validity assessment performed in step 4, it was also necessary to evaluate how well the latent constructs related with theoretical relevant ones, which is referred to as nomological validity (Hair et al. 2009). In this case, the MSX scale constructs presented nomological validity, since the EF's were significantly related with the variables from the well-established scales borrowed from literature (Wolfinbarger and Gilly 2003, Richins 1997, Pullman and Gross 2004).

Table 10
Relationships of Mobile Service Experience Factors to Experience Outcomes

EF \ EO	Attitudes	+Emotions	– Emotions	Sensorial Descriptors	Perceived Values	Social Values	Loyalty
Awareness	−.024	−.081	.067	.064	−.049	.141*	−.033
Usefulness	.650***	.480***	.033	.053	.702***	.401***	.662***
Service in store	.154***	.018	.079	−.081	.040	.171	.042
Ease of use	.235*	.405***	−.360***	.730***	.057	.084	.242**
Security	−.035	.118	−.489***	.017	.120*	.031	−.027
Availability	.074	−.035	.109	−.004	.043	−.018	.003
Loyalty	.907***	.889***	.001	.668***	.848***	.625***	
R2	.707	.752	.415	.613	.706	.385	
Df/ X^2	2.075	2.289	2.467	2.098	2.605		
X^2	626.586***	995.678***		875.834***	633.569***	854.325***	458.688***
GFI	.847	.809		.802	.849	.808	.873
CFI	.931	.895		.886	.926	.884	.939
TLI	.919	.880		.869	.914	.866	.927
SRMR	.0542	847.		.0825	.0568	.0970	.0521
RMSEA	.067	.073		.078	.068	.082	.064

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

SEM analysis for the relationships of EF's with EO's is presented in Table 10. Before interpreting the results, the model fit was also considered according to the different measures and recommended cutoff values presented previously. The $R2$ (coefficient of determination) was also analyzed to understand the model's explanatory power. The six SEM's had acceptable R^2 valuesranging from 0.39 to 0.79. All the fit indices are within acceptable ranges, with GFI, goodness of fit indices, ranging from 0.80 to 0.87; CFI, comparative fit indices, from 0.94 to 0.88; RMESA, badness of fit indices equal or below 0.08 and SRMR ranging from 0.09 to 0.05; (Marôco 2010). The results reveal that generally EF's have significant relationships with each EO. Nevertheless, some of this impact is stronger in some than in others. To facilitate the interpretation of results, the modelling results are also shown graphically.

As seen in Figure 18.1, Usefulness positively influences attitudes. Service in store, even in smaller weight, significantly influences the overall assessment of satisfaction.
Ease-of-use can also be referred as having influence on attitudes, although with less statistical significance. These results show that the service concept for managing loyalty programs and beyond a technological component, contribute to an overall customer satisfaction. Moreover, in confirmation with literature, (Wolfinbarger and Gilly 2003) these attitudes also have the strongest influence in loyalty.
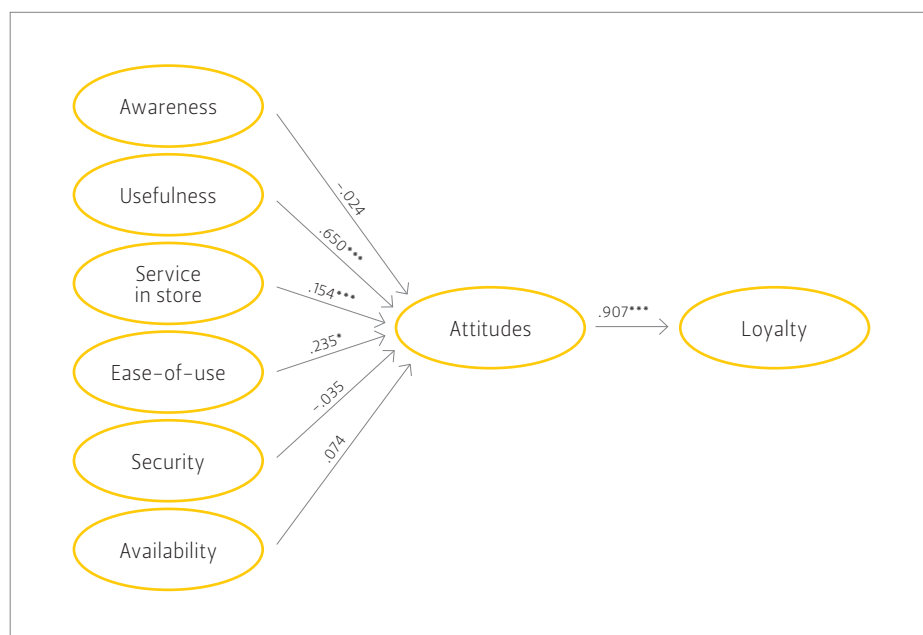
Figure 18.1
SEM – EFs on attitudes and indirect relationship with loyalty

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

The emotional reactions in Figure 18.2 have to be considered as being positive or negative. For instance, usefulness has significant good influence on positive emotions. The same happens with Ease-of-use, which, on the other hand, has significant negative impact on negative emotions. The negative emotions are also significantly affected by security. The positive emotions have a strong and also significant relationship with loyalty.

From these results, it can be assumed that customers feel optimistic towards the service usefulness and ease-of-use and these attributes can promote their loyalty. However, if the service is not easy to learn and use, if it does not drive confidence and privacy, customers may feel afraid or insecure.

Figure 18.2
SEM – EFs on emotions and indirect relationship with loyalty

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

In Figure 18.3, Sensorial descriptors had a strong and significant impact on ease–of–use, confirming the strong relationship between visual and tactile interaction and the perceived easiness to use the service and learnability.
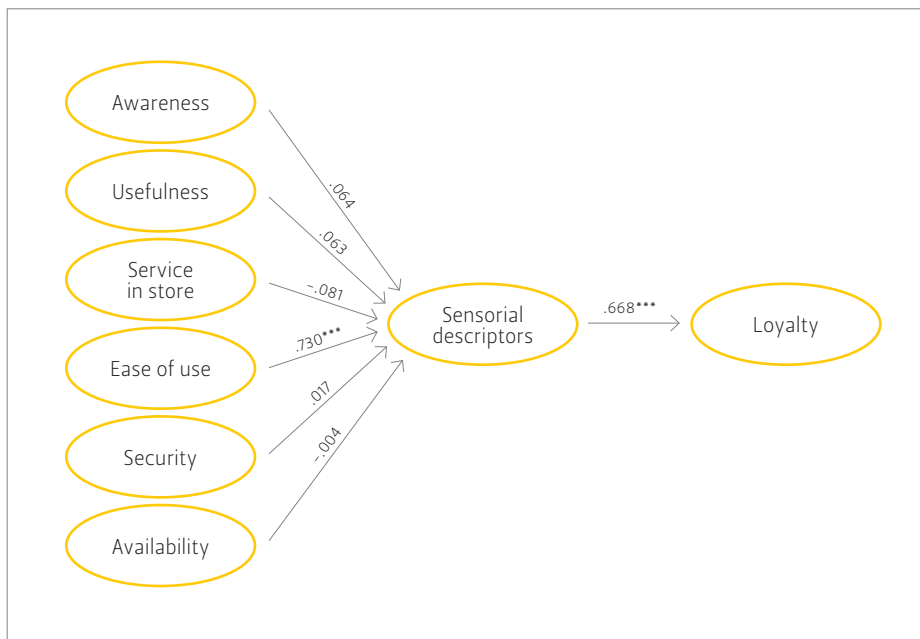
Figure 18.3
SEM – EFs on sensorial descriptors and indirect relationship with loyalty

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

Perceived value is significantly related with the service usefulness, confirming the MOBSERV convenience according to its use as depicted in Figure 18.4.
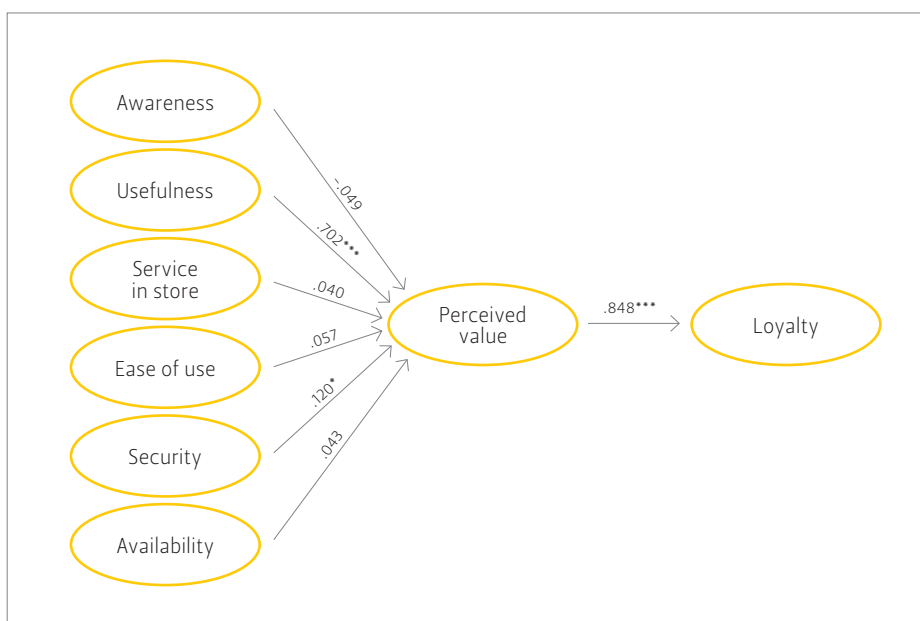
Figure 18.4
SEM – EFs on perceived value and indirect relationship with loyalty

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

Social value (Figure 18.5) is once more significantly driven by the service usefulness. This confirms the service utility in enhancing social self–concept. Customers feel that the service contributes to their self–recognition and this might once again be related with the fact that the service purpose is the loyalty cards management.
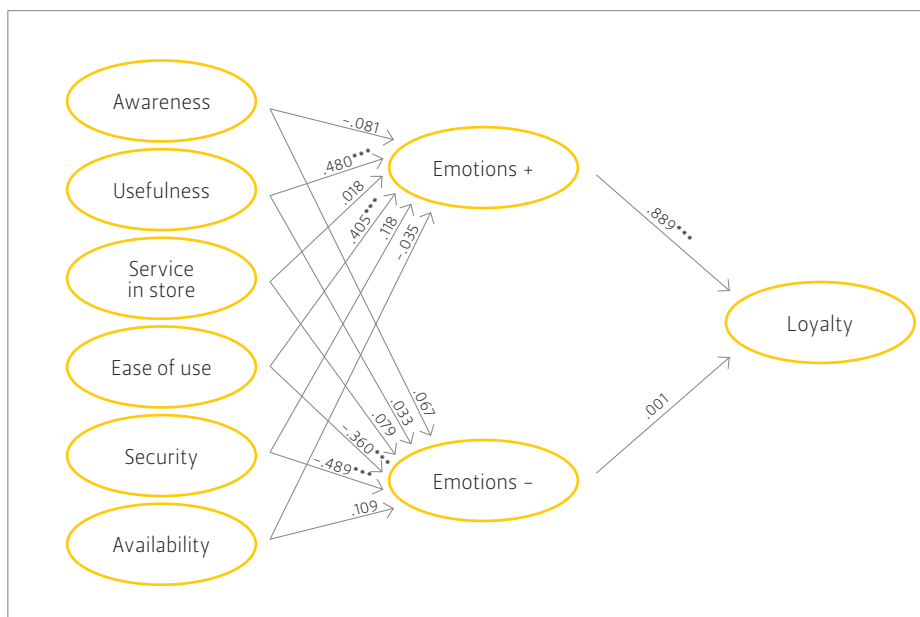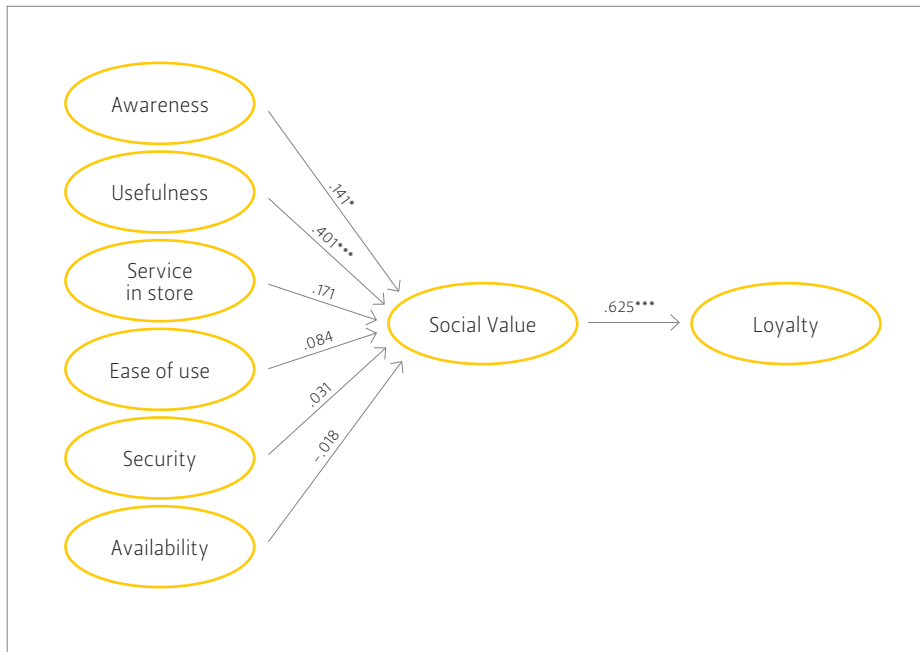

Figure 18.5
SEM – EFs on social value and indirect relationship with loyalty

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

Finally, Loyalty is directly influenced with significance by all the EF's except by negative emotions, as expected and presented in Figure 18.6. Moreover, Loyalty is indirectly influenced by ease-of-use and usefulness with statistical significance. Therefore, the overall assessment of EF's has a strong impact on customer loyalty.

Figure 18.6
SEM – EFs direct relationship with loyalty

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

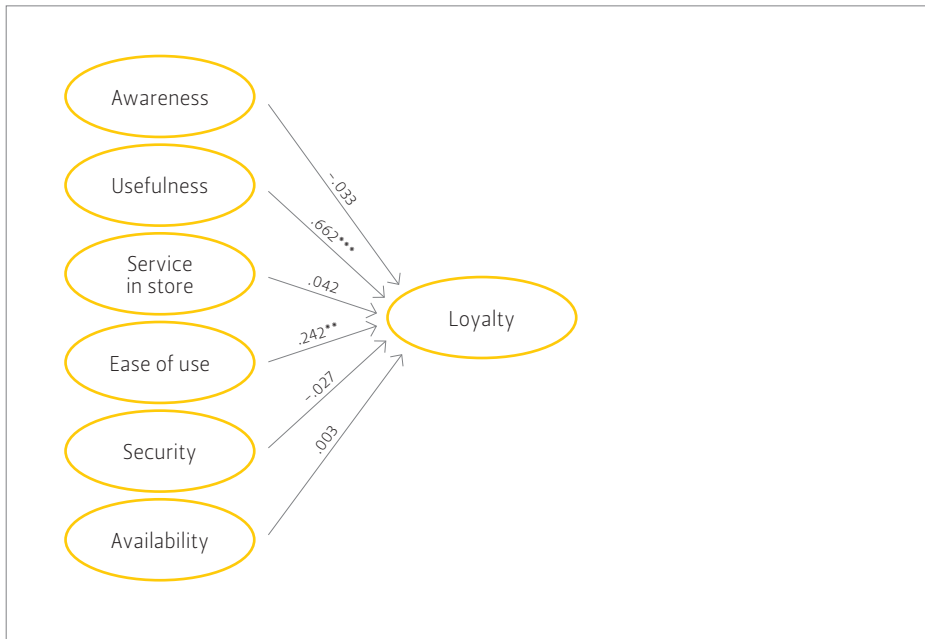## 4.3.1. Implications of the quantitative study

The findings from the quantitative study have several implications for practitioners. An MSX scale was developed and tested for the EF measurement. This scale has impact on different EO's, allowing for the design of mobile services through the required holistic perspective of the experience offered.

These EF's comprehend: 'Awareness' as the extent to which the service is promoted in the different communication channels; 'Availability' is the level to which the service is available and accessible through space and time; 'Usefulness' materializes the degree to which the service improves users' life, which in this case is very much related to the convenience and dematerialization of personal cards, vouchers, bonus coupons, etc; 'Ease-of-use' as the extent to which the service can be used effortlessly and in a pleasant way; 'Security', formalizes the extent to which the service assures privacy of data and promotes trust, and finally, 'Service in store', which comprehends the extent to which the service is well-known and accepted in stores.

Traditional EF's, such as usefulness and ease-of-use, continue to have the strongest impact on cognitive assessments. However, it is interesting to note the strong impact that ease-of-use has on emotions, both positive and negative.

Security has little impact on experience outcomes except the negative impact on negative emotions. This corroborates previous research (Pagani 2006) and indicates that security may be a *dissatisfier* and a barrier to adoption of mobile services. The theoretically new constructs, such as 'service in store' and 'awareness', have a low impact on EO's.

However, 'attitudes' may be driven by 'service in store' and 'social value' may be driven by 'awareness' of the service. These results put together technology-based requirements with other service requirements, concerning people and process. 'Usefulness' is a dimension that goes beyond the service mobile application and integrates the service concept and its utility.

The final model confirms the impact of EF's in a broader range of EO's, providing the experience a relative importance on cognitive, attitudinal, emotional, sensorial and behavioural assessments. The MSX model incorporates a set of factors covering a holistic view of experience with elements that commonly integrate the service offer, how it is offered, and received.

4.4. Conclusion of the Exploration Stage

The Exploration stage aimed at studying the experience through a global perspective.

The qualitative and quantitative studies were undertaken in depth, covering a large part of the research work. Methodologies of the social sciences were developed with its characteristic rigour, thereby contributing towards the relevance of the results.

The qualitative study applied Grounded Theory to the understanding of customer experience within mobile services, this way enlarging the perspective to the field.

As a result, it involved data collection along mobile service adoption and use, covering three levels of experience: overall experience for managing loyalty cards, service experience according to MOSERV concept and the MOBSERV encounter experiences.

The quantitative study was built upon the previous qualitative studies. Then, we developed a measurement model for EF's, and evaluated their relative impact on a broad range of EO's.

In summary, the exploration stage entailed an in-depth understanding of customer experience. It undertakes EF's for those aspects of experience involving both what the service offers and how it offers, such as the 'service in store'. Moreover, it entailed a holistic view of experience. It covers experience outcomes, namely customer's felt perceptions, attitudes, behaviours, emotions and sensorial reactions towards the service. These results were iteratively worked on in the main stages of development and were also very significant for the next ideation and reflection stages.

5. Ideation

The ideation is part of the design process and involves the generation of many possible different solutions (Zimmerman et al., 2007); Through creative frameworks, proto- types and integrative thinking tools, the ideation stage makes room for the promo- tion of ideas in the Service Design (SD) iterative cycle (Brown, 2008). Multidisciplinary groups with the main service stakeholders work together to create new service so- lutions (Patrício et al., 2013). The process flows between divergent and convergent thought processes, connecting the abstract and the concrete (Brown, 2009, Guilford, 1950, Dubberly et al., 2008).

The research objective for this phase was to incorporate the customer experience in a mobile service environment through the use and test of SD methods and tools. The exercise implied the connection of Mobile Service Experience (MSX) research with an immersive research approach in the company.

This approach which demanded the close following of events, promoted the aware- ness of the customer experience dynamics. The iterative assimilation process MSX is reported in this chapter which is dedicated to MOBSERV Ideation.

Constructive design research and action research are generally thought to involve a spiral of self-reflective cycles of planning, acting, observing, reflecting and re-plan- ning (Denzin and Lincoln, 2005).

Accordingly, right from the beginning of the present research dissertation, there was an active participation of the researcher within the MOBSERV team developers (Den- zin and Lincoln, 2005).

Over the past three years (2009-2012) the collaborative work comprehended week- ly appointments to exchange information and occasional joint actions.

SD research has brought creative and valuable discussions to the MOBSERV devel- opment group. Through the idea-generating cycles, modelling methods, as well as creative or selective techniques and prototyping tools were required. The researcher started using modelling tools to help the development team have a broader perspec- tive of the customer experience and service value co-creation. After each stage of data collection on customer experience by the researcher, the corresponding results were presented to the development team, and SD techniques were used to feed the service development process. The decoded customer EF's had a visible impact on the service concept development and implementation.

Ideas were often made tangible with cheap materials, then iteration went on promoting discussion and reflection (Koskinen et al., 2011). Visual representation tools promoted creative thinking workshops for demanded or predefined topics. As suggested by several authors, brainstorming and mind mapping sessions, as well as widespread examples of these techniques, were used to generate, visualize structure and classify ideas (Moggridge, 2007, Brown, 2008).

5.1. Incorporating experience along SD stages

Even if there are several SD instrumental techniques, they become more useful if they help to integrate the experience in a constant way in service development. The designer is a facilitator, a provoker, but it is necessary to take the tools and work the content (Meroni and Sangiorgi, 2011).

In order to incorporate experience, Dubberly and Evenson (2008) suggested to follow their – experience cycle – in the early stages of a project. This applies to the definition of the broad outlines of a service and to the process, as successive iterations add increasingly finer levels of detail.

According to Figure 19, the study of customer experience was used to learn how to work with its characteristics, followed by the mobile service design.

On one hand, there was research into the customer experience requirements, on the other hand, there was the incorporation in the SD path of those requirements.

Following action research guidelines, the idea was that changes would occur both within the setting and within the researcher itself. Beyond that, constructive design research would also enable a holistic vision of the service experience whilst, raising customer experience awareness in the development team.

Action research and Constructive design research methods would bring transparency to the division between theory and practice of SD research (Somekh, 1995). They also entail the investigation of actual practices, involving therefore, learning about the real world. Through their investigations, researchers want to become especially sensitive to the ways in which their particular practices are common practices of social communication.(Denzin and Lincoln, 2005).

Figure 19
Incorporating customer experience requirements along the SD path
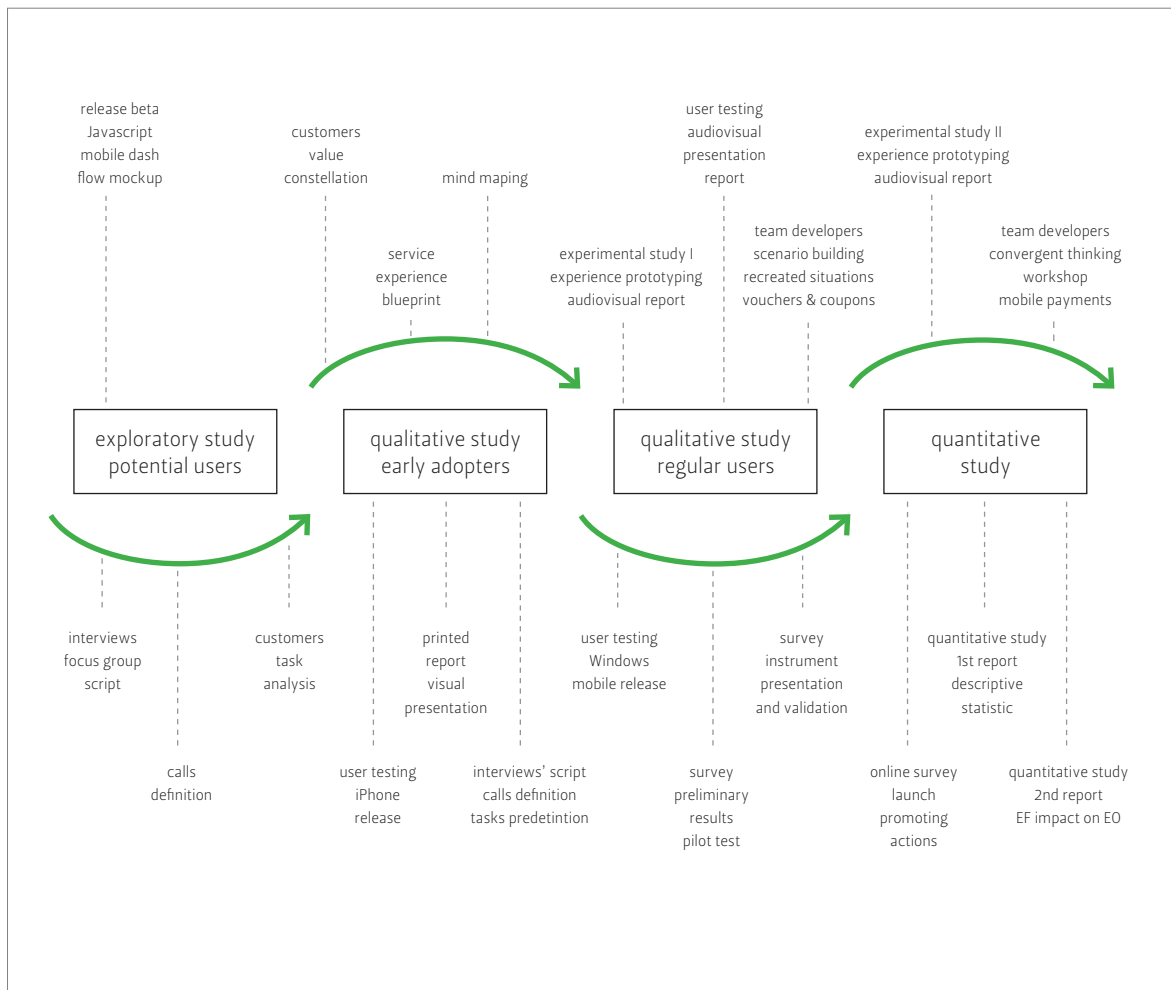
This way, the research work involved an active participation of the researcher throughout MOBSERV's different iterative cycles of development and implementation, in close interaction with the company development team (Herr and Anderson, 2005).

Meanwhile in the exploration stage, the service concept was first investigated and discussed with potential users. This was followed by the study of the early adopters and, in a third phase, of the regular users (Sarmento and Patrício, 2011b).

Finally, the quantitative study confirmed the previously identified experience dimensions (Sarmento and Patrício, 2012a). This data was iteratively used to work along the different cycles of SD, with the purpose of reaping the greatest benefit from the EF's gathered (Figure 19).

Constructive design research methods rolled out over three years of work and through weekly participative appointments in the company. The reciprocal collaboration facilitated a deep understanding of the service development process. Conversely, this method fed the process with proper actions of the SD modus operandi (Carr et al., 2011).

After each stage of data collection on customer experience, partial results were presented to the service development team. Hard data and SD tools were used to convey the information available to the developers.

Taking advantage of these regular meetings, the design researcher used visual representation tools and promoted creative thinking workshops for the requested and predefined topics (Goodwin, 2009). Also during these regular meetings and as required for action research, a reflexive process was deliberately and systematically undertaken (Somekh, 1995).

The results of the experience studies undertaken with the users of all stages were presented through different media (video excerpts, graphics or interview quotations) always adapted to best-fit communication (Figure 20.10, 20.11).

Along this design and research period, the activities were meant to promote multidisciplinary approaches, changing and unfreezing ideas of service experience.

Having assimilated those partial results and having clearly visualized, understood and absorbed the experience characteristics a new level would be attained by the MOBSERV team with a broader perspective of customer experience.

5.2. Ideation results

As mentioned, the main research goal of this stage was the incorporation of customer experience requirements through the ideation process. However, this process has resulted both, in a sequence of non-linear interdependent events between research and development and between ascertained elements for design and the design itself.
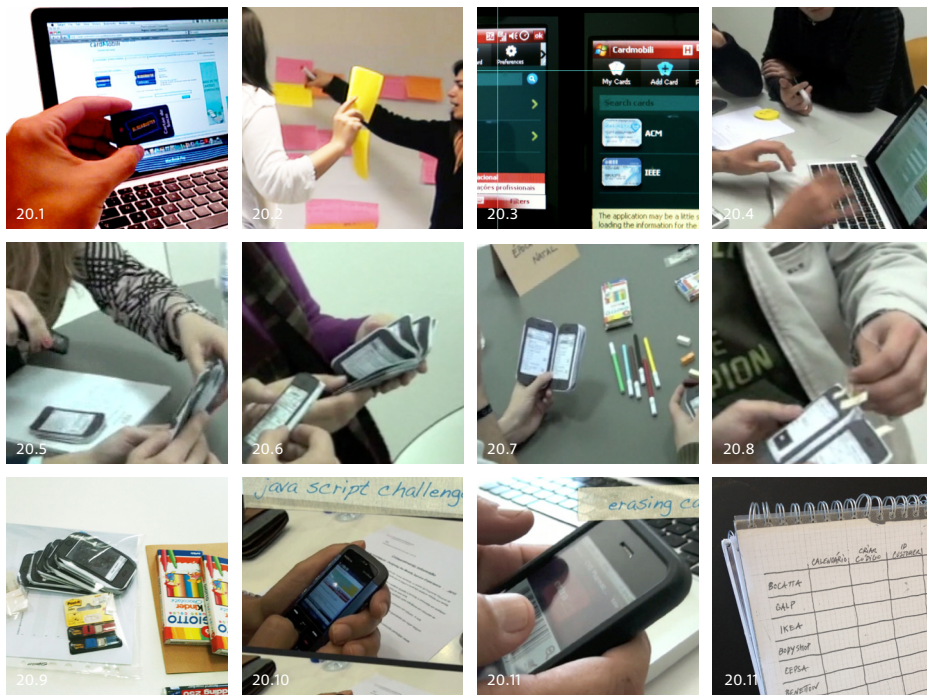
Figure 20

Fig 20.1
Inserting customer
data in the server

Fig 20.2
Mind mapping

Fig 20.3 and 20.4
User experience
prototyping

Fig 20.5 to 20.8
Role playing

Fig 20.9
Low tech mockup

Fig 20.10 and 20.11
Video report

Fig 20.12
Sketch book

5.2.1. First service design cycle for the first release

Understanding the customer experience

In the first exploratory study of customer experience, the Beta version of the service was launched only for JAVA SCRIPT mobile platforms. This first assignment included the analysis of the mobile application mock-up, generating, therefore, the preliminary suggestions for the service design with experience on adoption and use.

Modelling enabled the creation of visual abstractions that helped developers to solve problems and find tangible solutions. Once specific hypotheses were defined, they could be initially tested inside the development team.

The developers' first concern was then to focus on the webpage and improve the way people would learn how to download and install the application. Beyond the ease of learning, the team was also concerned with the lack of MOBSERV awareness. As a result, the interdisciplinary work promoted the discussion and the construction of a model articulated between the different channels: homepage, online communities and mobile app. Some discussions took then place over the preliminary proposals for graphic interfaces and the developers as well as the researchers got together for the first time.

In the Beta version, the identification of experience key factors was mainly focused on the conceptual change from a loyalty card service to a multichannel loyalty service with a more active participation of all the stakeholders.

That meant that the service concept would have to be explained to all those involved – from early customers to managers to service partners and their associates. The service would also need a strong and, above all, coherent image.

The qualitative study with potential customers had provided important insights into the development of the MOBSERV service concept. The analysis of the customer procedures concerning loyalty program management enabled a better understanding of the overall activities involved on how MOBSERV could enhance the customer experience. The analysis took into account the different touchpoints between the customer and the service throughout the use of the MOBSERV.

This study would also enable the identification of new tasks connected to the MOBSERV first release in comparison with the classic methods for managing loyalty programs. These new tasks would also reflect new experience characteristics, which were also identified.

Figure 21
Customer activities involving loyalty programs management
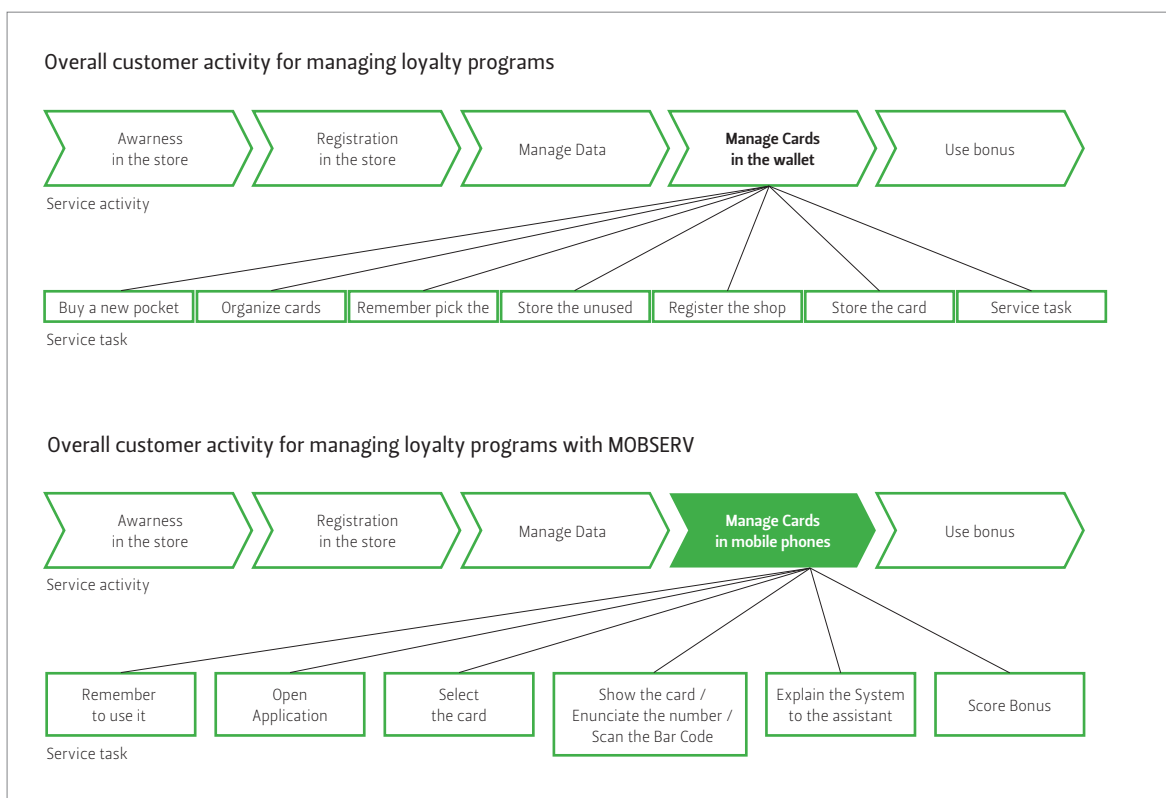
As shown in Figure 21, loyalty programs in mobile phones were a new event, not necessarily recognized by all shop assistants: customers had to explain themselves. Through those diagrams, the analysis was communicated graphically to the team of developers in order to observe more easily how these new tasks may affect customer procedures.

This approach also identified new different steps in the process for managing loyalty cards as is the case of inserting customer data in the server. The service users had to insert all their personal data from their loyalty cards into the service file system, so it would be available whenever they wanted. However, this was a new task, something that was not necessary until MOBSERV appeared (Figure 20.1).

The understanding of these new customer procedures gave support to the MOB-SERV conception. As from this preliminary study, the team of developers became more aware of the implications for being a self-service and of how customers would have to serve themselves. In this way, MOBSERV design would aim at reducing customer efforts.

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However, this was a new task, something that was not necessary until MOBSERV appeared (Figure 20.1). The understanding of these new customer procedures gave support to the MOBSERV conception. As from this preliminary study, there was an awareness of implications of being a self-service, and of how customers would have to serve themselves. In this sense, MOBSERV would be designed in order to reduce customer efforts.

Exploring the redesign of the MOBSERV concept with the Customer value constellation

The second study on customer experience was performed and its results helped the redesign of MOBSERV for its first release. Right at the end of the first cycle of interviews for this qualitative study, graphical representations of the service value constellation were assembled and presented to the service developers (Figure 22).
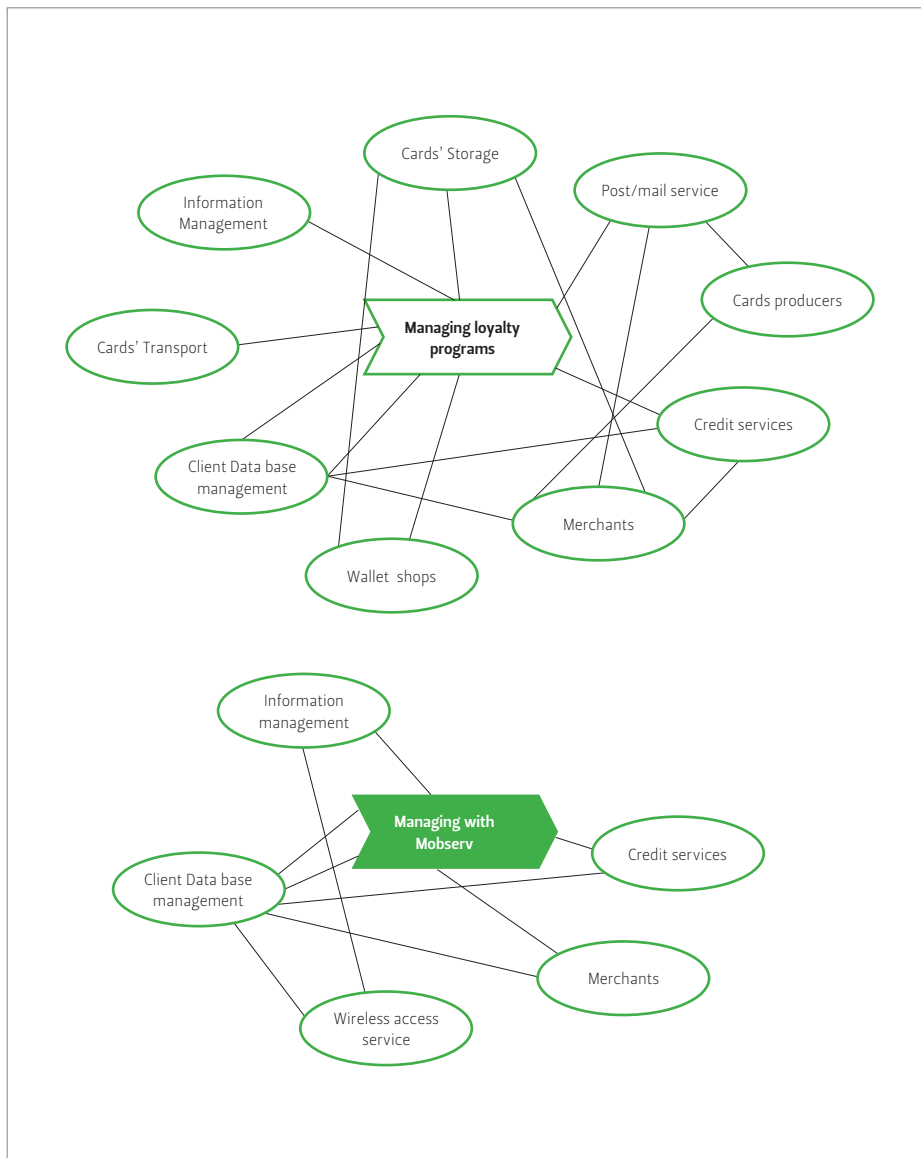
These diagrams aimed to analyse the existing service concept and to explore new service innovation possibilities to enhance the overall customer experience. The company's contribution supported new service concepts and the offer of integrated solutions (Patrício et al., 2011).

Through this analysis, the development team could frame its perspective and understand how the company's offering would fit as an input into the value-creating system, while considering the inputs offered by other companies (Normann and Ramírez, 1993).

With MOBSERV, a new value proposition would be offered, establishing new connections in the value network and changing the way customers managed their loyalty cards.

As presented in Figure 21, the service experience would be moved from the traditional model to a new mobile experience model. The important action of 'managing loyalty programs' would from now on involve fewer participants in the value creating system. Nevertheless, the structure simplification revealed the demand for an increased effort from each stakeholder and repositioned the company in the value constellation.

The management of loyalty programs on a mobile phone would bring new technological, functional and even social challenges. Therefore, the development of the customer value constellation, within which MOBSERV was integrated, helped to understand how the service contributed towards the customer experience. It also pointed out directions for positioning the service in such a way as to enhance the customer experience and the firm's competitive position. This way, the company would need to acquire good partnerships considering all the stakeholders involved in order to enhance experience.

5.2.2 Second SD cycle with new version of MOBSERV

TThe first release was launched in Java Script in order to cover a broader number of mobile phones. A new qualitative study was undertaken, six months after the first study and after this MOBSERV launch. The goal of this second study was to comprehend the early EF's incorporating them in the design of the service and, optimising its characteristics according to the different levels of experience (Patrício et al., 2011). The EF's derived from this second study enabled a detailed understanding of the interaction between the customer and the service provider across the different service touchpoints.

Service Experience Blueprint
The in-depth understanding of customer interaction with the service detected difficulties in some tasks at different service touchpoints. Consequently, it was essential to identify these touchpoints and what the service involved in order to improve customer experience covering all levels of interaction. The Service Experience Blueprint (SEB) was used to support the service in the enhancement of the interaction experience (Patrício et al., 2008).

SEB allowed for the understanding of the details of the interaction experience for each touchpoint, as well as for the connection between touchpoints.
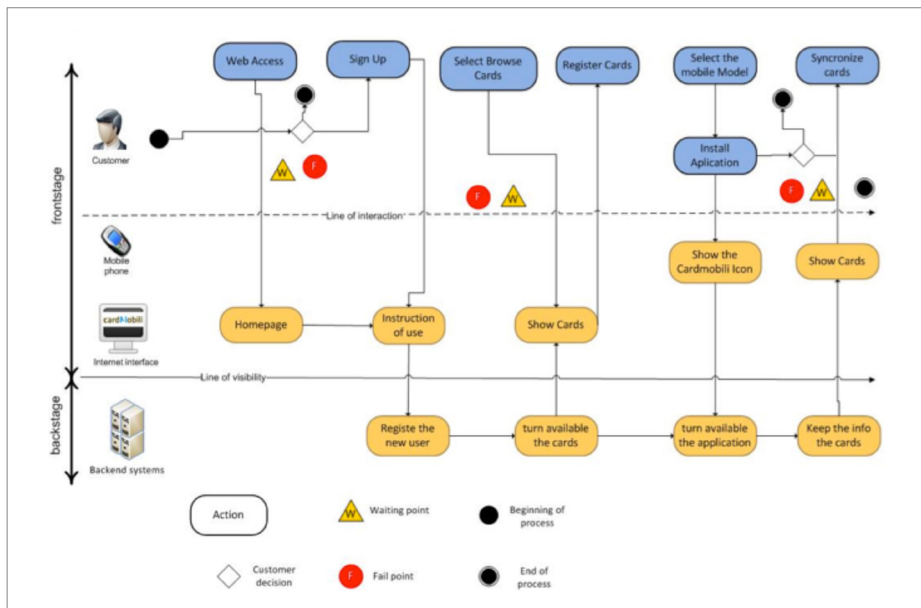
These mapped outcomes, divided into the different tasks involved in the service operations, were helpful in the communication of the message to the development team. These tools contributed towards analysing the fail and waiting points they should focus on. Four SEB's were made up for four different touchpoints: Awareness, facility of registration in a new loyalty program, ease of interaction and straightforwardness of access to bonus (see also in appendix D). As an example, the installing of the application in some models of mobile phones could be difficult and harm the registration experience for a new loyalty program (Figure 23). The team of developers easily perceived SEB as they were using a common diagrammatic language used for programming as well (they were all made in Visio Microsoft release 2007).

Attached to these SEB's several examples were shown. These were either contributions from the qualitative interviews or small images picturing the situations. Reminding the registration moment, the customer may have experienced several failing points: first, they may not have had wireless to access the webpage for the first registration. Then, the customer had to select and browse his/her cards. Then he/she had to install the application on the mobile phone and synchronize his/her list of cards. These tasks took time and effort and might have failed due to the customer's network packet data or difficulties in understanding the procedure. Some customers would give up and blame MOBSERV for the loss of time. SEB helped to better visualize the steps where developers should get involved to reach superior experiences.

Mind–Map for 'Security'

In view of subsequent milestones, the developers' team had to be focused on spe– cific topics of progress – Security was revealing itself a priority, as potential users had revealed they feared the unknown.

The interviewees had referred the security dimension several times in the first and the second qualitative studies.

Therefore, a brainstorming session was used and facilitated by the research team in order to open the concept for 'Security (Figure 24). The Mind–Map tool was a relaxed task, promoting team building, in these early days of design research.

This session took two hours' work and all the developers' team took part, (eight members at the time). The whole process was video–recorded, therefore allowing the detection of flows for idea generation.

Participants first wrote individually seven words about security, which they then mind–mapped with everyone's contribution. This broad topic was stretched even more generating the most possibilities. Hence, the centre of security was divided into ten branches – Trust, Theft, Backups, Hackers, Vouchers, Critical Cards, En– crypted, Encrypted perception, Phishing and Merchants. However, the different paths were visually structured and even if they had an organic shape, each one could understand relations and hierarchies within the sub–topics. This tool has promoted a broader perspective on security issues, involving with it all the re– search and team developers.

5.2.3. Third SD cycle

In the third SD cycle there were also several versions of the service adapted to different mobile platforms (Iphone, Symbian and Windows mobile). Along with the evaluation of these different versions in different contexts, new service features were also being conceived. MOBSERV was being used regularly and so this SD stage came after the third qualitative study of experience as well.

The third study aimed at understanding MOBSERV regular users and their experience requirements in order to incorporate them in the service, with increased accuracy.

Service Experience prototyping

Service Experience Prototyping (SXP). demanded to work with all service components in order to reach a detailed and improved design. Prototyping is still an important challenge when dealing with the intangibility of the services (Stickdorn et al., 2010). Since MOBSERV is mobile and involves several stakeholders, it had an increased complexity.

While "Iphone's" version was being released, two researchers used the application and their own mobile phones were monitored so they could give a first input with several, personal different tasks performed and evaluated. A heuristic evaluation and its experiential outcomes of the experiment were presented to the developer's team, fully documented with images and text.

Similarly, while the results were being implemented during this last qualitative data collection, the "Windows Mobile" version was also developed, and the researchers' team were again invited to pilot this platform.

Along with these above-mentioned activities, an experimental study considered two prototyping processes (Sarmento and Patrício, 2011a). The study, fully described in the next chapter, compared the ability of user experience prototyping and service experience prototyping to enable the evaluation and identification of improvements for this new mobile service. These two prototyping approaches were assessed as they enabled participants to evaluate and identify the improvements in several EF's connected to the interface. Feedback of this experimental research was given periodically to developer's team through video summaries. (Figure 20.3).

Service role-play

With the third qualitative study, a short movie was made with the most important data collected. The recorded interviews were presented to the developers' team. A task list of features and functionalities had been defined with the company support and approval and so these study results were also presented not only as a checklist but also with graphic indicators of the regular users' performance. Conversely, it was decided to study the EF's with the developers themselves, within role-playing activities for specific service tasks.

At this point, new features were being developed involving geo-referential location vouchers and coupons. Developers were especially considering the new tools for scoring bonuses and the geo-referential commercial information.

So researchers challenged them with two different circumstances – shopping at Christmas time and trying to buy a waterproof camera: Christmas time is the period where one wants to buy many things, in many different places and for many different purposes, so one can consider the stores where there is a loyalty program and it benefits from it. On the other hand, to buy a waterproof camera involves technological advisers and the customer would want to compare prices in specialized stores.

Developers had to act in pairs, without assisting the other group's performance, as they were being video recorded. The interfaces studied were folded-up into 3D low-tech mock-ups that participants had to use. A cardboard stated the situation, for example: 'Christmas time'; then, there were pens, markers and other stationery to stimulate the edition in real time. These settings had the ability to promote conversation around the shopping setting (Figure 20.5, 20.6, 20.7, 20.8)

The various different reactions were compared at the end. As a result, they could diagnose problems they experienced with their own application, such as dealing with reactions from other customers or feeling lost and share it aloud and spontaneously. This activity had relevance in the sense that developers could themselves feel the complexity of the scope of the experience. The situation promoted their sense of experience concerning shopping decisions and beyond technological features.

5.2.4. Fourth SD cycle MOBSERV

The design researcher was not directly responsible by the service implementation. Though, since there was a contact with the customers in several moments, for different experience studies, the work was also definitely relevant in charting the MOBSERV path to market. After the last quantitative study of experience, the researcher's role was beyond data collection and analysis: Developers counted on SD approaches to move forward on service upgrading with EF incorporation.

Convergent thinking

While divergent forms of thinking involve generating alternatives in which the notion of being 'correct' has a broader value and are quite common, they are not the only method used in the design process. Convergent forms of thinking involving rational and analytical skills are used as well (Guilford, 1950). They are more effective in situations where an answer exists and simply needs to be either recalled or worked out through decision-making strategies.

The MSX structure equation model was reported to the company focusing their attention to the EF influence on the EO's. The weight of each dimension was graphically represented as on a chalkboard to better communicate their relative importance.

A convergent thinking tool was also specifically used to structure and organize typologies of mobile payments, as a new feature was being prepared for this purpose. There are at least five ways to make a mobile payment (Mobilepaymentstoday, 2011). The aim was to work with two of those – 'closed loop' and 'PayPal'.In closed-loop payment networks, the owner of the network provides the payment services directly to merchants and cardholders without involving a third-party financial intermediary. In the 'PayPal' mode, there is an acquirer which performs payment processing for online vendors, and other commercial users, for which it charges a fee.

The aim was to define the properties of each payment model and organize them within a recognizable structure. Therefore, six sketchbooks were prepared with handmade tables, with empty cells to fill in with different payment models (see Figure 20.12). Each row and column mentioned the payment typology. The sketchbook also had many scanned images of coupons and other fee forms to take into account. Then there was a decision process, picking the proper cell

each time for a repeated situation. As a result, different typologies and characteristics were identified as well as the most recurrent combinations.

The work group was split in pairs, each one with their own sketchbook. All teams had to suggest new combinations, select types, and define their criteria for analysis. After one hour's work, the results were compared and evaluated together.

This activity helped the decision processes of mobile payments. The fact of being developed with informal sketchbooks has promoted a sense of tangibility and invites everyone to an active participation. Similarly, the handmade tables encourage to their completion, thereby enhancing the activity dynamics.

5.3. Conclusions of the Ideation stage

The ideation stage was an action-research approach carrying out customer experience factors to be incorporated in Service Design. The SD tools presented in this ideation stage followed the service's design cycles. This stage had research contributions and managerial implications. On one hand, the methodologies used followed the clear research objective concerning the active EF incorporation in the SD process. On the other hand, this stage had impact in the company's environment and in the developers' way of working.

The researcher's role began by discovering which human processes exist to manage the service underneath and how to best serve customers' needs through its creative processes. The researcher used a range of methods such as observations, interviews, context mapping, journey mapping and a survey. Focus groups and interviews with ever increased and deeper ways of collected data were used and the findings communicated to the company's developers and thereby following their process of conception. The EF's were integrated according to the importance in relation to the service adoption and regular use.

The different tools in each phase allowed for the service improvement and supported all stages. During the Ideation stage, developers and managers became aware of the experience potential and in time were incorporating EF's along the SD iterative cycles, raising their consciousness and creating a subsequent business impact.

Each decision to make an activity was the result from a need that was identified in the study. Therefore, the study followed the change of the service concept from the experience of a loyalty cards program to a service with multichannel loyalty
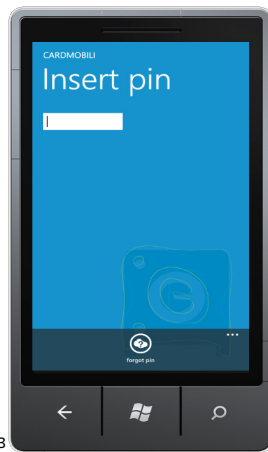
and fewer stakeholders implicated. The analysis of customers' activities as well as the value constellation enhanced the service innovation potential to reach an overall customer experience. These analyses also permitted the understanding of how new tasks would affect customer procedures and subsequent experiences. The development of the customer value constellation, within which the MOB–SERV was integrated, helped to understand how the service contributed to the customer experience and pointed out directions for positioning the service in a way so as to enhance the customer experience and the firm's competitive position. This way, the company would need to make good partnerships considering all the parties involved in order to enhance the experience (Figure 25.1).

The problems detected in analytical moments of customers' interaction were communicated to the developers based on their feedback. These fail points led to the outlining of possible solutions.This way, for instance, they developed a feature to edit barcodes, so the customer could best adapt how to scan it in store. However, this feature was not accepted as expected because customers did not understand why they could edit that 'critical' element (Figure 25. 2).

Figure 26
MSX model, the EFs
impact on EOs

The development of the customer value constellation, within which the MOB‐SERV was integrated, helped to understand how the service contributed to the customer experience and pointed out directions for positioning the service in a way so as to enhance the customer experience and the firm's competitive posi‐tion. This way, the company would need to make good partnerships considering all the parties involved in order to enhance the experience. The Service Experi‐ence Blueprints were made for different touchpoints: As a consequence, sev‐eral service situations were reframed: the installation of the application in some models of mobile phones could be difficult and harm the registration experience for a new loyalty program. Therefore, a MOBSERV webpage tutorial was imple‐mented to support the 'Registration task'.

Mind‐mapping (with dimensions ascertained from the experience studies) gave clues and opened paths for the work experience. This tool has promoted a broad‐er perspective specifically on security issues, involving in it all the research and team developers. Several actions were implemented afterwards like insertions of pin codes according to the different mobile platforms Figure 25.3 and 25.4.

Service experience prototyping enabled developers to evaluate EF's considering the service a holistic view, beyond technological features. This activity had relevance in the sense that developers could themselves feel the complexity of the scope of the experience. The situation promoted their sense of experience concerning shopping decisions and beyond technological features. Consequently, it has raised the need for new features such as a global search for new offers (see Figure 25. 1).

The Chief Executive Officer hanged the MSX model of impact on the wall so they could from then on remember the exploration findings (Figure 26). All EF's taken into account throughout this process were specific attributes of a service that is mobile: 'availability' thereby considers that the service could change with its context of use. On the other hand, 'service in store' embraced a particular analysis, like in this case the store is not the main scenario.

The researcher prepared each of the activities described and took part in all the actions besides being up to date with every evolution of the service. The role of the researcher was immersive, as expected, giving the team developers weekly feedbacks of what was being observed. This work was at all times visually and graphically representative with a language easily understandable on one hand but also different from the developer's common speech. Since the beginning, as in a common exploratory study, there was an undefined role for each partici-pant. It was expected that SD researchers would have a word to say regarding the external appearance of the service (like the website). This way, one would reach the preconceived ideas of 'experience' and SD as being only a wrapping paper. However, the work developed went much further into the service de-velopment. Then, and according to the feedback gathered with the developers that actively had participated, the ideation tools raised their substance. Brain-storming and Mind-Mapping worked as an icebreaker. Shaped as a workshop on creative thinking, they immediately followed the initial qualitative outputs of the study of experience. The focus on specific aspects like 'awareness' or 'security' were demanded requirements and thus developers observed:

> (...) Good time to put the whole team to dissect an issue that was bothering us. And allowed to exchange ideas. It concerned reorgani-zation of how the various elements were bonded, and a deeper un-derstanding of problems and solutions. (...) The Brainstorming later supported and structured the discussion around identifying priorities for the service in a relaxed way.

Activities that support decision, like group work promoting convergent think-ing, were also presented with a playful dimension. For this purpose, the use of probes had a valuable contribution. In the same way the activities meant to evaluate and prototype were always prepared with low-tech mock-ups and la-belled to framework a scenario and simulate a service event, thereby making the developers put themselves in situations closer to reality. The tangible probes gave the implemented actions the necessary step to span the bridge from the abstract to the concrete:

> (…) The construction of scenarios without the use of coupons allowed the development team to focus on those aspects of usability and ex-perience from the user's viewpoint.

> (…) We put ourselves in the place of the final user's experience living their difficulties and attitudes and a more naturally use of the application.

> (…)The one that interested me most was the purchase of a photo-graphic camera / Christmas shopping, because it was one that al-lowed me to see and feel for the first time what it was like to use our product (or part of it) and allowed me to realize early design faults that had not even passed my mind, had we not tried to "use" the ap-plication in that context.

This approach and the activities developed allowed the team to draw attention to the customers' experience requirements and take into account the perspective of the service globally. The iterative work has served, above all, to decode the experi-ential requirements and systematically materialize them into design characteristics supporting the MOBSERV development and accomplishing customer wishes. Moreo-ver, the researcher informed the developers of the MOBSERV impact following the service implementation in real-time. Therefore, the technological development for each MOBSERV release had effectively incorporated the service EF and considered their impact on the business environment. Advantages were actively taken from the intrinsic design communication skills promoting internal communication required on NSD (Edvardsson et al. 2000). As the service development was running, the use of visualizing tools brought into play divergent and convergent ways of thinking.

Developers were not familiarized with these ways of working and often the pres-entation of a result or a playful deed had the power to break routines and to reach unformatted ideas.

There was an important and noticeable managerial implication from this iterative EF incorporation that is a change in the business model. In fact this action research approach of an SD for the MOBSERV start-up helped to think and judge the company's course, changing from a B-to-C towards a B-to-B model. That is to say that the study of the end customers turned out to be such a broad field for this specific service offer making it difficult to reach and answer its experience requisites properly. On the other hand, MOBSERV ceased to be so focused on the end users, but went on to sell the solution for large operators, a conclusion to which this work has also contributed (Figure 27 and Figure 28).

Figure 27
MOBSERV Homepage,
October 2009
©Cardmobili

Figure 28
MOBSERV Homepage,
October 2013
©Cardmobili

6. Reflection

Prototyping is a well-established practice in New Product Development. Prototyping is an inherited practice from other fields of design. Following Vargo and Lusch (2004), there was a shift from a goods-dominant view, in which tangible output and discrete transactions were central, to a service-dominant view, in which intangibility, exchange processes, and relationships are central.

However, tools like prototyping and, in this case, Service Experience Prototyping (SXP) are still understudied in service design literature. The increasing importance of New Service Development (NSD) and customer experiences has created a significant interest in SXP (Moggridge, 2007, Stickdorn et al., 2010). SXP is still a challenge when dealing with this intangibility of the services, particularly in mobile services, given that we cannot put a service in a box and ask customers what they think about it (Stickdorn et al., 2010). This reflection stage describes an experimental research to better understand SXP and its components.

Although there are many reported methods to evaluate experience, no empirical study had been done to assess how experiences should be tested throughout the SD process. The work involved for this stage comprehends two series of experimental studies in order to compare the SXP with the more widely used methods and techniques for UXP.

6.1. Mobile Service Experience Prototyping

Experience prototype is a version, in any medium, that is designed to understand, explore or communicate what it might be like to engage with what we are designing (Buchenau and Suri's (2000). This definition emphasizes the representations needed to successfully convey an experience with a product, space or system. In order to evaluate these versions, Buchenau suggests prototyping techniques such as storyboards, scenarios, sketches or video (Moggridge, 2007). In fact, by visualizing and prototyping experiences, it becomes evident which parts of a service are more significant and which parts need to be interconnected to deliver a compelling service offer.

The iterative approach of prototyping with modifications and validations leads to many and more concrete requirements and less suppositions, giving confidence to those who follow a design process (Gerber and Carroll, 2011).

However, in technology-based services, prototyping techniques are more interface oriented, such as usability testing or a simulation of a final product (Goodwin, 2009). On high fidelity interface prototyping there are even simulators – software that simulates the mobile experience. These detailed approaches can change the way pilot studies are evaluated and provide opportunities for ideas to evolve (Ballard, 2007).

The increasing importance of mobile technologies for service provision and the study of customer experience have also promoted interest in SXP (Buchenau & Suri, 2000). Based on fieldwork with mobile services Waljas et. al (2010) argue that the central elements of service experience should fit cross-contextual activities, flow of interactions and content, and perceived service coherence. Nevertheless, these studies are kept mainly concentrated on the mobile device.

From an SD perspective, service prototyping aims to assess what happens when some external factors interfere during 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, Stickdorn et al., 2010, Koskinen et al., 2011). Service Prototyping has also been defined as an approach to developing and testing ideas at an early stage before large-scale resources are committed to implementation (Stickdorn et al., 2010). Service prototyping should therefore be used in the early stages of the service development cycle to have a quick assessment of the service, in practice, and with other developers and users. And so prototyping generates more upfront activity than traditional service development processes (NESTA, 2011).

Edvardsson and Enquist (2009) defined service prototype as a tool for testing the service by observing the interaction of the user with a prototype put in the place, situation and condition where the service would actually be performed. In addition, they advocate that companies may promote trial experiences, testing the activity in a simulated setting, thus enabling customers to assess value-in-service. This can be performed through an "experience room", a place for creating and simulating customer value by enabling the customer to try and assess the real value of a service experience prior to purchase and consumption (Edvardsson and Enquist, 2009).

Literature shows there are different approaches to experience prototyping and service prototyping. However, they are not well integrated. It is therefore essential to understand the contributions that each approach may bring, the situations to which they are best suited, and how they can be synthesized to prototype service experiences.

Specifically regarding Buchenau and Suri (2000)'s definition, the

> *(…)trial version of an experience with a product, space or system;*

this idea can be complemented by Edvardsson et al.(2000)'s suggestion to consider all the elements of the service to be tested. However, it is not clearly defined which elements these are that define this service design space. The same happens in the HCI field; there is no systemic order for the service experience and therefore the test elements are not clearly defined.

Also considering Booms and Bitner (1980), who added 3 P's to the original 4 P's to apply the marketing mix to a service concept:

Participants (all human actors in the service encounter including service assistants and other customers);

Physical evidence (the physical surroundings and all tangible cues);

and *Process* (procedures, mechanisms and flow activities).

Later on, Bitner (1990) reinforced that these elements should be included in the strategies for improving the service encounter satisfaction. Therefore, these 3 P's are important to SXP because a more complete view of the service will be assessed. An equitable representation of each part of the service concept should be evaluated and prototyped to enhance improved customer experiences.

Building upon User Experience Prototyping (UXP), service prototyping, and Booms and Bitner conceptualization of the 3 P's of service, this research defined Service Experience Prototyping (SXP) as a form of testing and evaluating a service experience that involves all the different elements of service design, including people, process and physical evidence, across different touchpoints of the service experience as depicted in Figure 29.

Since both the process and people are so important to services, services do not really come alive until people are using the service and walking through the process.

SERVICE EXPERIENCE PROTOTYPING

people
customers service employees
other customers

physical evidence
artifacts interactive
systems technology

service process
interaction

When compared with UXP, SXP explicitly addresses the elements of service design (people, process, and physical evidence), and considers all these elements as part of the design space, and not as contextual elements. The distinction between the two approaches therefore stresses the fact that UXP considers almost all the service elements as 'context', thus being outside this design space, whereas at SXP, people, process and servicescape are specific components of the design space itself, as shown in Figure 30. Service experience prototyping should therefore address this holistic view along the iterative service design process. Testing the experience with mobile services from this global perspective is crucial for the design of technology–enabled services and mobile services in particular.

6.2. Experimental study

Building upon the proposed conceptualization of SXP, an experimental study aimed to compare UXP and SXP. It was developed to understand the elements and contributions of the different approaches to prototype mobile services.

The process would be settled on *methods that allow 'designers, clients or users to experience (service) themselves* (Buchenau and Suri 2000)

This experiment was part of the process of MOBSERV development, which, as explained before, would allow customer identification and the scoring of bonus. Following experimental research guidelines, this section details the experiment design and procedures (Neuman, 2005).

Figure 30
Comparing UXP with SXP
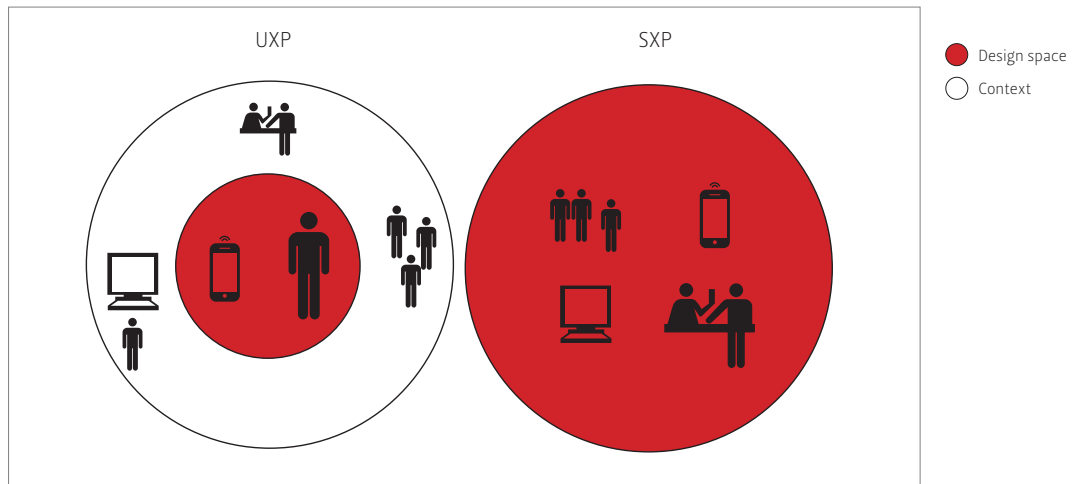
The study compared the ability of UXP and SXP to enable the evaluation and identification of improvements for this new mobile service. These two prototyping approaches were assessed as they enabled participants to evaluate and identify the improvements in several EF's connected to the interface, the service and the mobility aspects, such as context of use and social interaction.

6.2.1. Experiment design

A set of EF's aimed at assessing the ability of the prototype in order to provide a holistic view of the service experience. Based on the dimensions ascertained from the quantitative study, *Awareness* is defined as the extent to which customers recognize and know about the service in order to try it. *Availability* is the way in which it is convenient and easy to access; *Usefulness* involves completeness of features, and data management; *Ease-of-use* concerns ease of learn and interface aesthetics; and service in store, which addresses the social interaction with store assistants.

Hence, the experimental situation comprised two treatments: UXP vs. SXP. The research hypothesis considered that there would be differences between these two circumstances. In the same way, the participants' capacities to suggest improvements to the investigated MOBSERV would also be distinct.

Two rounds of collected data were made. These two experiments add the same procedures and samples with the same characteristics.

However, they cannot be compared. The second study benefitted from the analysis of the results of the first study and from greater literature review. The instrument used to evaluate the experimental situation was structured differently. Thus the results cannot be compared even if the procedures were the same.

Context of the experiment

Both Experiments involved master degree students enrolled in NPD (New Product Development) courses. Therefore, all students had previous knowledge of new product/service development methodologies. The experiment involved independent-samples for UXP and SXP considering students of the same course in each experiment test. The first round of the experiment will be described as a pilot test and had five groups from five different courses. For the second round of the experiment (one year later) the sample had four multidisciplinary groups, more comparable in number, although their background was not under evaluation.

Treatment

The experiment comprised prototyping the same mobile service (MOBSERV) for both experimental situations UXP and SXP. The situation would promote an enactment of the two experimental groups, each one seeking to be focused on their respective design spaces (Figure 30). Therefore, the same sets of tasks were included, but with a different emphasis: one group focused on UXP and the other group on SXP. Participants were provided with two storyboards, which were used in the experiments. Both storyboards showed the same eight tasks of the mobile service usage Figures 31 and 32 . The linearity of the storyboards was considered to be desirable for this specific situation of assessment, since they offered the same flow of experience (Sarmento and Patrício, 2011a). The UXP storyboard focused on the interaction between the user and the mobile or computer service interface. Although some contextual elements were presented, the storyboard purposefully left it up to the participants to select the service experience elements they should prototype. Differently from the UXP, the SXP storyboard represented the service process as a whole with its three elements: people (employees and other customers); servicescape throughout the different service encounters and service settings; and the service process, represented by the flow of events, but showed the context in which it occurred.

Figure 31

A storyboard A for UXP focus on the interaction between the customer and the service in the tech-
nological interface, leaving for the team the definition of the contextual elements to be tested

Informativeness   Sign up/ Trial   Syncronize   Register new program

Open application   Select a program   Score   Share
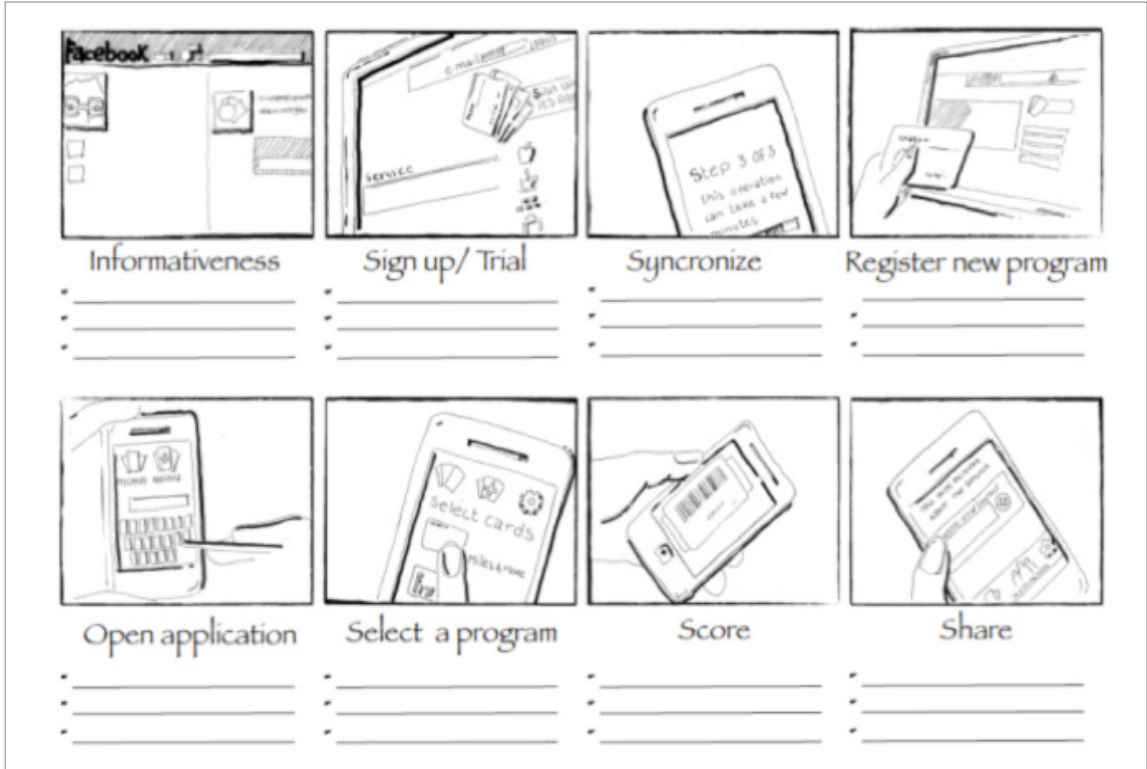
Figure 32

A storyboard B for Service experience prototyping with an explicit on the three elements of service
design: physical evidence: mobile phone and physical environment

Informativeness   Sign up/ Trial   Syncronize   Register new program

Open application   Select a program   Score   Share

Storyboard A therefore focused on the application interface while storyboard B provided a more holistic view of the service interface, explicitly including the three elements of service design. For example, the storyboard for UXP started with service awareness through an online community such as 'Facebook', whereas in the storyboard for SXP participants started with awareness of the service through a regular promotion flyer, explicitly representing the store environment. These two storyboards represented the same tasks, and the storyboard sketches for each were the only difference between the two experimental situations. Besides the two storyboards, both groups were asked to prototype the service experience and were free to decide how to do it.

Experiment procedures

The experiment took an average of 120 minutes and used the same procedures, in all series. Participants were randomly divided into two groups and each group was given a UXP or SXP storyboard, respectively. The experiment took place in separate rooms but with the same conditions: a computer and a mobile phone with Internet connection and a barcode scanner. Both groups were given access to the service webpage and mobile interfaces. Participants were invited to prototype the service experiences, take notes and post-it experience factors associated with the task requested, while they explored the service.

 In the beginning participants had to decode the same service tasks into service experience factors, and create a movie script over the storyboards (60 minutes). Subsequently, participants were invited to develop a screenplay (15 minutes) and perform it, considering the performance of the eight service tasks, presented in the storyboards.

The process was followed by a debrief phase.

Participants answered a questionnaire divided into two parts (set one by one). Part I was qualitative with an open-ended question:

 – Which proposals for the improvement of the service experience did you identify through this prototype?

Part II had 45 statements considering the prototype capability to evaluate the service experience and to identify improvements through a seven point Likert scale. This stage took 30 minutes.

At the end of the experiment the groups were joined together. The differences between the two storyboards were revealed, and the prototyping results were discussed.

The combination of the two methods (qualitative and quantitative) was used to gather information and evaluate each prototype capacities. Their results allowed for a comparison of the two prototypes.

6.2.2. Pilot Test

The pilot test involved 5 groups of students enrolled in product/service develop–ment courses, with the following backgrounds: Mechanical Engineering (n=7), Informatics Engineering (n=16), Innovation and Technological Entrepreneurship

Graph 2
Quotes by percentage for EFs

SXP
UXP
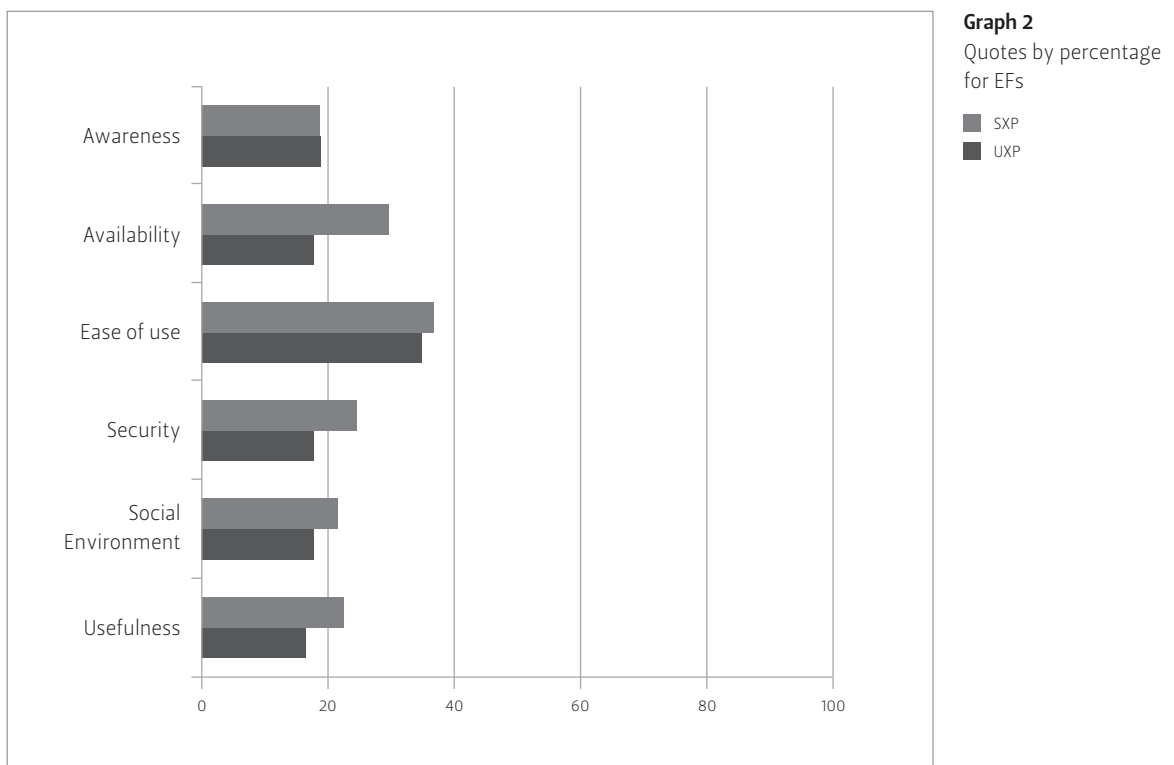
(n=12), Product Design (n=15) and Service Engineering and Management (n=22) in a total of 72 participants. All students (who were on average 27 years old, 34% being females) were enrolled and had previous knowledge on new product/service development methodologies.

In spite of being supported through the same theoretical base, this pilot test had a survey instrument to some extent different from the final experiment.

However, as is described above, it allowed testing and to make a comparison between UXP and SXP.

Table 11 and 12
Construct means scales in a 1–5 scale

Prototype capability to evaluate the service

Evaluation Factors	Mean UXP N=38	Mean SXP N=35	Mean difference
C1 service features	3.61	3.03	0,58 **
C2 Easiness to learn	3.39	3.00	0,39
C3 Easiness to use	3.41	3.13	0,28
C4 Accessibility	3.26	2.94	0,32
C5 Security	2.18	2.17	0,01
C6 Privacy	2.18	2.13	0,05
C7 Use environment	3.41	3.64	−0,23
C8 impact on customers	3.09	3.33	−0,24
C9 Impact the store assistant	2.38	3.38	−1 **
C10 visual interaction	3.58	3.21	0,37
C 11 Tactile interaction	3.74	2.91	0,83**
C12 real context of use	2.88	3.39	−0,52*
C13 global experience	3.26	3.24	0,02

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

Prototype capability to suggest improvements

Evaluation Factors	Mean UXP N=38	Mean SXP N=35	Mean difference
M1 Innovative features	3.81	3.74	0,07
M2 Interfaces	3.91	3.39	0,52**
M3 Ease of use	4.14	3.78	0,36*
M4 ways of use	3.67	3.74	−0,07
M5 security issues	3.47	3.06	0,41
M6 privacy issues	3.47	3.06	0,41*
M7 informativeness	3.37	3.76	−0,39*
M8 Store environment	2.85	3.52	−0,67**
M9 Visual interaction	3.72	3.19	0,53**
M10 Tactile interaction	3.69	3.06	0,63**
M11 context of use	3.50	3.81	−0,31
M12 global experience	3.56	3.67	−0,11

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

6.2.3. Pilot Test Results

The pilot test already had symptomatic differences between the two situations: UXP and SXP. Content analysis was made considering the qualitative written answers of the pilot experiment questionnaire. Participants had to make proposals for the improvement of the service experience. Answers were coded according to the experience factors previously described in the literature review for this research and mentioned by the participants of both groups according to the Graph 2.

These qualitative results, (presented in percentage) indicate that usability issues were the most important concern for both groups. Even on diagnosing problems or suggesting improvements, aspects concerning ease-of-use were highly mentioned (with 35% UXP and 37% SXP of references to proposals in the prototyping method). The SXP group seemed more open to outside inputs, (cultural, social) store context and interaction with friends, with 30% references. On the other hand, UXP groups were always engaged to effectively accomplish the tasks as if it were a heuristic evaluation. The results of this second part of this pilot experiment are summarized in Tables 11 and 12. To analyze our data, we applied t-tests with the experimental situation as the independent variable. This analysis allowed for the examining of the prototype capabilities as well as the difference between the experimental environments for all the above-mentioned dependent variables.

In this pilot experiment, UXP groups felt significantly more capable to evaluate service features $t(67) = 2.75$ p=008 and tactile interaction $t(64)=3.02$ p<.004.

Regarding improvements, UXP's were also more capable of proposing improvements 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's were significantly more capable of evaluating impact of store assistant $t(59)=-3.14$ p<.003 and real context of use $t(59)=-1.86$ p<.074. SXP participants also felt more capable of making suggestions for informativeness $t(66)=-1.81$ p<0.74 and store environment $t(64)=-2.61$ p<.01.

If we analyse significant differences between groups at p<0,1, the difference between other variables also becomes relevant. The SXP group felt more able to evaluate the service 'real context of use' and to identify improvements for ser-

vice 'informativeness'. On the other hand, 'ease-of-use' and 'privacy issues' were better assessed by the UXP group. In summary, the results show that UXP participants were better able to evaluate service 'features' and 'tactile interaction'. UXP participants were also better able to suggest improvements related to 'interfaces', 'visual interaction' and 'tactile interaction', 'ease-of-use' and 'privacy'. On the other hand, the SXP group was better able to evaluate the 'store assistance' and 'real context of use' and suggest improvements for the 'store environment' and 'informativeness'. These preliminary results indicated that that each group had different but complementary perspectives on the prototyping capabilities.

The pilot test had the same procedures of the final experiment. However, these preliminary results were an incentive to improve the collection method, increase this analysis process and enhance the robustness of results.

6.2.4. Final Experiment

The final experiment involved 4 multidisciplinary groups, which were more comparable in number. They were on average 25.6 years old and a third of them were females. They were, once more, master degree students enrolled in new product/service development courses. They had the following backgrounds: (A) Informatics and Computer Engineering (n=23), (B) Innovation and Technological Entrepreneurship (n=17), (C) Product Design (n=17) and (D) Service Engineering and Management (n=16) in a total of 73 participants.

The answers to the open-ended question were qualitatively analysed to categorize participant responses after the experiment. These suggestions were coded in terms of EF's as in the previous study.

Nevertheless, a matrix for the instrument analysis was also made. It combined the three elements for services performance: People, Process and Physical evidence, with the main categories from the qualitative study, when analysing MSX Factors – Awareness – Accessibility – Ease of Use – Usability – Security and Social Environment.

6.2.5. Final Experiment Results

When considering the content analysis comparing the first qualitative and exploratory responses the 'service process' is the most frequently mentioned factor.

The offers should be related to my cards. (SXP participant)
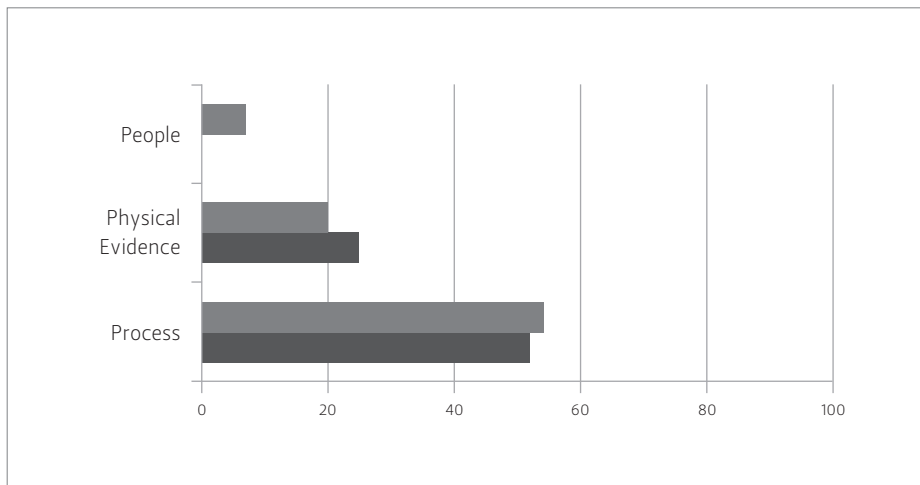
Graph 3
Quotes by percentage
for people, physical
evidence and process

SXP
UXP
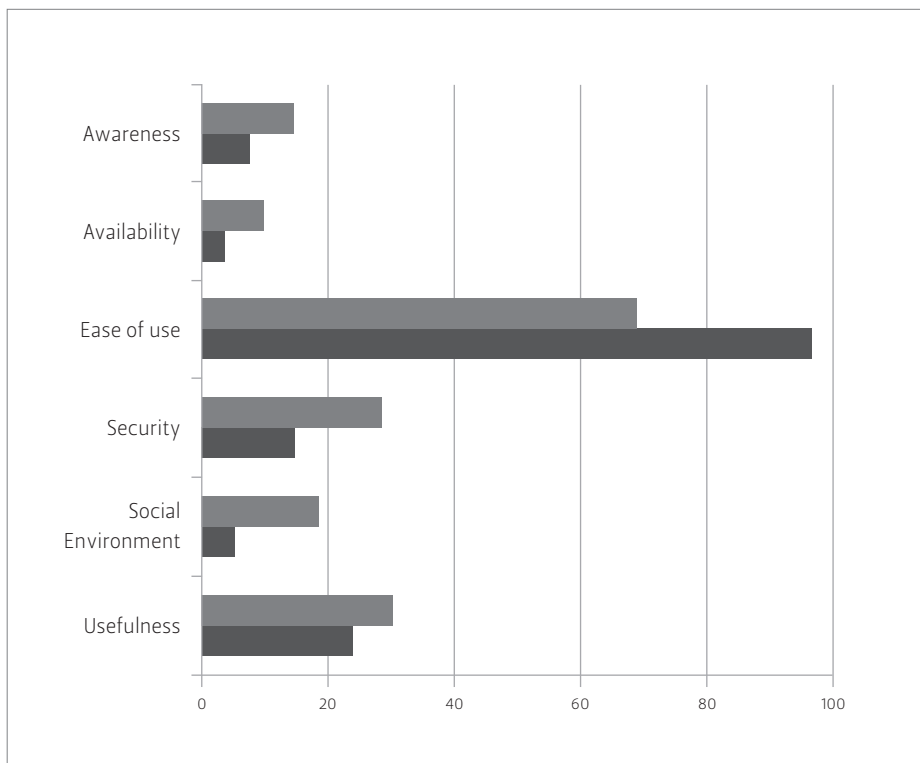
Graph 4
Quotes by percentage
for EFs

SXP
UXP

On the other hand, when evaluating the references on – ease–of–use – comparing with the other dimensions, this is the EF that is better assessed from almost all participants' point of view. Usefulness is the second most commonly reported factor, although it was more referred by SXP groups. However, while SXP groups focused on overall usefulness of the service, such as the number of loyalty programs supported, UXP focused on interface features, such as displaying the credit card barcode on the mobile phone, or being automatically identified when entering a store. This difference is illustrated by the statements of the participants from the different groups:

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

"There is no credibility, especially when you are near the store assis-tants; the service should support more cards". (SXP participant).

The study results also indicate that the SXP groups were more open to cultural and social factors, such as store context and interaction with friends. During the different series of the experiments, one could observe that often UXP groups remained seated while using the mobile or computer interface, whereas SXP groups tended to move around the 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 were a heuristic evaluation, whereas SXP groups always simulated the social interaction and some service processes to promote the awareness with customers or store employees. The quantitative assessment of participants' ability to identify improvements for the service was equally made in the final experiment, relating to the experience factors previously described. These results allow for examination of the prototype capabilities to assess different service design elements. The quantitative analyses are summarized in Tables 13 and 14: Table 13 considers the issues on 'people', 'process' and 'physical evidence'. While table 14 considers the six main categories for MSX factors combined with these three aspects of the marketing mix, already fully mentioned.

Table 13
Construct means scales in a 1–7 scale; 1 – totally disagree; 7 – totally agree

This Prototype allows to evaluate, identify or test

Evaluation Factors	Mean UXP N=38	Mean SXP N=35	Mean difference
1 The role of the customer in the service	4.95	5.43	−0.48
2 The role of others in the service	3.16	4.03	−0.87*
3 The role of employees in service	2.58	4.29	−1.71***
4 The customer interaction process with the service on his/her phone	5.66	5.51	0.14
5 The interaction of the customer's process in the store environment	2.97	4.83	−1.86***
6 Physical interaction' aspects with the mobile phone	5.39	5.23	0.16
7 Physical interaction aspects with other artifacts surrounding	3.51	4.03	−0.45
8 Interaction aspects within physical environment	3.45	3.97	−0.52

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

Table 14
Construct means scales in a 1–7 scale; 1 totally disagrees; 7 totally agree

This Prototype also allows to evaluate, identify or test

MK	EF	Evaluation Factors	UXP Mean	SXP Mean	Mean difference
People	Aw.	1 How the service is released to potential users	3.76	3.97	−2.08
		2 How the service is released for potential partners/stores	2.03	3.43	−1.40***
	Ac.	3 Service accessibility for users	5.16	5.26	−0.09
		4 Accessibility in service stores	2.66	3.86	−1.19***
	Sec.	5 Security issues facing the customers of the service	3.47	4.54	−1.07**
		6 Aspects of security facing store partners	2.66	3.40	−0.74**
	Soc.	7 Social interactions between service customers and other customers	3.89	4.06	−0.16
		8 Social interactions between service customers and store assistants	2.55	3.69	−1.11**
	Es.	9 If the interaction of the customers with the service is easy	4.74	5.14	0.40
		10 If the interaction of store assistants with the service is easy	3.13	4.26	−1.12**
	Us.	11 Service usefulness for customers	5.50	5.43	0.071
		12 Service usefulness to the stores and their assistants	3.47	3.57	−0.098
Process	Aw.	13 How customer knows the service process	4.34	4.83	−0.48
		14 How stores assistants know the service process	2.61	3.49	−0.88**
	Ac.	15 Technical service accessibility (wireless data packets, etc.)	4.61	4.77	−0.16
		16 Technical conditions in-store for service process	3.29	3.77	0.48
	Sec.	17 If the process of using the service on your phone is safe	4.03	4.26	0.23
		18 If the process of using the service in the store is safe	3.26	3.23	0.04
	Soc.	19 Interaction with other people in the service process	3.76	4.60	0.84**
		20 Interaction between customer and store employee in the service process	3.55	3.80	0.24
	Es.	21 If process is easy to use for customers	5.55	5.40	0.15
		22 If service process is easy for store assistants	3.53	4.20	−0.67
	Us.	23 if the service facilitates for customers, the process of using loyalty programs	4.74	4.66	0.08
		24 If service facilitates the stores to use loyalty programs	3.42	4.06	−0.63
Physical evidence	Aw.	25 Visibility of service disclosure in the mobile phone	3.82	3.91	−0.098
		26 Visibility of service disclosure in store environment	2.61	3.57	−0.96***
	Ac.	27 Where and when the service is accessible in the mobile phone	4.34	4.69	−0.34
		28 Where and when the service is accessible in store	3.03	3.43	−0.40
	Sec.	29 Visibility of security measures in the mobile phone	3.26	4.34	1.08**
		30 Visibility of security measures in the store environment	2.61	3.31	0.70*
	Soc.	31 How other people react to the service use	4.39	5.29	0.89**
		32 How store assistants use the service	2.84	3.77	0.93**
		33 Store environment where the service is used	2.34	3.37	−1.03**
	Es.	34 The service display and instructions of use in the mobile phone	5.18	4.94	0.24
		35 Visual easiness of the service and its user instructions for store assistants	3.13	3.91	−0.78*
	Us.	36 If the service can reduce the volume of cards in the wallet	6.18	6.51	0.33*
		37 If the service eliminates the need for use of the store physical card	5.37	6.06	0.68*

***Statistically significant at p<0.01 **Statistically significant at p<0.05 *Statistically significant at p<0.1

The comparison between the UXP and the SXP groups were analysed through the application of t–tests. From the analysis of table 13, the SXP groups felt more capable to evaluate 'people' – The role of others in the service t(71) = –2.31 p=0.02 and the role of employees in service t(71) = –5.18 p=0,00. SXP also felt more capable to evaluate the role of the customer during the 'service process' in the store environment t(67) = –4.82 p=0,00.

However, when analyzing the data obtained through the intersection of experience categories with people, process and physical evidence, on table 14 – the responses change. The statistically different items are mainly related to people and physical evidence. On the other hand, the SXP groups always respond with higher values, recognizing more advantages in the prototype to evaluate these aspects.

Therefore, experience factors considering 'people' within store environment, such as service release t(71) = –3.64 p=0,001, accessibility t(71) = –2.94 p=0,004, security issues t(71) = –2.18 p=0,03 and social interaction t(71) = –2.86 p=0,06 or interaction with the service itself from the store assistants point of view t(71) = –2.53 p=0,01, have significant differences between groups. The same happens with security issues facing the customers themselves t(71) = –2.62 p=0,01, that were more easily evaluated by the SXP groups. Regarding service 'Process', there are two significant items both involving social aspects – How store assistants know the service process t(71) = –2.20 p=0,03; and the interaction of others within the service process t(71) = –2.18 p=0,032

'Physical evidence' is the element that has greater differences between groups. So awareness in–store environment t(71) = –2.88 p=0,05 is significantly better evaluated by the SXP group. Both items of security measures, either in the mobile phone t(71) = –2.67 p=0,09 or in the service store t(71) = –1.88 p=0,1, are statistically different. The same happens when evaluating 'physical evidence' combined with the social environment, which was significantly different in all its three items – other people's reaction to the service use t(71) = –2.20 p=0,031; store assistants' use t(71) = –2.88 p=0,025; and store environment where the service is used t(71) = –2.87 p=0,005. The visually perceptible 'ease–of–use' is better evaluated by the SXP group, justifiably more so in a store assistants' item t(71) = –1.87 p=0,066. The service usefulness evaluation is also statistically different – either reducing the volume of cards in the wallet t(71) = –1.67 p=0,099, or eliminating the need for a physical card t(71) = –1.77 p=0,080. In these 'usefulness' variables it is remarkable that both groups have given high importance, in a seven point Likert scale.

 Comparing with the previous study test, it is noticeable that, in the recent experiment, SXP gave to all significant responses, higher scale relevance than the UXP groups. This reveals that for this set of questions SXP groups felt the prototype to be more adequate than the UXP to evaluate the service. These quantitative results revealed significant differences between the two–prototyping approaches, revealing that the two prototypes can provide complementary inputs to SD.

6.3. The EF addressed through prototyping the service

This experimental approach to SXP has explicitly included the elements of service design (people, process and physical evidence), and considered them as an integral part of the design space. Whereas UXP concentrates on the design of the product or interactive system, considering the other elements as contextual, SXP considers service specific characteristics as components to be designed. Therefore, SXP contributes to the holistic view of the service experience along the iterative SD process. The results of this experimental study address the participants' views of how UXP and SXP help them to elicit problems and improve ideas of experience. It thereby contributes to clarify, for each approach, advantages and disadvantages for the design of services towards the customer experience.

When prototyping a service experience, none of the propositions is the best to evaluate all EF's and they can be used in complementary ways to enable a more comprehensive view of the service experience. The qualitative results revealed that participants of the UXP group could test and evaluate in more depth the tangible dimensions of the service interface. On the other hand, SXP participants were able to recreate an overall representation of the service experience, highlighting service design issues that could not be so easily identified by UXP groups. SXP's performed the store environment simulating time intervals, social interactions, and several other elements they considered relevant to illustrate the physical evidence of the service.

The quantitative results corroborated the qualitative study, as they also showed that the different experimental situations provided different inputs to the design process. Whereas UXP groups were able to better evaluate and identify improvements regarding ease–of–use and the technology interface, SXP groups felt more able to evaluate and identify improvements considering the overall service offering, involving physical, process and social elements of the service experience.

6.4. Conclusion of the Reflection stage

The reflection stage involved an empirical study to better understand the prototyping methods in the SD context. Therefore, this stage of the dissertation is the one that most contributed to design as a science. The experimental study allows for the understanding of the mobile service experience prototyping concept and tackles its components on the SD process. This phase has contributed to SXP theoretical support. On the other hand, the empirical approach helped to validate the concept.

The experiment results show that the SXP does not substitute, but rather complements UXP, as it considers different designing spaces. Prototyping mobile service experience involves the interaction with the mobile technology and with other elements of the service offer, such as social environment, physical evidence and process. SXP can therefore be used for a more holistic outlook of the mobile service, considering the different service encounters and all elements of the service experience. UXP allows for a more detailed and focused evaluation of the interaction with the digital interfaces of the mobile service, even if considering the users' input.

The technological interface, which in this case is the mobile application, continues to be a crucial element of the experience. However, the service experience is also formed through customer interactions with the other elements of the service. A more holistic approach to experience prototyping with all elements of the service interface can provide valuable inputs for designing services that enhance the customer experience. Therefore, the key elements of service design should clearly be integrated in SXP. This reflection stage suggested that UXP and SXP should be used in complementary ways to support mobile service design. This means that the diverse prototyping approaches should be used at the different levels and steps of the design process. Moreover, what is considered to be a useful method for SXP depends a great deal on what aspects of SD are considered important. These different approaches should be seen as tools that designers might use alternatively or in combination according to each specific design context. On the other hand, this perspective on SXP gives clues to both fields: interaction design and service design, especially in the mobile services field, enhancing customer experiences and improving their evaluation along the design process.

7. Research discussion and contributions

Since mobile technologies for services provision were launched, it has reached maturity, demanding an ever-increasing convergence to disciplinary areas and fields such as design, marketing and human-computer interaction (HCI). Nevertheless, the conception of new mobile services required the study and creation of qualified experiences considering its antecedents and consequences of consumption, thereby promoting competitiveness.

Therefore, that is why it was relevant, on one hand, to understand which experience aspects would affect or influence customers and their use of mobile services. Also on the other hand, to contribute to the interconnection of these research areas, such as service design and interaction design promoting one more feeder to their evolution.

These challenges afforded the motivation for this research as presented in the introduction of this dissertation.

One study's main objective has been to understand these MSX's, either working with a service provider or witnessing them through customer sharing. Subsequently, it aimed to contribute towards the mobile service conception, building and implementation, through the experience drivers assessed.

The knowledge was obtained through exploratory, qualitative and quantitative phases with mobile customers, followed by intensive work and relationship with the MOBSERV company. The iterative process of designing and testing by methodologies adequate to this service's specific characteristics was used all along this research period.

In fact, this dissertation was formally divided into two paths – behavioural research and design research, which answers the challenges as follows:

    With the combination of the research approaches;

    With a contribution for the understanding of the MSX concept;

    Finally, it contributed towards mobile service design through the interconnection of fields, methodologies used and the tools implemented.

7.1. Design Research Contribution

There was an enunciated gap, referred in the methodology, between the general insights of social researchers and the specific work of designers. Buchanan (2001) proposed to fill this space by transferring and translating the theoretical contributions of social sciences into outcome features, alternative methods or techniques. This dissertation research contributes towards this goal: It combines the broad and empirical methods of social sciences with the creative, dynamic and tangible approaches of design research.

Behavioural science methodologies were, as usual, rooted in data collection and empirical analysis techniques of customer experience. This research aimed to be based on the required topic for the priorities of the Science of Services (Ostrom et al., 2010) with a close issue on designing interactions. In other words, working intensively with people. This implied carrying out several stages of data collection as well as small and practical experiments – and actively seeking rigour and developing more informed actions as an outcome. Nevertheless, design research was also documented carefully and thereby entailing validated findings.

A consistent literature review illustrates customer experience as a resource for mobile services and the established practice of Service Design is presented with its tools and processes. The Design Thinking stages: Exploration, Ideation and Reflection were described with their specific methods and presented with enough detail so that their particular procedures can be replicated (Zimmerman et al., 2007, Brown, 2008).

Despite the research activities addressed having tackled the service needs and thereby assuring the research relevance, there was a close working progress with the MOBSERV company as well. The value of use of Design Thinking on Service Design includes the methods of designing and exploring EF's with a reflection on methods, such as SXP, covering the overall service experience in an iterative way.

This also includes the viewpoint of multidisciplinary approaches; therefore, the strength of communication with visual means and the management of the different languages were crucial. The study articulates explanation of the research outcomes providing enough information to help developers to understand and incorporate experience in the service development.

It also has been described and documented in a way that researchers, designers–practitioners, and other developers or managers can leverage the knowledge derived from the work and enjoy its extensibility.

7.2. Exploration – Understanding the Mobile Service Experience

The conceptual background on understanding mobile service experiences involved the complementary viewpoints of HCI and services marketing. The HCI perspective is rather limited to an empirical approach concerning the ease–of–use and particularly focused on aspects of service's digital interface. From the services marketing point of view, the research privileges the conceptualization of experience in its relation with the social sciences approach, even if without an empirical understanding.

Bearing in mind that an experience is something complex that affects and influences customers and their use of mobile services, covering all moments of contact, the exploratory stage comprises a qualitative research and its quantitative validation for a transversal and in–depth understanding of this phenomenon.

7.2.1. The Qualitative study contributions

The integrated perspective of the qualitative results confirms the significant differences between the service experience's dimensions through time – from the initial forms of adoption to the experience of use – in different participants at different phases. The understanding of these diverse dimensions of experience reveals different sensibilities covering MOBSERV's development.

The qualitative study includes data collection from customers, through three defined phases of MOBSERV adoption and use. This work gradually increases the complexity of the data collected, not only in terms of its approach, but also by intensifying deeper levels of understanding the service experience. The mobile service studied meets six main EF's: Awareness, Availability, Usefulness, Ease–of–use, Security and Social Environment.

This study provides a theoretical contribution by examining how the existent studies and concepts take place in the growing and unique context of mobile services. For instance, the 'Usefulness' concept, which is usually worked in HCI mainly oriented to a system, emerges in this study as belonging to an overall

perspective of the service utility. 'Usefulness' appears to participants as an aspect of MOBSERV and not as an application or a system's characteristic.

Certain EF's could not be identified in the beginning of this data collection, as is the case of the Awareness to a service, in order to have the intention of adopting it. For this qualitative study, this dimension had particular importance as it may be related with the service 'convenience' and 'portability', meaningful characteristics of mobile services.

The identification of the EF's allows them to be used as design elements and to be manipulated to promote better MOBSERV experiences. Moreover, the different importance degrees, throughout the different stages of service adoption bring out the need for an evaluation when the EF might be more critical.

This indication generated a sense of insight to their impact in mobile experience outcomes that are not only connected with their definition and isolated effect, but also with their relative influence throughout the process.

To summarize, this qualitative study was innovative and is distinguished from other studies on MSX in these three aspects: One is the application of the 'Grounded Theory' to the understanding of EF's on mobile services; the second one is the collection of data throughout the mobile service adoption; and finally, the iterative use of this information gathered as a valuable contribution through its first main stages of development.

7.2.2. The Quantitative study contributions

The qualitative studies framed a relationship between EF's and EO's, and to confirm this idea, a survey with MOBSERV regular customers from all over the world was carried out. This quantitative study revealed the MSX complexity and how its perspective is extended in time and place when compared with traditional service quality studies and goes beyond the general customer assessment of technology-based services.

The MSX scale concerns the conception of mobile services; the incorporation of its dimensions adds value to mobile service design and management. This broader conceptualization of MSX scale involves both the moments before the service usage and elements that are not yet in direct control of the mobile service provider as is the case of 'Service in store'.

Traditional EF's, such as usefulness and ease-of-use, continue to have a strong impact on cognitive assessments. Moreover, the strong impact of 'ease-of-use' on emotions, both positive and negative, was also encountered.

However, some interesting attributes of MSX arise with some influence on EO's. It is the case of 'awareness' or 'service in store ', which drive overall satisfaction and social value, respectively.

At this point, the increased holistic view of EF's is taken along the different stages of service implementation with their different service encounters. The model presented reveals not only a global perspective of the impact of EF's on the EO's, but also how they all have a significant impact on loyalty.

These studies bring empirical evidence to the understanding of MSX, and more specifically an insight into the experience requirements system at all moments of mobile service adoption.

7.3. Ideation contribution

The ideation stage was the time for 'envisioning new futures' with research through design. Therefore, this stage brought numerous inputs through the action research (with an active and immersive presence of the researcher in the field) and constructive design research (the service took the place and became the key means in constructing knowledge).

On one hand, 'Ideation' had a research objective by carrying out customer experience factors to be actively incorporated in the Service Design process. Therefore contributing to New Service Development (NSD), this stage promoted the integration of experience into the better design of mobile services. While one the other hand, this stage had a practical influence in the company's environment and in the developers' way of working. MOBSERV development has resulted from hard work augmented by a creative human-centred discovery process, pursuing iterative cycles of collection, modelling, testing and refinement.

The iterative work developed within the MOBSERV company comprised research within a practical context of SD. The constructive design research methodology benefited from two paradigms since it was responsive to the scope, knowledge base and rigour of the academic research, while documenting the practice of SD with an inside perspective.

Ideation contributed to an incorporation of customer EF's, which are not only necessary but also lead to an improved mobile service offer.

MOBSERV wanted to be a service tailored to the customer's expectations so service developers were involved in ascertaining experiences right from the beginning. On the other hand, the outcomes of this stage reveal that SD work transcends the mere generation of knowledge to include work at personal, professional and organizational levels. This contributed to service strength and team empowerment. At each stage of development, the understanding of customer experience was used for designing the new service through different SD methods and tools.

The researcher has worked as a capability builder, it has transferred its processes and methods, displaying facts in different manners and acting as a conduit to some parts of the business's process. The researcher has worked as a design-practitioner, as a facilitator, enabling better collaboration, synergy and participation between research and development; mobilising and emphasizing other ways of thinking. The researcher has also worked as a privileged channel of communication making use of visual means, conveying ideas and sharing findings towards the understanding of all stakeholders.

DT value for MOBSERV lay beyond an inspirational competence. Creative design tools like 'Mind Maps' helped to adopt divergent thoughts and remain open-minded when specific topics such as security issues were accountable.

Exploring service experience attributes with tools, such as customer value constellation or service experience blueprint. It helped the developer's team which, this way, could easily and faster understand the consequences of their preliminary models. These graphical tools such as the Customer Value Constellation enabled development, framing the whole value-creating system and opened new forms of service innovation, such as changing customer roles in value co-creation and changing MOBSERV processes of integration. With the Service Experience Blueprint (SEB), each service touchpoint was considered and designed to best employ its unique capabilities and guide customers to other service interfaces whenever it better enhanced the overall customer experience. On the other hand, SEB has permitted the articulation of the different channels, not only the mobile, in its diagnosis of what is flowing and what needs to be managed for each phase of the service process.

In presentations through short films, the EF's and EO's come alive, clearer and tangible, being straightforwardly workable.

The use of task analysis, scenarios and role-playing, covering the overall service experience, were used as well as low-tech mock-ups for specific service situations. This going back and forward has helped improve perspectives of the service, and gaining of confidence, until a final validation, offering a global perspective of the customer experience.

This Ideation stage and the DT role of generating, developing, and testing new features led to new solutions, such as developing bonus systems or geocoding concepts for MOBSERV; The research was not directly dependant on the implementation of the service, though since one had contact with the customers in several moments, for the different releases, the researcher's presence was also relevant in charting the path to market. The ideation stage through the iterative experience incorporation has contributed to changing the business model. The constructive design research approach within the MOBSERV start-up helped to think and judge the company's path, changing from a B-to-C to B-to-B model. In other words, the study of the end customers has revealed to be a broad area for a specific service offer, being difficult to accomplish and respond properly to customers' experience requisites. The three years of MOBSERV's design revealed that it was more advantageous to work as a supplier to other business partners. This research has also contributed to that consciousness.

The ideation stage has promoted to put things to work and sell, as a design practice but with special attention to experience attributes, considering the different service adoption stages. Therefore, research through design process has contributed in several ways to the recognition and profitable use of customer experience in the new service.

Services are less discussed as a design object, but more as a means of a more collaborative and creative work. The main contribution of these constructive design research methodologies with its iterative process with the company was in helping and building a new behaviour for managing loyalty programs with a mobile phone, taking advantages of all the impact of technology and mobility by involving the service developers and sharing customer-rich information. All in all, the Ideation stage connects design research and practice role with an unavoidable managerial theme.

7.4. Reflection Contributions – Mobile SXP

In the reflection stage there was a conceptualization for the mobile service experience prototyping. Its components were reached as well as disassembled in order to better understand them along the SD process. Reflection contributes with theoretical support on prototyping services research and validates the assumptions with the experimental study. This stage has permitted a deeper assessment of the existent practices and the experiment results indicate that no prototype is the best to evaluate service experience, although SXP and UXP can be used in complementary ways to enable a more comprehensive view of the service experience. SXP does not substitute, but rather complements UXP, as it considers different goals.

SXP should evaluate not only the service interface or physical evidence, it should include the service process and people, because value is co-created by who is using it and walking through its process. Therefore, Prototyping MSX involves the interaction with the mobile technology and the other elements of the service offer: the social environment, physical evidence and process. SXP can consequently be used for a more holistic outlook of the mobile service, considering the different service encounters and all elements of the service experience. UXP allows for a more detailed and focused evaluation of the interaction with the digital interfaces of the mobile service. The empirical study results addressed the participants' views of how UXP and SXP help them to elicit problems and improve ideas of experience, thereby contributing to clarify, in each approach, advantages and disadvantages for the design of services for customer experience. The technology interface, which in this case is the mobile application, continues to be a crucial element of the experience. However, the service experience is also formed through customer interactions with the other elements of the service. A more holistic approach to experience prototyping with all elements of the service interface can provide valuable inputs for designing services that enhance the customer experience. The key elements of service design should therefore clearly be integrated in SXP. These different approaches should be seen as tools that designers might use alternatively or in combination according to each specific design context. This new perspective on SXP gives clues to interaction design and service design, especially in the mobile services field for which customer experience is a crucial differentiator.

8. Conclusions and future research

This research dissertation had two main goals: to understand how an experience is formed while incorporating it along the different phases of a mobile service development. Consequently to improve Service Design (SD) methods. Overall, this research has provided three responses:

Firstly, throughout an explorative cycle, the experience drivers were identified. In fact, a holistic view of experience was ascertained, covering the whole experience system through a dedicated design of a mobile service and supporting the co-creation of value. An understanding of the diverse dimensions of experience revealed different sensibilities along the different stages of service development. A scale to measure mobile service experience was developed enabling the assessment of customer perceptions – experience factors (EF's) impact on experience outcomes (EO's). This relationship is not only connected with their meaning and isolated effect, but also with their relative influence and weight along the process of adoption and use. Further research on experience may be suggested when considering other empirical grounds and developing alternative mobile service offers considering financial, educational or health areas.

Secondly, the combination of behavioural science and design research provides a tangible awareness to an abstract problem as well as endorsing knowledge. Research paradigms' complementarities were decisive for a multidisciplinary investigation, communication and understanding. Hevner et al (2004) presented that the key differentiator between routine design and design research is the clear identification of a contribution to a knowledge base of foundations and methodologies. Design research through practice is not new, however, this dissertation contributes to its substantiality. Conversely, there is still a lot to do through creative investigation such as to improve methods, take advantage of communication skills to integrate multidisciplinary research panels or tackling rigour without losing motivation. In this dissertation, Design Thinking joined mobile technological knowledge and service design. The interconnection of disciplines in all stages of this iterative work was essential to decode experiences and systematically materialize them into design characteristics. The cyclical work sustained the mobile service development and helped to achieve improved customer experiences synchronized with the service maturity.

Finally, the new perspective on Service Experience Prototyping (SXP) gives clues to interaction design and service design, especially in the mobile services field for which customer experience is a crucial turnkey and promotes competitiveness.

In face of a product design background, the experimental studies on prototyping were a comprehensible way to integrate experience in a build-up stage. SXP is a tool that designers should use alternatively or in combination with other prototyping techniques according to each service design context. What is considered to be a valuable approach for service prototyping depends largely on what aspects of its design are considered important. This dissertation opened ways for SXP coverage understanding and usefulness. However, further research on SXP is also suggested to better analyse other variables considering other types of mobile services; EF's can thus be crossed with 'service key factors' and the building of a new assessment.

All services promote experiences and these are decisive for their success essentially because they are co-created by both service providers and customers. Mobile services are a reality, offering endless possibilities for innovation. Mobile services, even as alternative channels for a service offer, have specific characteristics such as being technology-based or being self-served. Services marketing and the HCI field have been studying the mobile service experience in-depth. However, the concept is more complex than a conventional idea of service quality, satisfaction or usability. This dissertation research contributes to improve mobile services by developing a holistic understanding of their experiences and proposing an active incorporation of this knowledge along the SD process; but it also identifies new challenges that will hopefully originate further research in this emergent area in order to further enhance the customer experience within the mobile context.

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Appendix A
Qualitative Study – Sampling

First qualitative study sampling – potential users

Potential users	Method	Gender	Scholarity	Mobile phone	06/2009
Interviewee 1	Individual interview	Man	Graduated	2 x Nokia	0 – 3 cards in the wallet
Interviewee 2	Individual interview	Man	Graduated	HTC touch	0 – 3 cards in the wallet
Interviewee 3	Individual interview	Woman	Graduated	2 x Nokia	4 – 6 cards in the wallet
Interviewee 4	Individual interview	Woman	Graduated	HTC	4 – 6 cards in the wallet
Interviewee 5	Individual interview	Woman	Graduated	Nokia N79	10 – 15 cards in the wallet
Interviewee 6	Individual interview	Woman	Graduated	Motorola	0 – 3 cards in the wallet
Interviewee 7	Individual interview	Woman	Graduated	2 x Nokia	10 – 15 cards in the wallet
Interviewee 8	Individual interview	Woman	Elementary school	Nokia	10 – 15 cards in the wallet
Interviewee 9	Focus Group 1	Woman	Graduated	Samsung U100	4 – 6 cards in the wallet
Interviewee 10	Focus Group 1	Woman	Graduated	Nokia	7 – 9 cards in the wallet
Interviewee 11	Focus Group 1	Woman	Graduated	2 x Nokia	10 – 15 cards in the wallet
Interviewee 12	Focus Group 1	Man	Graduated	HTC HD / iPhone	4 – 6 cards in the wallet
Interviewee 13	Focus Group 1	Man	Graduated	Blackberry	7 – 9 cards in the wallet
Interviewee 14	Focus Group 1	Man	Post Graduated	IPhone	7 – 9 cards in the wallet
Interviewee 15	Focus Group 1	Man	Graduated	Nokia	4 – 6 cards in the wallet
Interviewee 16	Focus Group 1	Man	Graduated	Nokia E66	4 – 6 cards in the wallet
Interviewee 17	Focus Group 2	Woman	Graduated	1 Qtek / 1 Blackberry	10 – 15 cards in the wallet
Interviewee 18	Focus Group 2	Woman	Graduated	Smartphone	4 – 6 cards in the wallet
Interviewee 19	Focus Group 2	Woman	Graduated	HTC	0 – 3 cards in the wallet
Interviewee 20	Focus Group 2	Man	Graduated	Sony Ericsson	0 – 3 cards in the wallet
Interviewee 21	Focus Group 2	Man	Graduated	Nokia	4 – 6 cards in the wallet
Interviewee 22	Focus Group 2	Man	Graduated	Not identified	7 – 9 cards in the wallet
Interviewee 23	Focus Group 2	Man	Graduated	Siemens	10 – 15 cards in the wallet
Interviewee 24	Focus Group 2	Man	Graduated	Nokia	0 – 3 cards in the wallet
Interviewee 25	Focus Group 2	Man	Graduated	Not identified	10 – 15 cards in the wallet

Second qualitative study sampling – early adopters

Early adopters Dec/2012 Jan/2013	Accessed the study through	Gender	Interview Place	Mobile phone	Age	Occupation	1st contact with the MOBSERV
Interviewee 26	Facebook	Man	Lisbon	HTC	41	Informatics' systems	MOBSERV Publicity
Interviewee 27	Facebook	Man	Braga	Nokia N81 / IPhone	33	Informatics' systems	MOBSERV Publicity
Interviewee 28	Peopleware	Man	Aveiro	Nokia	26	Marketing student	Peopleware
Interviewee 29	Newsletter	Man	Régua	Nokia	60	Commercial Pharmacy	Magazine
Interviewee 30	Facebook	Man	Porto	Nokia N78	47	CEO Educational Co & Priest	TV
Interviewee 31	Facebook	Woman	Porto	Nokia 6210	33	Communication Manager	TV
Interviewee 32	Peopleware	Man	Guarda	HTC	24	Informatics' systems	Peopleware
Interviewee 33	Peopleware	Man	Lisbon	Not revealed	33	Informatics' systems	Peopleware
Interviewee 34	Email	Man	Viana	Nokia N86	40	Judge	Magazine
Interviewee 35	Facebook	Man	Braga	IPhone	31	Informatics' systems & CEO Design Co	TV
Interviewee 36	Email	Woman	Porto	HTC / Diamond	34	Architect	Friend
Interviewee 37	Email	Man	Lisboa	Nokia	40	Bank Cash Management	Peopleware
Interviewee 38	Facebook	Man	Porto	IPhone	24	Researcher industrial Engineering	TV
Interviewee 39	Facebook	Man	Porto	IPhone	28	Researcher industrial Engineering	Friend
Interviewee 40	Peopleware	Man	Gaia	Nokia	43	Priest	Magazine
Interviewee 41	Email	Woman	Ovar	Sony Ericsson	33	Dentist	Friend
Interviewee 42	Email	Man	Porto	Nokia	29	Informatics' systems	Friend
Interviewee 43	Email	Man	Porto	Not revealed	40	Architect	Friend
Interviewee 44	Email	Woman	Porto	Nokia	36	Researcher industrial Engineering	Friend
Interviewee 45	Peopleware	Man	Coimbra	Samsung d830	30	Informatics' systems	Peopleware
Interviewee 46	Email	Man	34	Samsung	34	Mechanical Engineering	Friend

Third qualitative study sampling – regular users

Regular Users 06/2010	Age	Gender	Mobile Phone	Occupation
Interviewee 47	39	Woman	Iphone 3GS	Teacher
Interviewee 48	24	Man	Iphone 3GS	Medicine student
Interviewee 49	38	Woman	Iphone 3GS	Interiors Designer
Interviewee 50	42	Man	Iphone 3GS	Physics' researcher
Interviewee 51	29	Man	Iphone 4	Marketing Strategist
Interviewee 52	45	Man	Android	Lawyer
Interviewee 53	46	Man	Nokia E71	Informatics' System
Interviewee 54	35	Woman	Nokia E72	Commercial at mobile communications
Interviewee 55	40	Man	IPhone 3GS	Architect
Interviewee 56	29	Man	Nokia N86	Doctor
Interviewee 57	35	Man	IPhone 3 GS	Teacher
Interviewee 58	35	Woman	IPhone	Management
Interviewee 59	34	Man	HTC touchcruise	Management Dept Lightning
Interviewee 60	37	Woman	Nokia E72	Researcher
Interviewee 61	33	Woman	IPhone 3 GS	Architect

Appendix B
Qualitative Study – Participants quotes

Categorization: examples of potential customers interviews.

Category	Initial category	Example Comment
Accessibility	Customers seem to develop routines and purchasing habits and successful loyalty services become part of those routines.	(Woman, Nokia 6301) Usually I go there every fortnight and always on the same day and the fun of it is that the store assistant has always the care of asking for the card.
	The rewards were very important for the recurrent usage and motivate people to use the service.	(Man, …) I don't go there just because I've card bonus but I go often has I have vouchers and I might earn something with that…
Usefulness	Almost half of the inquired people admit having loyalty cards stored at home and some have a second compartment in the wallet to store loyalty cards.	(Man, HTC and IPhone 3G) I've some bonus cards that I've been gathering at home I'm not sure of how many I have…
	Some people referred to enjoy the alert information received on their mobile phones according to their loyalty service options.	(Woman, Nokia5310) They send those messages to the mobile phone and I think this is to be positive…
	Saving space in the wallets was another aspect people agree on being more of an advantage.	(Man, Nokia N78a) Usually I bring the mobile phone and everything that takes less space in the wallet helps!
Social Environment	Considering the acceptance of loyalty programs, it was confirmed that, the retailer's support had decisive impact to the development, especially in what concerns the adoption phase, as the inquired revealed their adoption mainly on retailer's pressure.	(Woman, HTC Touch) Usually they ask: would you like to adopt our client's card… and I end up by accepting it… (Woman, Nokia5310I think this makes us feel well… it makes us feel that we are doing a good purchase. I would feel bad if I wouldn't have done that… if I hadn't used it… everybody pulls the card.
Security	More than a half of the statements refer that comfort would be prior to safety, although, some fear for their privacy.	(Woman, Sony Ericsson 220i) I behave myself well as I have nothing to fear, but it bothers me as it is a privacy invasion and I might be shopping in a place wherever pleases me without someone saying: ah! That's fun this lady has just bought that in that store…
Ease–of–use	In what refers the adoption of a new mobile loyalty service the ease–of–use was the most required factor for the adoption of the new service.	(Man, Nokia T650) I believe that reading a book on a mobile phone must be an awful experience…
	Some participants expressed their ideas of how they imagine the new service could be,	(Woman, Nokia 5310) We, as final customers, could eventually have an access channel; Imagine that I want to know what is my situation with a specific retailer at a certain moment…

Categorization: examples of early adopters' interviews.

Category	Initial category	Example Comment
Awareness	Only thirteen (13/21) of them had already scarcely used the application in an open store context (ex. scoring). Besides these customers, sometimes did not understand the Service concept: they generally believed that the company had already partnerships with the majority of loyalty programs in the country.	(Man, Nokia N78) I must confess that I have not yet used it anywhere. I believe that the retailer (y) has partnerships, so would it be possible for me to identify myself through the mobile phone on a purchase?
	Additionally it was identified within the sample that early adopters in many circumstances were primarily responsible for informativeness – to spread the word and promote the service.	(Man, Samsung d830) Usually, It's this way the person is very, very surprised, looking at me… and asking: do you have the card in the mobile phone?
Accessibility	On the registration – task, was identified that the proximity and easy access to the Internet could affect positively the carrying out of the process.	(Man, Nokia N86) I took note in a post-it, as is my habit, and I pasted it in my wallet, then whenever I open my wallet there it is to search through it if there is an Internet access! (Woman…) I first heard about the MOBSERV through television at the news, I adopted it right way and I immediately looked for it in the Internet…
Ease-of-use	At the 'set up' stage – the identification of the model of the mobile phone – revealed to be a problem to be solved in order to promote an efficient registration, and ensure the download of the proper application;	(Man, HTC) hum… I didn't feel confused though for those who aren't updated in terms of equipment could have been easier…
Usefulness	In general the users did not recognize more advantages on having their loyalty programs organized and the majority didn't discharged, up to this time, the cards from their wallets.	(ManI,Nokia N78) I haven't yet release any card because, even if two of them might work, it is boring to have to do it in such a slow way. I know that by now I can use two (cards) and in a couple of months I would be able to release another one, and in a year another… But I would like to have a store network…
Social Environment	Sharing programs wasn't yet an expressed requirement, and participants didn't understand how to take advantage from this tool. Although some participants referred bar code has an important instrument to be linked to the application even if some of them speculate on its performance.	(Man HTC) I think that it would be an advantaged the use of the bar code or similar that would enable the mobile phone to interact with the services processor. (Man IPhone) No doubt that at this point, the most important is for them to establish partnerships – technically there is a problem to solve connected to the numbers and the bar codes – but if they increase partnerships, they might not have any problem …

Categorization: examples of regular users' interviews.

Category	Initial category	Example Comment
Security	Some tasks were not fully completed such as sharing cards or registering cards with a different name, not only because they didn't know how to do it but also because some imposed themselves to be more careful. Nevertheless security issues seemed to be enough at this stage of development for the majority of the participants.	(Woman, Iphone3G) I have no pin because they are only images; I mean for the cards I have there is no problem... Things will change because data will be available even if it is encrypted; this is only encrypted data, but anyone can use, if you lose your mobile phone as it happens with credit cards.
Usefulness	Some of the participants already used this service concept before, which means they previously had in their mobile phones a backup of their cards even for documents such as their driving license; Some participants had already released their cards physically:	(Man, Iphone3G) I had already in my mobile phone lots of digitalized cards, like pictures... though I didn't manage them that much... I had not many cards... but they appear in miniatures, so whenever I wanted to know the number I would open the picture, because in some stores people know me, and they only want to know the number. I had a backup of my cards and I did not need to bring them with me all the time even the driving license, it was more secure. (Woman, Iphone3G) I left them at home... there they are in a little box; so it saves me space in the wallet, but there are some cards that I use frequently and whenever I need them very often I don't have them with me... I must remember...
Ease-of-use	Interviewees described some situations where they could not fulfil the intentions they suppose they would be able to:	(Woman, Iphone3G) It was supposed to be an application to make things easier, but it is not the application itself, it is only afterwards, from whom is on the other side, the thing isn't yet tuned for this two reasons: I had already used it here (in this store); I had shown my mobile phone and the lady said, she wouldn't be able to accept it... I would need a card for that promotion specifically... at last she accepted it but only for that time, she told me that I would need the physical card... So these issues connected with acceptance and the assistants not being informed... But it is not worthwhile to feel disgusted, because I understand that there is a time for a system implementation... the only thing that upsets me is that in some companies the information do not flow...
	Some describe their behaviour to deal with technical problems at scoring bonus,	(Man, Iphone3G) At the second time I've insisted: You have to pass the bar code twice, she did that... and it didn't work... And I've insisted and she, being careful, at last could do it ... – I referred a certain position... And she could score... it wasn't easy... I also told her to use the card perpendicularly and pass it horizontally and slowly, and it worked!
Awareness	Some had listen about partnerships and they wanted to try some new features of the service:	(Woman, Nokia E72) Then it was really funny... usually I am not ... but I did it anyway, because I wanted to try... I went to the sandwich store and the store assistant said: We don't have any digital card... And I was wondering why... and then I came home, I didn't argue... I said ok probably it's my mistake... So I did a blank card because even if it is not in the list we can create one!
	They also reveal positive emotions on using innovative applications and sharing the new service:	(Woman, Nokia) I feel good because I am using a new thing and if the person doesn't know it I can inform, I appreciate that as I enjoy a lot to use new things, and I don't like that people don't know things, so I really must show the card...

Appendix C
Survey Instrument

In each question please indicate the answer (between 1–Totally Disagree and 7–Totally agree), which better reflects your agreement with the statement shown. You may also answer – Not applicable.

Cardmobili service is well known by the general public.
Cardmobili service is divulged through Internet.
Cardmobili service is divulged by the media (newspapers, TV, radio).
Cardmobili service is divulged in commercial spaces.
Cardmobili service is innovative.
My family and friends know Cardmobili service.
Cardmobili service is easy to use.
Cardmobili service fits with my routines.
Cardmobili service use is intuitive.
The mobile interface of Cardmobili service is visually pleasant.
The Web interface of Cardmobili service is visually pleasant.
Cardmobili service is easy to install in my mobile phone.
Cardmobili service is fast.
The management of data with my cards is easy with Cardmobili service.
Cardmobili service is useful.
Cardmobili service has a wide range of cards.
Cardmobili service provides complete information about the loyalty programs.
Cardmobili service has useful features for managing loyalty programs
Cardmobili users can show their friends the cards they have and recommend the service on social networks.

With Cardmobili service I don't need to carry cards with me.
Cardmobili service is convenient as it makes it easy to carry information.
Cardmobili service is always accessible.
Cardmobili service is always available.
Cardmobili service can be used everywhere.
Cardmobili service can be used at any time.
Cardmobili service is safe.
The company that operates Cardmobili service is trustful.
Cardmobili service doesn't interfere with the privacy of data.
With Cardmobili service, data is correctly processed in the commercial spaces.
Cardmobili service uses safety features.
The Cardmobili service allows me to give feedback.
Cardmobili service has a large number of partnerships.
Other customers notice, when I use Cardmobili service.

Cardmobili service speeds up the process in the commercial environment.

With Cardmobili data identification and registration in the commercial spaces becomes easy.

The store assistants know how Cardmobili service works.

 Cardmobili service is accepted in the majority of commercial spaces.

The store assistants know Cardmobili service.

Shop assistants encourage me to use Cardmobili service.

The convenience of Cardmobili service according to its use.

Cardmobili service usefulness.

The value of Cardmobili service for your money and effort's worth.

Cardmobili service makes me feel accepted.

Cardmobili service helps me in the way I'm recognized.

Cardmobili service causes a good impression on the other customers.

The Cardmobili service user is socially accepted.

To use Cardmobili service is fun.

I am optimistic with Cardmobili service.

I enjoy the use of Cardmobili service.

I am afraid of using Cardmobili service.

The use of Cardmobili service in a commercial place is embarrassing.

I am worried of using Cardmobili service.

I feel unsafe when I use Cardmobili service.

Cardmobili service is disappointing.

For me Cardmobili service is visually clear.

For me Cardmobili service is visually appealing.

Cardmobili interface has good light contrast.

I think Cardmobili interface has a good tactile interaction.

I think Cardmobili is portable.

On the whole the use of Cardmobili service leaves me,

My overall experience with Cardmobili is ...

My general feeling towards Cardmobili service is...

I imagine myself using Cardmobili service the next few months.

I would recommend Carmobili service to other people.

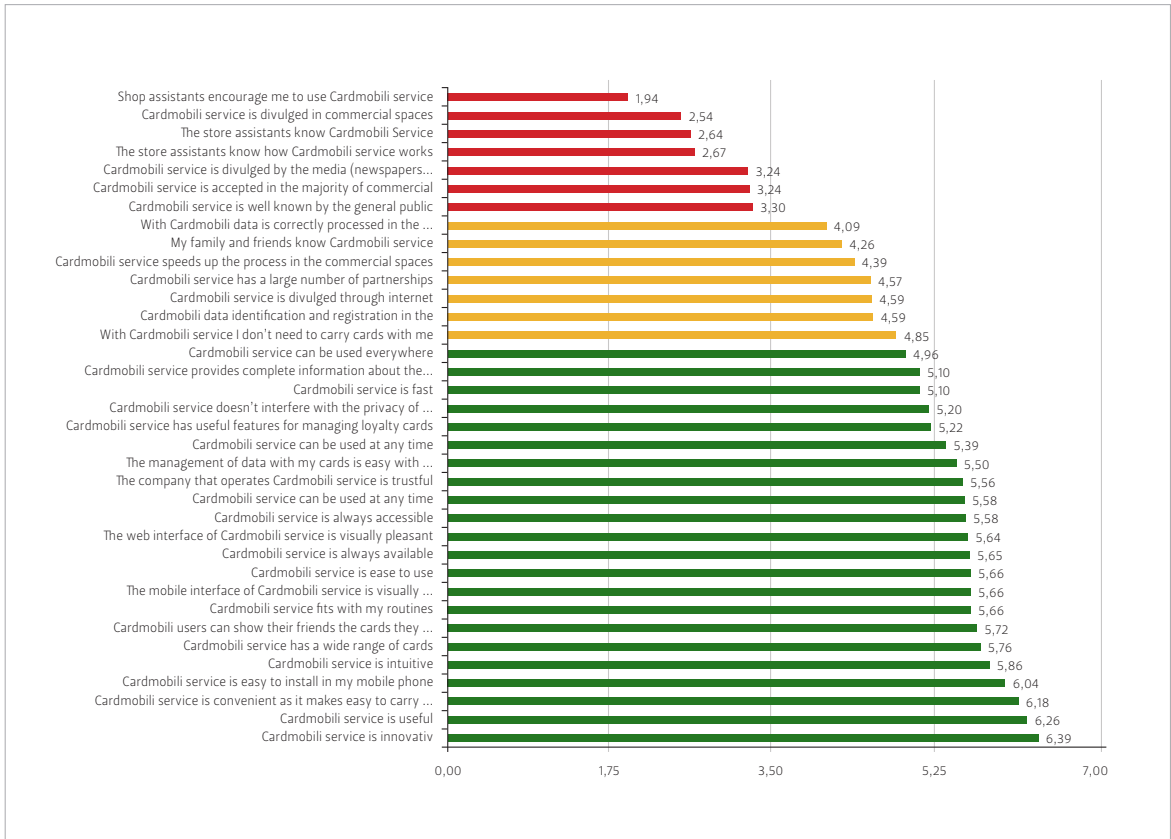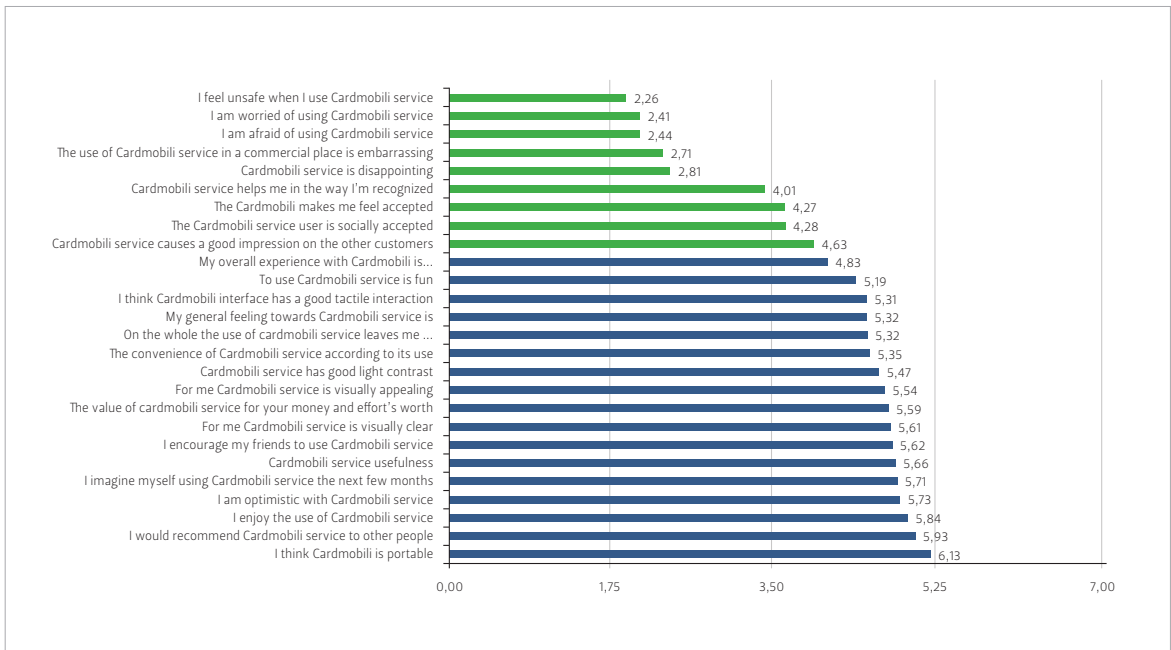I encourage my friends to use Carmobili service.

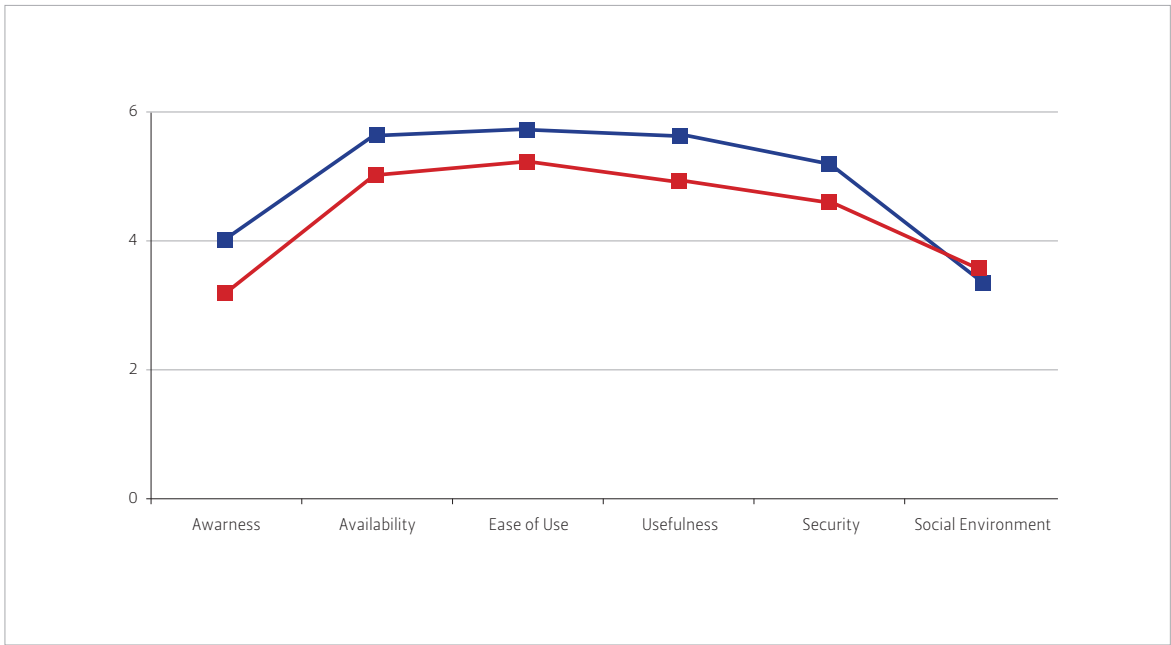# Appendix D
Quantitative Study – Preliminary data analysis

Descriptive statistics – independent variables

Variable	Value
Shop assistants encourage me to use Cardmobili service	1,94
Cardmobili service is divulged in commercial spaces	2,54
The store assistants know Cardmobili Service	2,64
The store assistants know how Cardmobili service works	2,67
Cardmobili service is divulged by the media (newspapers…	3,24
Cardmobili service is accepted in the majority of commercial	3,24
Cardmobili service is well known by the general public	3,30
With Cardmobili data is correctly processed in the …	4,09
My family and friends know Cardmobili service	4,26
Cardmobili service speeds up the process in the commercial spaces	4,39
Cardmobili service has a large number of partnerships	4,57
Cardmobili service is divulged through internet	4,59
Cardmobili data identification and registration in the	4,59
With Cardmobili service I don't need to carry cards with me	4,85
Cardmobili service can be used everywhere	4,96
Cardmobili service provides complete information about the…	5,10
Cardmobili service is fast	5,10
Cardmobili service doesn't interfere with the privacy of …	5,20
Cardmobili service has useful features for managing loyalty cards	5,22
Cardmobili service can be used at any time	5,39
The management of data with my cards is easy with …	5,50
The company that operates Cardmobili service is trustful	5,56
Cardmobili service can be used at any time	5,58
Cardmobili service is always accessible	5,58
The web interface of Cardmobili service is visually pleasant	5,64
Cardmobili service is always available	5,65
Cardmobili service is ease to use	5,66
The mobile interface of Cardmobili service is visually …	5,66
Cardmobili service fits with my routines	5,66
Cardmobili users can show their friends the cards they …	5,72
Cardmobili service has a wide range of cards	5,76
Cardmobili service is intuitive	5,86
Cardmobili service is easy to install in my mobile phone	6,04
Cardmobili service is convenient as it makes easy to carry …	6,18
Cardmobili service is useful	6,26
Cardmobili service is innovativ	6,39

Descriptive statistics – dependent variables

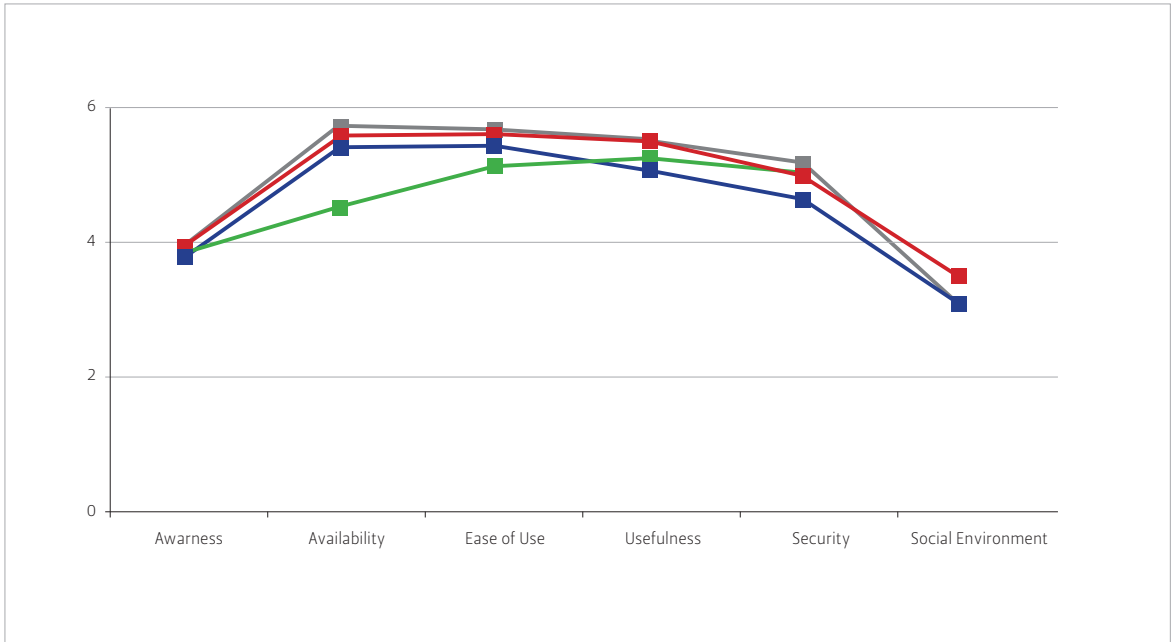| Variable	Value
I feel unsafe when I use Cardmobili service	2,26
I am worried of using Cardmobili service	2,41
I am afraid of using Cardmobili service	2,44
The use of Cardmobili service in a commercial place is embarrassing	2,71
Cardmobili service is disappointing	2,81
Cardmobili service helps me in the way I'm recognized	4,01
The Cardmobili makes me feel accepted	4,27
The Cardmobili service user is socially accepted	4,28
Cardmobili service causes a good impression on the other customers	4,63
My overall experience with Cardmobili is…	4,83
To use Cardmobili service is fun	5,19
I think Cardmobili interface has a good tactile interaction	5,31
My general feeling towards Cardmobili service is	5,32
On the whole the use of cardmobili service leaves me …	5,32
The convenience of Cardmobili service according to its use	5,35
Cardmobili service has good light contrast	5,47
For me Cardmobili service is visually appealing	5,54
The value of cardmobili service for your money and effort's worth	5,59
For me Cardmobili service is visually clear	5,61
I encourage my friends to use Cardmobili service	5,62
Cardmobili service usefulness	5,66
I imagine myself using Cardmobili service the next few months	5,71
I am optimistic with Cardmobili service	5,73
I enjoy the use of Cardmobili service	5,84
I would recommend Cardmobili service to other people	5,93
I think Cardmobili is portable	6,13

Comparison Portuguese vs English surveys

■ Portuguese   ■ English
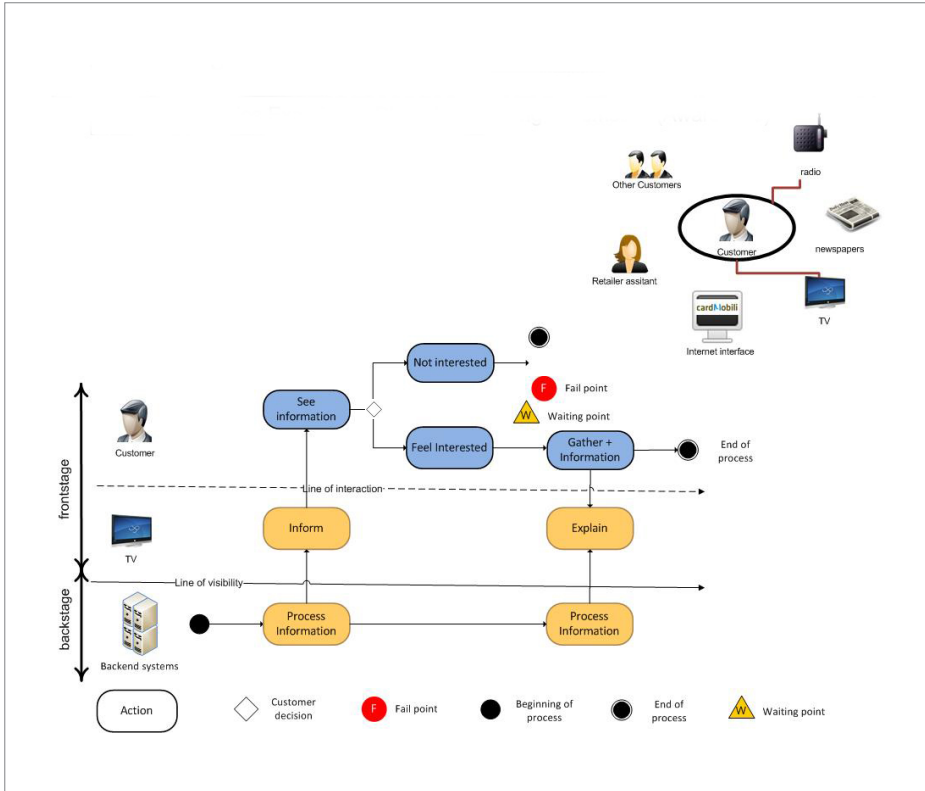
Comparison between mobile plataforms
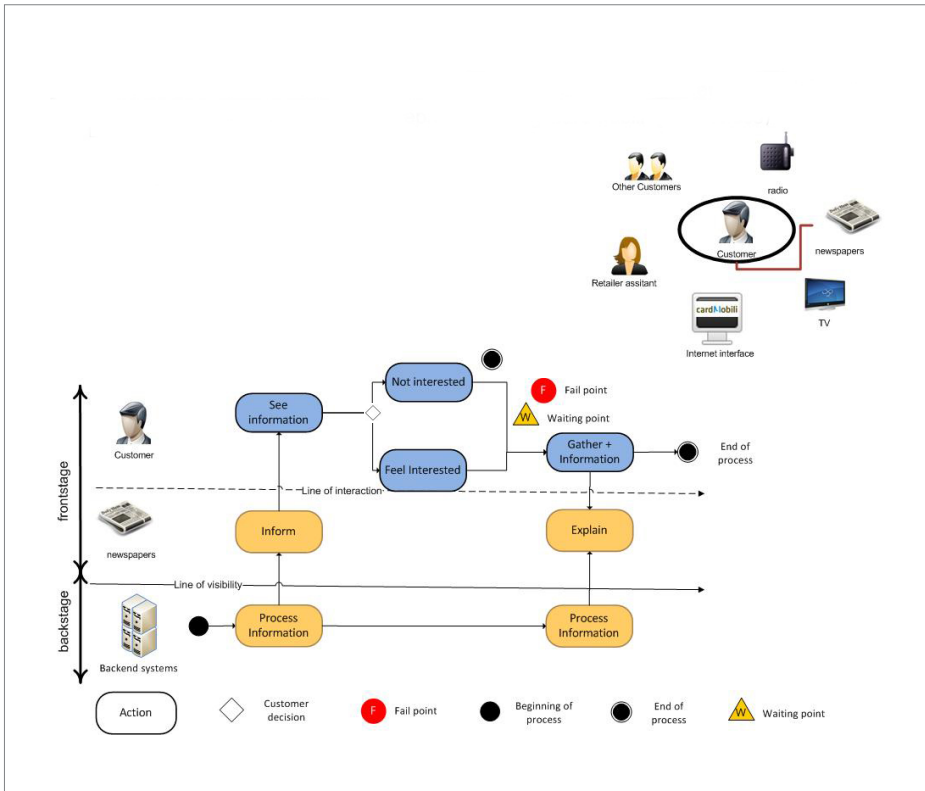

■ iPhone   ■ Windows   ■ Android   ■ JAVA

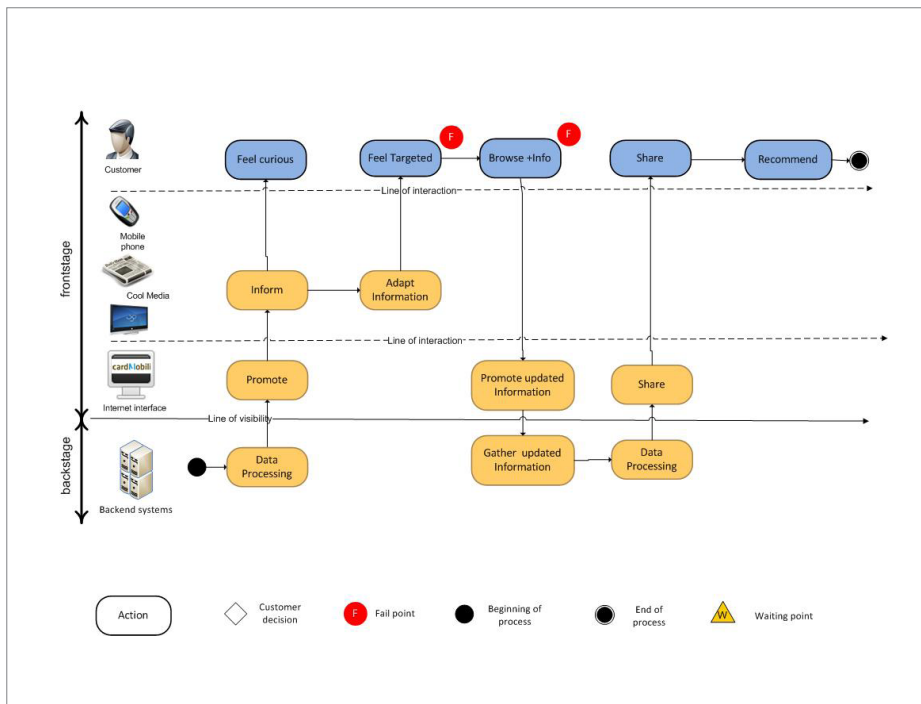# Appendix E

Other Experience Blueprints

Service Experience
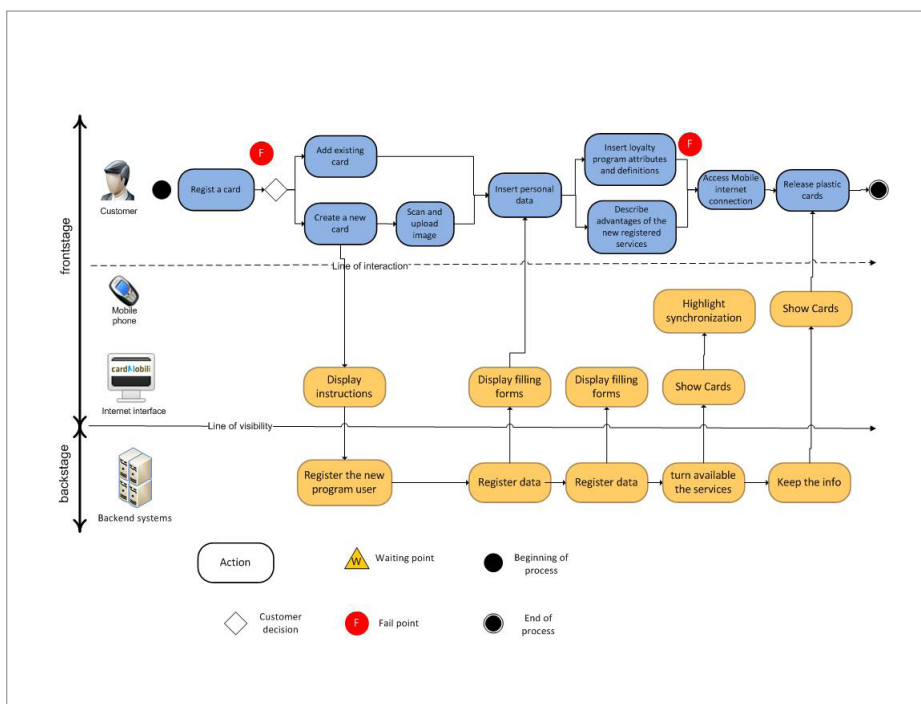Blueprint for using
MOBSERV (Awareness)

Service Experience
Blueprint for using
MOBSERV (Awareness)

Service Experience Blueprint for using MOBSERV (Communication)

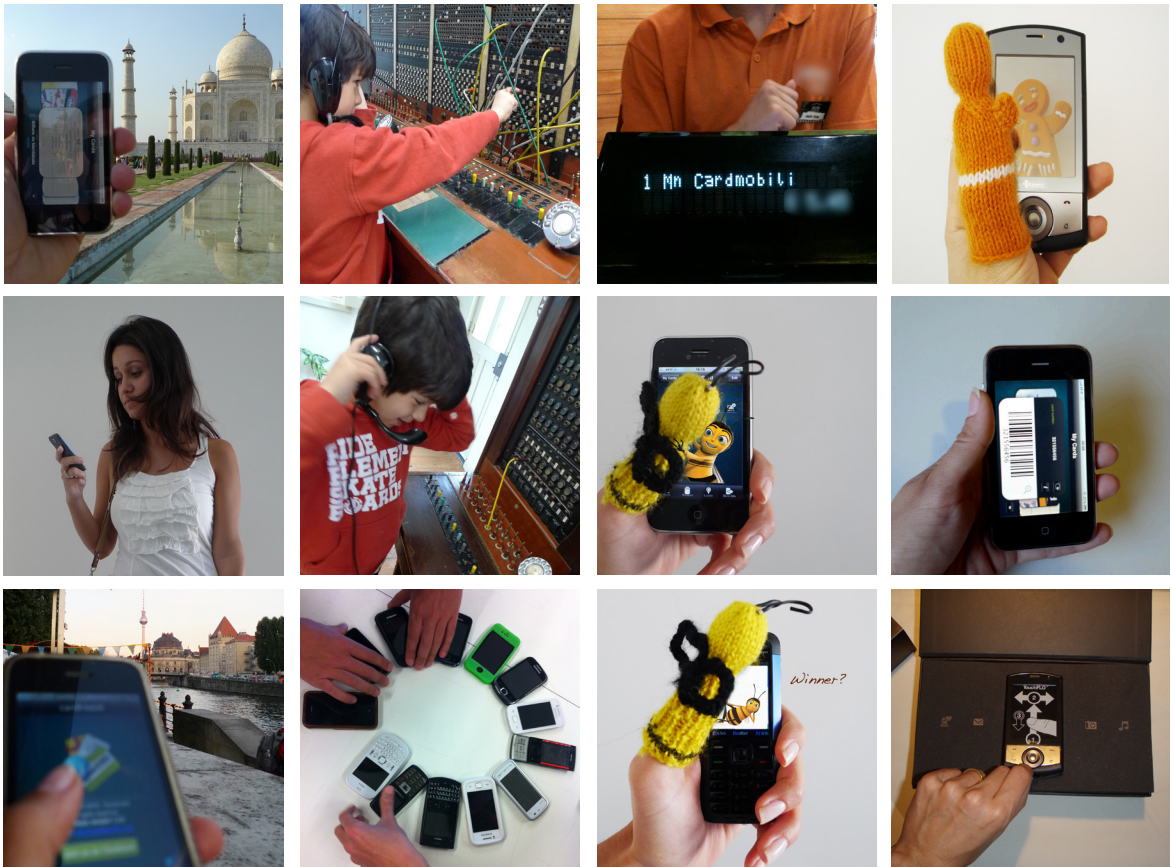Service Experience Blueprint for using MOBSERV (Create a new card)

Appendix F

Many ideas presented in this research were materialized with pictures. Here are a few of them in this process.

Appendix G
Glossary

Action research	It is a research initiated to solve an immediate problem or a reflective process of progressive problem solving led by individuals working with others in teams or as part of a comunity of practice" to improve the way they address issues and solve problems. (Reason and Bradbury 2008)
Constructive Design research	Refers to design research in which construction be it product, system, space, or media — takes center place and becomes the key means in constructing knowledge (Koskinen et al. 2011)
Customer	person or organization to whom the service is provided. As this thesis adopts a service perspective, a broad conceptualization of customer is used, defined as person or organization to whom the service is provided, whether that person or organization pays the service or not. As such, this broad definition of customer also encompasses users as defined in the Interaction field..
Customer Experience	Internal and subjective response customers have to any direct or indirect contact with a company. (Verhoef et al. 2008)
Design research	Implies an inquiry focused on producing a contribution of knowledge. It is focused on the development of knowledge instead of artefacts for consumption (Laurel 2003)
Design Science Research	(...) Is adequate whenever research is related with the creation of innovation artifacts that are not a result of natural laws or behavioural theories (Hevner et al. 2004)
Design Thinking	The application of design process that involves grounding, to gain multiple perspectives on a problem; ideation to generate many possible different solutions; iteration as a cyclical process of refining a concept; and reflection (Brown 2008)
Design-as-practice	Design-as-practice mobilizes a way of thinking about the work of designing that acknowledges that design practices are habitual, possibly rule- governed, often shared, routinized, conscious or unconscious, and that they are embodied and situated. (Kimbell 2009)
Experience centered design	It requires designers to engage with the users and their culture in rich ways in order that they can understand how the user makes sense of technology in his/her life (Pullman and Gross 2004, Zomerdijk and Voss 2009)
Experience Factors	(EF) Customer perceptions of all aspects of the service that drive the customer experience. (Verhoef et al. 2008, Carreira et al. 2013)
Experience Outcomes	(EO) represent the customer's responses to all attributes of interaction towards the service (Verhoef et al. 2008, Carreira et al. 2013)
Grounded theory	It is a systematic methodology in the social sciences involving the discovery of theory through the analysis of data. Rather than beginning with a hypothesis, the first step is data collection, through a variety of methods. From the data collected, the key points are marked with a series of codes, which are extracted from the text. The codes are grouped into similar concepts in order to make them more workable. From these concepts, categories are formed, which are the basis for the creation of a theory. (Corbin and Strauss 1990)
Research through design	Because design knowledge grows in part from practice, design knowledge and design research overlap. The practice of design is one foundation of design knowledge. Even though design knowledge arises in part from practice, however, it is not practice but systematic and methodical inquiry into practice—and other issues—that constitute design research, as distinct from practice itself.(Friedman 2003)
Service interface	It is the physical or virtual collection of points of contact between customer and the service provider to support the specific service activities (Patrício, Fisk, and Cunha 2008)
Service provider	The person or organization who provides the service In the design field, the term client often refers to the organization who pays for the service design project, and which then provides the service to its customers or users. As we adopt a service perspective, this organization will be referred to as service provider.
User Centred Design	It is Design focused on users, but more specifically focused on their work and on providing usable tools for them.(Constantine and Lockwood 2000)
User Experience	a person's perceptions and responses that result from the use or anticipated use of a product, system or service. ISO 9241-11:1