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Creating a Product-based Service Start up

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A mi querido esposo Mario, por todo su apoyo y comprención

— Catalina Rodríguez Espinoza

Abstract

The present dissertation is developed in the healthcare area; it is not on an existing company but a new one that will come to try to solve problems with foot pathologies, hand in hand with the existing service providers. Foot pathologies affect many people around the world specially the diabetic population. The idea is not to try to replace any of the current service providers, but to help them to improve the service as it is and to add a new service.

This was achieved by integrating the service design with product service systems and multiple service providers. The data was collected by interviewing the different stakeholders, and then analyzed by systematizing the information. The data was used to design a new service concept.

The main conclusion of the present project is that throughout the whole dissertation the designer managed to integrate the service design with the product service system, while taking into consideration the needs and expectations of the actors involved. The cooperation of and between the stakeholder proved to be one of the most important assets to make this service both a reality and a success.

Acknowledgments

- I want to thank everyone that made this project possible. Specially my parent, who gave me all the support and help they could. Also I want to thank to all the professionals who gave a little bit of their time to make this project a reality.

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1 Introduction

1.1. Project Framework

The *Insole Solutions* project was born out of curiosity of the promoters. Having experienced diabetes and foot injuries or conditions, in their families first-hand, it became obvious for them that a solution for a technology that could address the patients' most common issues was needed. Foot wounds are one of the most common, complex, and costly sequelae of diabetes mellitus. Even for the most superficial wounds, treatment is often difficult with poor healing responses and high rates of complications (Armstrong and Lavery, 2005). This is commonly known as *diabetic foot*.

Foot conditions are not unknown nor are a new problem to be addressed. Cross-sectional studies of foot conditions suggests that in excess of 80 % of the population have a foot problem of one kind or another (Clarke, 1969, Cartwright and Henderson, 1986 and Benvenuti et al., 1995). Although most ailments may be considered to be relatively trivial, Bowling and Grundy (1997) found that foot problems were consistently associated with deterioration in the functional ability of people over the age of 65 years (Garrow et al., 2000).

A mail survey that examined foot problems was conducted, rates of utilization of foot-health services, and the perception of foot problems as medical conditions in a sample of people aged 65 years and older who lived independently. Although 71 % of the 128 respondents reported suffering from foot problems, only 39 % had consulted medical personnel about their feet, and only 26 % identified their foot pathologies as medical conditions. More female than male respondents experienced foot problems and had visited medical personnel about their feet. Increased education of older individuals about their foot-care requirements, as well as increased access to podiatric medical services, is recommended (Munro and Steele, 1998).

It is evident that even though a large percentage of the population has some degree of foot condition, most of them do not seek medical attention, as it is reflected on different studies, for a large amount of the population neglect foot conditions until they become unbearable.

1. Introduction

Foot pain can have a profound impact on quality of life. Half of all adults say that foot pain has restricted their activities—like walking, exercising, working, or playing with grandchildren—in some way. For those with chronic foot pain, that number jumps to 83 %. People say they would exercise more (39 %) and participate in more activities (41 %) if it weren't for their foot pain (American Podiatric Medical Association).

Among those who have visited a podiatrist, 88 % said their podiatrist was able to quickly provide a clear diagnosis, and 76 % said their podiatrist was able to prescribe an effective treatment regimen and/or medication that helped their foot- or ankle-related issues improve or go away. In addition, more than a third (34 %) of those who visited a podiatrist said their podiatrist helped identify another health-related issue they had, such as diabetes, circulatory problems, or nerve issues. Those who have visited a podiatrist are also extremely satisfied with their care; in fact, more are satisfied than those who sought out a primary care physician for foot care (American Podiatric Medical Association).

Flat feet (pes planus) is a fairly common condition in which the foot does not have a normal arch, and so the entire foot touches the floor when you're standing. According to the 2012 National Foot Health Assessment conducted by the NPD Group for the Institute for Preventive Foot Health, 8 % of U.S. adults ages 21 and older (about 18 million people) have the condition. Another 4 %, or about 8 million U.S. adults, have fallen arches (Institute for Preventive Foot Health).

Flat feet can occur as normal arches "fall" over time. Years of walking, running and standing can weaken the posterior tibial tendon, which runs along the inside of the ankle from just above the joint to the arch. This tendon is the main support for the arch; overloading the tendon can cause inflammation (tendinitis) and tearing. Once the tendon is damaged, the arch loses support and can flatten, resulting in "fallen arches." (Institute for Preventive Foot Health)

Letting these conditions untreated could degenerate in greater health issues as was stated by Dr. Oscar Oeding during an interview. Dr. Oeding (orthopedist medic) stated during said interview that many foot conditions that are relatively easy to treat in early stages, can develop much more serious pathologies later on, as can be a knee or hip replacement.

The acquisition of this information made the promoters come up with a product based service that could help address these conditions in an early stage. A more approachable manner to get in touch with the general population, having the support of the healthcare providers community.

Now in order to being able to develop this service, it is imperative to integrate the service design with the product service systems. Specially since most of the times when speaking of

service design, it rarely involves products, but the paradigm has to change to help companies to address the customers in a more customized way.

The evolution of the companies in the last decades, has come to blur the former clear differentiation between the products and services (Mont, 2002). This means that now the average customer, when buying a product, expects something more from the company that just the product itself. As part of this evolution, some new concepts and definitions have emerged. "The term product–service systems (PSSs) has been defined as a marketable set of products and services capable of jointly fulfilling a user's need (Mont, 2002).

A PSS is an integrated product and service offering that delivers value in use. A PSS offers the opportunity to decouple economic success from material consumption and hence reduce the environmental impact of economic activity (Qu et al., 2016). In other words, this concept comes as an opportunity to combine both the product and the service, and this actually helps the companies to add a differentiation factor that can carry many benefits. And even though for the purposes of the current dissertation this will be applied for very specifically case, the results of the research can be applied for many areas and other products.

1.2. Passaporte de Empreendedorismo

Thankfully, the Portuguese government and the European Union decided to create a fund circumscribed in within the QREN program. The result was a direct financial support for small groups of entrepreneurs who had an idea that wanted to be implemented in a start-up: a program named *Passaporte ao Empreendedorismo*. This funds allowed a series of promoters to work on their projects towards a company for a year, and helped not only to improve their technology, but also to create their business model. This dissertation is part of such growing process, after being part of the *Passaporte ao Empreendedorismo* 2014 - 2015 program, in an effort to deliver a base plan for tackling the market and to propose a product-based service to commercialize *Insole Solutions*'s products.

Nowadays internationalization is key in every single aspect of every business. In a world that has never been so closed-knit before, international markets are as close as national ones. Taking into consideration the dimension of other geographical areas besides the EU, it becomes almost a necessity to think global. This is the main reason why *Insole Solutions* was thought as an international company since the beginning, as this particular situation has been address throughout this study: the market research has been done in three different countries.

The *Passaporte ao Empreendedorismo* is an initiative of the Portuguese government, that has as an objective to stimulate young qualified entrepreneurs to develop an innovative

project, that is at the idea stage, and they do this by facilitating a set of technical and financial tools (Passaporte Empreendedorismo). This program provided some bases and tools for the team to get a further development of the idea, and that is how *Insole Solutions* appeared.

Now entering further into the project, why a service? Because the service industry is growing world wide. "Approximately 70 % of all workers in highly industrialized countries are employed in industries commonly thought of as services: communications, transportation, health care, education, wholesale and retail redistribution, and financial services" (Mont, 2002). And also in countries like Costa Rica, 84 % of small and medium-sized businesses are service related (Morales, 2015).

But for any project to succeed it need to have some kind of support and for the developer team, one of the first was the *Passaporte de Emprendedurismo*.

1.2.1. Insole Solutions

Insole Solutions is not yet a company nor an enterprise, not even a business at this stage. But it is the name of the project developed within the *Passaporte ao Empreendedorismo*. As it was mentioned before the idea of the company comes from the search for a solution for feet pathologies, in order to create a new service of early detection and treatment of feet related afflictions.

The idea emerges from the necessity of creating a service that is expected to improve the quality of life of every costumer. How? As it was reflected on the previously cited articles, feet are usually neglected, men and women usually just accept that at a certain point during the day their feet will hurt; *Insole Solutions* comes as a solution.

The promoters' idea comes from the fact that every day more and more products are customizable. These help producers to differentiate and diversify their products to better respond to customers' demands — the so-called move from mass production to customized production or mass customization (Mont, 2002). For the promoters became really clear that even though customization is in fashion, products as important as shoes are still standard. Shoes, at least in occidental civilizations, are things that are used every day for at least 10 hours a day (taking into consideration the standard 8 hour work day, 1 hour lunch, and 1 hour for transportation) and for most brands the only specifications you can choose are size and width, and not even for all brands.

Insole Solutions was born as a solution to this problem, the idea is not to customize the shoes but to have a customized insole that can be used for all the shoes a person owns, this way people will have standard shoes customized to their feet and the way they walk. The service will provide a full gait analysis, pressure and temperature profile; in order to create a

full profile for each patient and also accompany the patients during the healing process and even after it.

What the promoters expect from this product based service is to help prevent and cure the most common foot conditions of the general population. Also to create a bridge between the health providers community and the patients, by raising awareness and creating a more approachable environment. This goal would be achieved by the development of a new service around *Insole Solutions*'s product, which is the customized insole.

1.3. Research project

The current dissertation has two different perspectives, practical and academic. For the practical focus the primary objective is to create a new service that will provide a new concept for treating foot conditions and preventing the future implication of these conditions. This service was developed around a product, with the assistance and guidance of experts in the area. For the academic and research purposes, the primary objective is to integrate the Product Service System concept with service design, under the aim of creating a collaborative Product Service System between all the stakeholders.

The new service was developed taking into consideration the different participants involved in the process, but with the ultimate goal to change the current paradigm. Making this service more approachable for the ordinary user, this will be accomplished by eliminating the white coat effect and making patients feel more comfortable and less nervous around the professionals providing the service. This new service will have to main components, the product and the service itself, the service will be dependent of two different insoles, one that will help with the preliminary analysis and another one that will be both part of the treatment and the follow-up of the patient.

In order to accomplish the mentioned goal, the following objectives need to be fulfilled:

1. Study the stakeholders and their needs.

2. Defining the value proposition and business model associated to the service.

3. Develop a new service under a new provision paradigm.

The associated research questions are:

1. How to integrate service design with product service systems, to design an integrated solution?

2. How to create a product service system integrating multiple service providers?

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1.4. Outline

The current dissertation is structured in six chapters. Chapter two presents the fundamental topics that help address the research. The topics are Service and Product Service Systems, Service Design, Exploring the Customer Experience and Envisioning New Services. Chapter three describes the methodology used in the conceptualization of a new service. Chapter four presents the analysis of the results obtained in the qualitative research. Chapter five presents the new service that is been proposed. Chapter six illustrates the conclusion and future works.

2 Literature Review

In order to be able to develop the present dissertation it is necessary to fathom diverse concepts that are important to help as a theoretical base to the creation of a new service. Those concepts were developed in the following sections.

2.1. Service and Product Service System

Searching through the literature there are many definitions for services, depending on the opinion, experience and background of the different authors; also it is a concept that has been evolving with time and will continue to evolve hand in hand with our society. None the less a more generic definition can be found as: "a service is a discreet domain of control that contains a collection of tasks to achieve related goals. In a good service architecture, these often relate to business departments or sub-departments and their tasks" (Jones, 2005). And even though it is a quite wide definition, this allows it to be more permanent through time.

But even though the past definition can be timeless, maybe it will be important to give a more explicit differentiation between a product and a service, the focus could be on the idea of tangibility: products are physically present whereas services are not. Both products and services incorporate productive processes, but the point at which the customer interacts with this process tends to be different depending on if they are products or services (Macintyre et al., 2011).

The difference becomes more clear in figure 2.1, where a visual comparison between both productive processes is made. After observing the figure, the most evident difference comes from the position of the customer in the process; a service can not start without the presence of the customer, but for the case of the product the customers interaction comes just before the outcome. The rest of the stages of the productive process are shifted to the right, and even though they are exactly the same, the macro description of both production process is very similar.

Now as the industry evolves, more and more companies try to differentiate themselves from other companies by making a mixture between both products and services. An example

A Productive Process
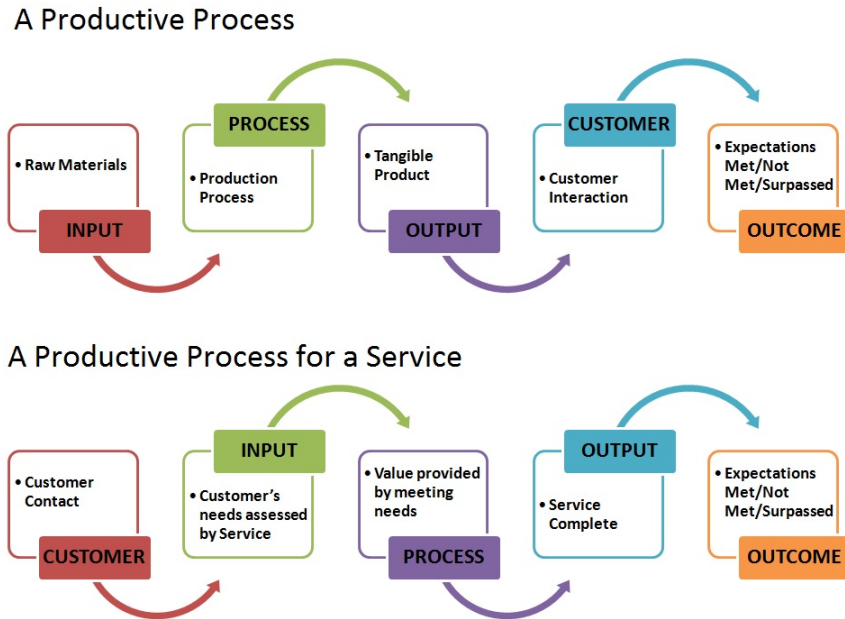
A Productive Process for a Service

Figure 2.1.: *Product and Service productive process, taken from Macintyre et al. (2011)*

of this is the variety of companies that are now allowing customers to custom-build the computer. Another example are the mobile phones; were there are multiple choices in color, ring tones, and even the functions of the buttons; and also the apps and software are chosen by the user. It is also pointed out that "product manufacturers increasingly seek to establish service relationships with their customers through offering a range of after-sales add-ons" (Macintyre et al., 2011).

This evolution can be observed on figure 2.2 where it becomes evident that until 1942 the differentiation between products and services is very clear, the line starts to get blurry in 1977 when the tangibility or intangibility is no longer a clear distinction between them. After 1987 it becomes more of a behavioral differentiation and for the millennium change is more of the validity with some exception, which means that for 2000 there was not a clear separation between them. In 2002 arises the idea that maybe they do not need to be two separate things, but they can be put together in order to create a more complex offering. Now for 2006 there is no longer a separation between products and services, but an integrated system, and everything can be considered a service.

Continuing with this line of thinking this means that for many products the classic differentiation does not apply anymore and because of that new concepts have been emerging as the product service system, topic that is developed on the next section.

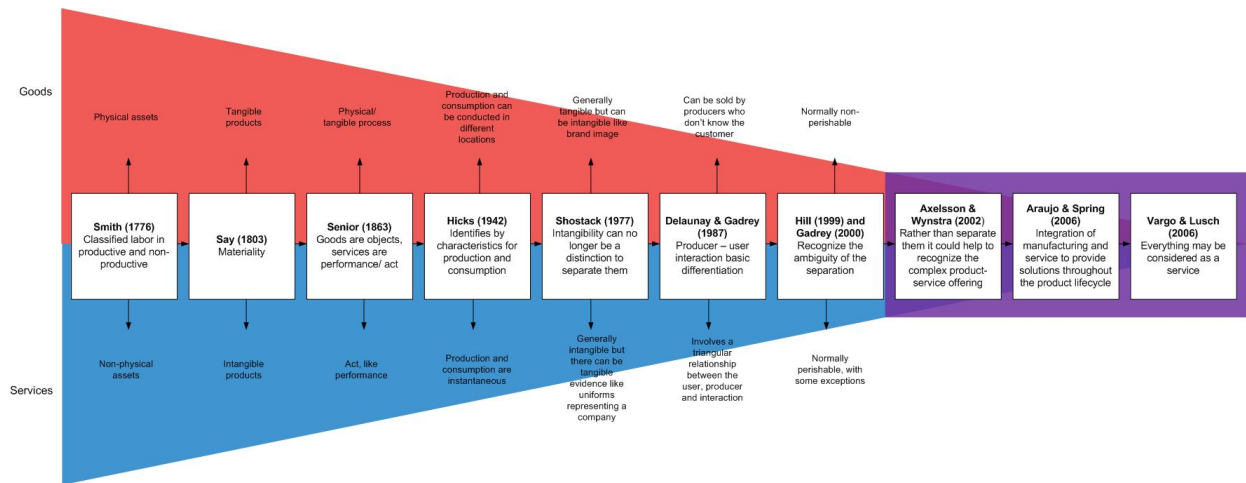As mentioned before, "the traditional boundary between manufacturing and services is

Figure 2.2.: *Based on "Defining good and service: over 230 years and counting", taken from Macintyre et al. (2011)*

becoming increasingly blurred. Of the employees that are working in traditional manufacturing industries, 65 - 75 % perform service tasks ranging from production-related activities like research, logistics (transportation), planning, and maintenance, as well as product and process design, to the all-supportive services existing at any company (e.g. accounting, financing, law services and personnel functions)" (Mont, 2002). Which means that even in the traditional manufacture industry, the employees inside them are developing tasks that are usually labeled as services.

As part of this evolution, some new concepts and definitions have emerged. "The term product–service systems (PSSs) has been defined as a marketable set of products and services capable of jointly fulfilling a user's need. The product-service ratio in this set can vary, either in terms of function fulfillment or economic value" (Mont, 2002).

The concept of product service system (PSS), also named as "functional sales", or "functional products", was proposed by the United Nations Environment Program (UNEP) in the late 1990s. Being the core idea to provide solutions to customers by integration of products and services, meeting customers' requirements while reducing resource consumption and environmental impact at the same time (Baines et al., 2007). A PSS is an integrated product and service offering that delivers value in use. A PSS offers the opportunity to decouple economic success from material consumption and hence reduce the environmental impact of economic activity (Qu et al., 2016).

Qu et al. (2016) says that a PSS can be thought of as a market proposition that extends the traditional functionality of a product by incorporating additional services. It is also stated that in this system the supplier/manufacturer can improve their competitiveness as these 'so-

lutions' may be differentiated from product-based offerings while simultaneously retaining asset ownership that can enhance utilization, reliability, design, and protection.

Most authors consider the PSS as a competitive proposal intended to satisfy consumer demand. Other authors, assert that the PSS goes beyond this view and, instead, aims at sustainability by seeking a balance between environmental, economic, and social concerns (Maxwell et al., 2006; Baines et al., 2007). In general, products are developed to satisfy consumer demand and are customizable to include services (Beuren et al., 2013).

In the literature there are two basic branches to analyze the possible benefits of this system, some authors decided to focus purely in the economical benefits and other try to cover both economic and environmental benefits, making a balance between the authors of each awn. The development of Product Service Systems (PSS) becomes an increasingly important strategy in achieving social, economic and environmental sustainability, which aims to reduce resource consumption with more efficient delivery, more widely available goods and services (Mont, 2003a; UNEP and PSS, 2001). This requires a change of focus from traditional production oriented philosophies, changing from intensive use of materials and energy in order to produce goods, to dominant service content partially replacing material intensive production. Services can provide value with less environment impact without compromising customers' needs (Manzini and Vezzoli, 2002; Mont, 2003a, 2003b; Tomiyama et al., 2000; Wong, 2003), hence provision of services and systems to consumers can hopefully utilize fewer resources (e.g. reduced materials and energy) (Manzini and Vezzoli, 2002; Mont, 2003a; Tomiyama et al., 2000) (Yang et al., 2009).

The PPS has three key elements which are: (Beuren et al., 2013)

1. The product

2. The service, in which an activity is performed without the need for a tangible good or without the need for the system

3. The combination of products, services, and their relationships

This elements can be classified accordingly to the type of service provided; said classification can be appreciated on figure 2.3 (Mont, 2002).

This considered the basic elements of the PPS, can be seen on both authors literature and both opinions complement each other. Even though it can be said that Beuren et al. (2013) gives a more general definition of the different elements; the first element of both authors characterization can be seen as almost the same, while Mont (2002) classification 2, 3 and 4; could be made equivalent to Beuren et al. (2013) second element and the last of each can be pared up.
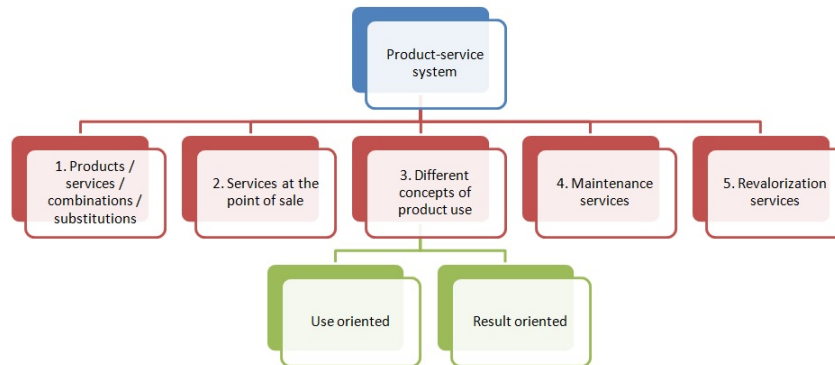
Figure 2.3.: *Classification of a product-service system, taken from Mont (2002)*

Morelli (2006a) states that industrial production is evolving towards models that more adequately address an epochal shift from mass consumption to individual behaviors and highly personalized needs. He is not the only one who is going under this line of thinking, since as it was mentioned before, Macintyre et al. (2011) also states that most companies are addressing the strong market competitiveness by offering more customized goods, and the new method of customizing products is through services.

The relation between the service and the product has to be well thought in order to make both the service and the product coherent with each other and also to economize resources and not to waste them.

Mont (2002) also determines different approaches toward the development of this type of system, which are:

- The sale of the use of the product instead of the product itself

- The change to a 'leasing society'

- The substitution of goods by means of service machines

- A repair-society instead of a throw-away society

- The change in consumer attitudes from sales to service orientation

After determining the changes in society that are pushing the companies to make the change it is also important to know what should be taking into consideration for the design of the PPS. Morelli (2006a) establishes that the designer of the PPS should use and have tools to:

- Work on the identification of the actors in the network, on the basis of defined analytical frameworks

- Work on possible PSS scenarios, verifying use cases, sequences of actions and actors' role; defining the requirements for a PSS and the logical and organizational structure of PSS

- Work on possible representation and management tools to represent a PSS in all its components, i.e. physical elements, logical links and temporal sequences

In general, products are developed to satisfy consumer demand and are customizable to include services. The PSS is a strategic design intended to integrate a system of products, services and communication based on new forms of organization, role reconfiguration, customers and other stakeholders (Beuren et al., 2013).

2.2. Service Design

One of the most important topics for the current dissertation has to be the service design; just as it was for the definition of services, for service design there are also many opinions of different authors but many of the concepts complement each other. The concepts that were considered were of more importance in the development of this dissertation are presented on this section.

Fitzsimmons and Fitzsimmons (1999) states that before being able to design anything it is important to create the service concept, which it is defined as more than the DNA of a service or the elements of its package. It is the idea that customers, employees, and shareholders of the organization have of the service or "service in the mind." The service concept is a "picture" or statement that encapsulates the nature of the service business and captures the value, form and function, experience, and outcomes of the service.

It is also stated that these are the main attributes of the service concept:

- Value: what consumers are willing to pay for

- Form and function:the overall shape of the service, how it is created, and how it operates

- Experience: the experience as perceived by customers

- Outcome: the benefits, stated or assumed, that it provides the customer and the organization

Smith et al. (2007) defines the service design as the "prototype for the service i.e. the utility and benefits provided for the customer. It specifies primary and secondary customer needs and both the core and supporting services that will fulfill those needs." Now Edvardsson et al. (2000) states that the service design is a form of architecture that involves processes, in other words it is the raw material to create something new. None the less the service design goes farther than just the materials, Berry et al. (2002) states that service design can be viewed as an orchestrating series of clues that as a whole meet or exceed the people's emotional needs and expectations. And Mager (2009) gives that last biding element saying that all this has to be approached by taking into consideration the systems and subsystems of the service's interactions and relations.

After determining the service concept Smith et al. (2007) describes the service design with the Prerequisites Model Edvardsson and Olsson (1996), where it is argued that the end result, and main task, of service development is 'to create the right generic prerequisites for the service' (p159). The model in figure 2.4 provides a framework for analyzing large scale new service development as well as the impact of smaller changes on the service prerequisites.
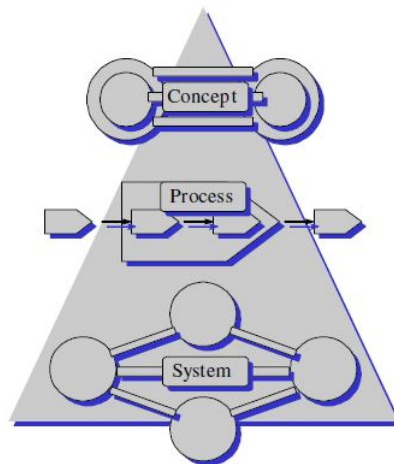

Figure 2.4.: *The Service Prerequisites Model*

Smith et al. (2007) also pronounces that this approach allows developers/designers to adopt a holistic, or panoramic, approach to new service design that addresses (1) the service

concept; (2) the service process; and (3) the service system. It is also stated that the service system incorporates "the resources available to the process for realizing the service concept". Where Edvardsson and Olsson (1996) identify a range of resources that are encompassed within the service system. They are:

1. Human resources (skills and knowledge, staff needs and views on new services)

2. Customers (understanding their wishes and expectations, identifying appropriate levels of customer knowledge, effectively designing customer interfaces (be they telephone, automated or face-to-face))

3. Physical/technical (buildings, technology, location, and communications systems)

4. organization and control (structures and hierarchies, supply chain processes, customer relationship management)

According to Smith et al. (2007) the service process refers to "the chain or chains of parallel and sequential activities which must function if the service is to be produced". This includes interfaces between departments, customers and suppliers and requires detailed consideration of processes and activities contributing to the service.

All of the above discussed is very important, but it is not to be over looked that the most important part of the process is to take into consideration the customer. According to Patrício et al. (2011), 'Customer experiences cannot be designed, but services can be designed for the customer experience'. In order not to neglect the importance of the customer experience, both the Service Experience Blueprint method and Value Constellation Model will be developed on the Methodology chapter.

2.3. Exploring the Customer Experience

2.3.1. Customer Experience

Customer experience could be defined as "the internal and subjective response customers have to any direct or indirect contact with a company" (Meyer and Schwager, 2007). Voss et al. (2008) classify experience-centric services as the ones in which the customer experience is at the center of service provision. The objective of this project is to explore and improve the current service for patients with some sort of foot pathology. For this matter it is imperative to understand the customer experience, and this exploration was made through some of the

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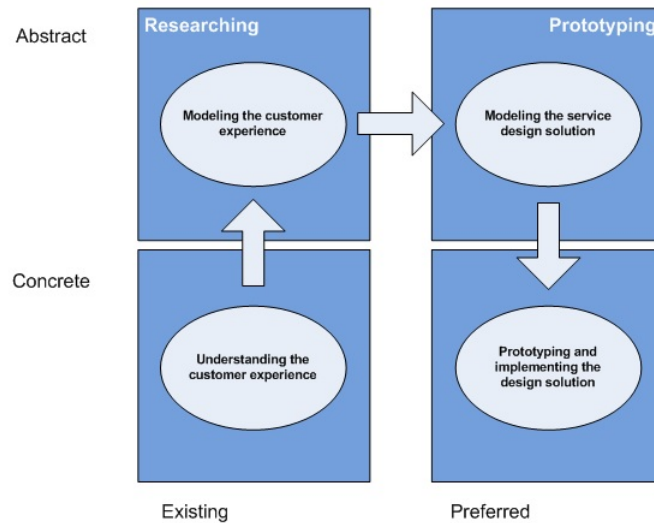tools mentioned in the literature review and also with the bridge model presented on figure 2.5

Figure 2.5.: *Bridge Model, taken from Patrício et al. (2013)*

In order to being able to follow the bridge model, it is important to understand the two basic parts of it. The existing service and the pretended one; this information will be obtained through interviews to the different parts involved in the service provision.

2.3.2. Methods to understand the Customer Experience

The customer experience is, sometimes, difficult to understand; especially since it could not be the same for the different customers. It could even depend on the mood of the customer at the time of accessing the service, because of that some authors like Carreira et al. (2013) recommend using experience factors (EFs); which he says can be defined as customer perceptions of all aspects of a product or service that contribute to the customer experience (Patrício et al., 2008). Moreover, even though prior empirical studies consider EFs that are not in direct control of the service provider, such as atmospherics or the social interactions. Abou-Zeid et al. (2012) do not analyze these factors as part of the customer experience from a holistic perspective.

But it is not enough to analyze the perception it is also important to know the internal response of the customer, that's where the experience components (ECs) come in, Carreira et al. (2013) says they can be defined as customer internal responses to the service provided and are driven by customer EFs. Prior experience research conceptualized three types of ECs associated with generic service provision (cognitive, sensorial and emotional) (Dell'Olio

et al., 2011). These three types of ECs can be used to systematize the customer experience, making it easier to analyze it.

2.3.3. Methods to systematizing the Customer Experience

Continuing with the line of thinking in this section it will be defined what could be considered to fit in the each of the three categories previously defined.

2.3.3.1. Cognitive component

Carreira et al. (2013) states that the cognitive component of the customer experience has been more extensively studied in prior research than the other components. It involves customer mental processes such as satisfaction or quality assessment of a service or product (Parasuraman et al., 1988). This means that it is more of a thinking process, a thinking assessment of the service. It is not only a feeling, but a component for which the customer makes an internal analysis of his experience and creates an opinion about it, in other words the service provider does not have total control about it, because is a personal opinion based on facts, but an opinion none the less.

2.3.3.2. Sensorial component

Continuing with the same idea, customers use all sensory systems (smell, sight, touch, hearing and some tomes even taste) during the service experience, and aesthetics is also related with the human senses based on the sensory interpretation of an object or environment (Hekkert, 2006). "Thus, the aesthetic concept is not limited to the visual domain; things can also be aesthetic or pleasant to listen to, touch, smell, or taste (Hekkert and Leder, 2008).

Putting it in a different way, the sensorial component is everything that the customer feels, but the things he can physically feel, is not an emotion of how things make someone feel, but the physical response to physical stimulation. For example, cookie smell, the music playing in the background, how comfortable are the chairs, the colors or how organized in space is everything.

2.3.3.3. Emotional component

Authors like Price et al. (1995) state that the emotional response of the customer can affect the service delivery. But most literature does not mentions or classifies emotions, but they use more standardized tools based on service affective assessment using the pleasure-arousal-dominance (PAD) scale (Russell and Mehrabian, 1977).

This last classification, advocates to feelings, how things make the customer feel. But has nothing to do with actual physical reactions, thoughts or opinions. It is about the sentimental response of people, some situations can make some people, sad, anxious, angry, happy, pleased, etc. Going through the whole gamma of human emotions, and those emotions will be classified here.

2.4. Envisioning New Services

The main objective of this dissertation is the creation of a new service, the new service was created under the aim of integrating service design with product service systems, to design an integrated solution with the different service providers. For that purpose it is important to use the proper tools and methodology. In the following section some tools will be explored. But for academic purposes this dissertation could guide future researchers for creating new product service systems with multiple service providers. As for any other subject, in the literature there are many options of methodologies and guides to design services; some of them are presented in the following subsections.

2.4.1. Design Thinking

Design thinking incorporates the consumer insights in depth and rapid prototyping, all focused at getting beyond the assumptions, beyond the established "boxed solutions" that end up not being the real or effective solutions. Design thinking—inherently optimistic, constructive, and addresses the needs of the people who will consume a product or service in an experimentation solution (Brown and Wyatt, 2015).

"It is the form of thought that enables movement along the knowledge funnel, and the firms that master it will gain a nearly inexhaustible, long term business advantage" (Martin, 2009). The advantage comes when service providers start actually addressing real problems with solutions that actually respond to customers needs. From the engineering point of view, engineering design is a systematic, intelligent process in which designers generate, evaluate, and specify concepts for devices, systems, or processes whose form and function achieve clients' objectives or users' needs while satisfying a specified set of constraints. (Dym et al., 2005)

Brown and Wyatt (2015) states that the design thinking process is best thought of as a system of overlapping spaces rather than a sequence of orderly steps, these sequence is:

- Inspiration: the problem or opportunity that motivates the search for solutions

- Ideation: the process of generating, developing, and testing ideas

- Implementation: the path that leads from the project stage into people's lives

2.4.2. Multilevel Service Design

In order to improve the service designing and the user satisfaction, some authors have proposed a multidisciplinary, multilevel service design. One of the evolutions that services have suffered through the years is the development of new technologies; with the uprising of internet and mobile technologies, service providers have seen themselves in the situation to keep up with the emerging technologies and the emerging necessities of the customers.

"Many firms have introduced online services without understanding customer experience needs or taking an overall view of the firm's multi-interface offering" (Patrício et al., 2011). In other words many companies try to keep up with new technologies without really understanding the customer, what does the customer really need? And what do they want? For these reasons is that designing for the customer experience is so important, specially since as was mentioned before, now customers expect to have a great experience and not only a tangible product. Instead of delivering pre-produced offerings, firms can only offer value propositions, which customers then transform into value through use (Normann and Ramirez, 1993).

The problem with customer value is that it is different to every one, in other words something valuable for one person may not be valuable for another one and dealing with subjectivity can be very difficult. And to deal with all of this problems there are some tools available, like the ones presented in figure 2.6, which will be explained shortly. Also according to Patrício et al. (2011) There are four main steps for multi-level service design, which are:

- Step 1: Studying the customer experience

- Step 2: Designing the service concept

- Step 3: Designing the firm's service system

- Step 4: Designing the service encounter

2.4.3. Value Constellation

Normann and Ramirez (1993) developed the concept of a value constellation, which represents the network of actors and their relationships while creating the service together. This value constellation can be viewed as a system of smaller service systems.
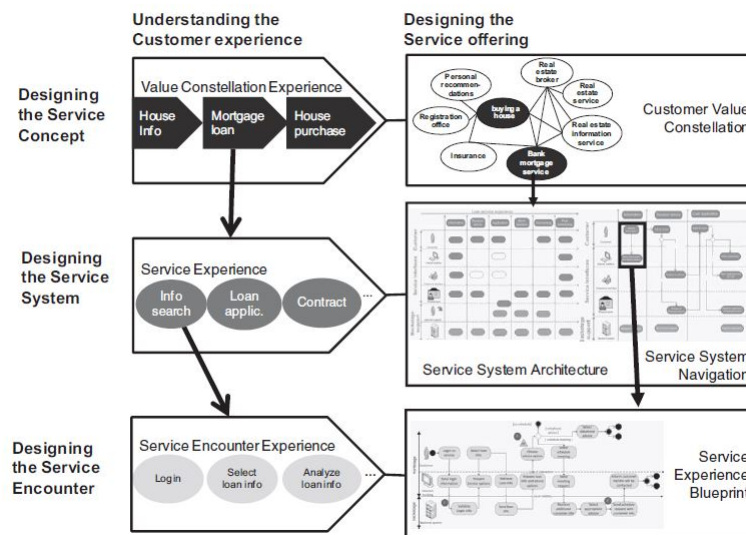
Figure 2.6.: *Component models of multilevel service design, taken from Patrício et al. (2011)*

"The value constellation experience is co-created through the interactions between the customer and all service organizations that enable a given customer activity" (Patrício et al., 2011).

"From this more relevant value constellation perspective, value is co-produced by actors who interface with each other. They allocate tasks involved in value creation among themselves and to others, in time and space, explicitly or implicitly" (Normann and Ramirez, 1993). In other words the value constellation helps to understand the interaction between the customers and the service providers, making it visual and easier to understand exactly were into the process the interaction is given.

2.4.4. Service System Architecture

In order to understand the service experience and the interactions that take place during the service provision, there are some tools that help to have a better and more visual comprehension of the different actors and interactions between them.

One of those tools is the service system architecture. "Based on understanding the service experience, the firm's service system is designed to enable customers to follow multiple patterns of navigation across service interfaces through the SSA and SSN" (Patrício et al., 2011).

According to her this includes three components, and the example of the SSA can be seen in 2.7

1. For each service task, the service system should offer an interface mix that enables customers to choose their preferred service interface.

2. The service system should enable customers to smoothly navigate across service interfaces through the different tasks of the service activity.

3. Instead of replicating every offering in every service interface, the service system should enhance the service experience while contributing to efficient resource allocation among interfaces.
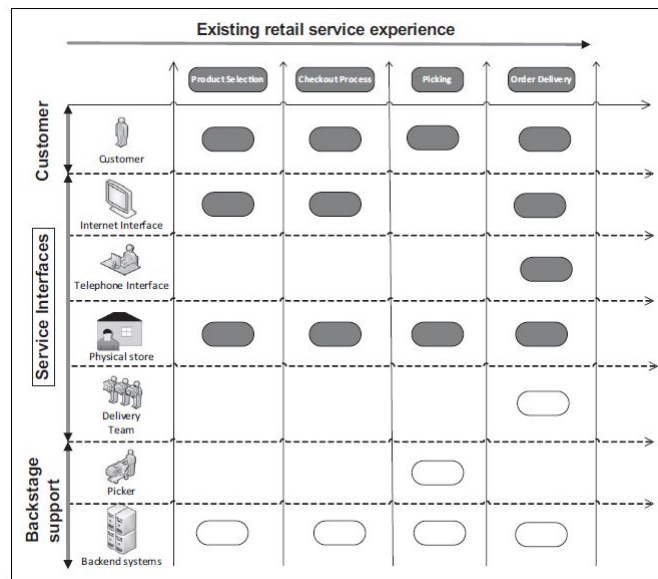
Figure 2.7.: *Example of a service system architecture for the retail service, taken from Patrício et al. (2011)*

2.4.5. Service Experience Blueprint

Service blueprints are pictures or maps of service processes that allow people involved in designing, providing, managing, and using the service to better understand them and deal with them objectively. A service blueprint simultaneously depicts the service process and the roles of consumers, service providers, and supporting services (Da and Dt, 1998).

It is especially appreciated that the service blueprint highlights the customer interactions in the service operations processes and, that the line of visibility is used to separate activities of the front office, where customers obtain tangible evidence of the service, from the back office processing, which is out of customer view. The blueprint can facilitate problem solving

and create thinking by identifying potential points of failure and highlighting opportunities to enhance customers' perceptions of the service (Tseng et al., 1999). An example of this tool can be appreciated in figure 2.8.
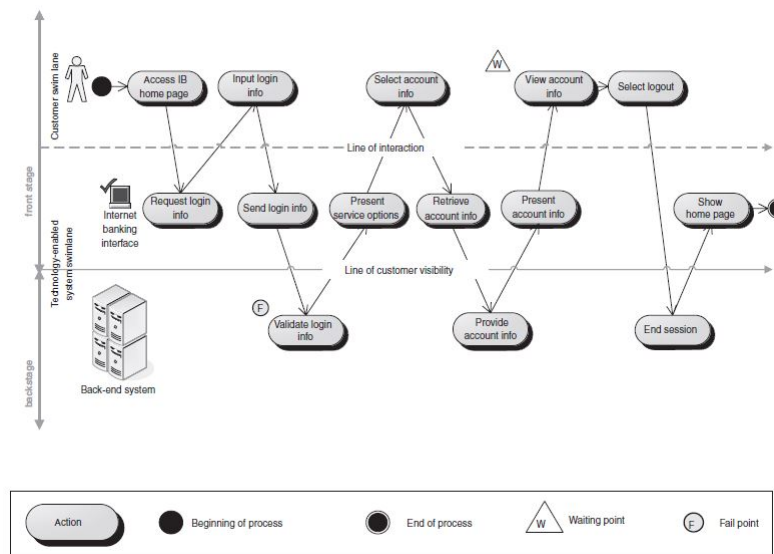
Figure 2.8.: *Service Experience Blueprint for Gathering Current Account Information Through Internet Banking, taken from Patrício et al. (2008)*

According to Patrício et al. (2008) the SEB method comprises three stages:

1. Assessment of the service experience for different service activities: This stage uses qualitative and quantitative research to identify CER dimensions and indicators, to analyze their importance and prioritization for the different service activities (independently of the channel used), and to assess relative service interface performance in satisfying those needs. By understanding customer experience needs independently of the service interface usage, SEB broadens the design space and enables designers to consider the various service interface alternatives.

2. Service design at the multi-interface level: Based on the results of the previous stage, a GOA is developed to understand the desired softgoal decomposition and prioritization) as well as to evaluate the contribution of different channel designs to satisfy CERs. This analysis allows for an integrated design of the multi-interface offering, defining interface specialization and integration.

3. Service design at the concrete interface level: After the multi-interface analysis, the design drills down to each service interface, using the SEB diagram. Based on the

21

previous stages, each service interface is designed to support the specific activities previously defined, leveraging its capabilities to better satisfy CERs while carefully designing service links to guide the customer to other channels whenever that enhances the overall service experience.

2.4.6. Motivation Matrix

As communication becomes more and more important for designing, new representation tools are needed for designers to communicate the new systemic solutions to a broader audience of stakeholders. The precision of those tools is absolutely critical: just like technical people in the production departments, all the other actors, including customers must understand their role in the system (Morelli, 2006b). And the main questions that need to be answered are:

- Who are designers communicating with? Different actors talks different languages and, therefore different communication techniques

- What is the content of the communication? An overall description of the system or a detailed description of products, events and infrastructures?

- What is the level of definition in the representation? The earliest concepts and the final solutions require different communication tools

One of those new techniques is the motivation matrix, it is a tool to coordinate roles and expectations from different actors, is a technique to visualize the functional relation between all the stakeholders of the production system. This determines the participation or contribution of the different actors to the system which is a fundamental step in deciding and organizing their role and input. The Motivation Matrix is mainly targeted at internal use and the perspective is primarily technical due to the construction point of view: the reason why each actor should be part of the system. By filling up the matrix the designer is forced to reflect and carefully extract the much needed information (Morelli, 2006b).

2.5. Conclusions

Nowadays technology is developing at speeds never before seen in history, and for that reason people every day expect more and more from products and services. That means that service providers need to keep up with the technology and what their customers expect from

them to stay in business. This can be achieved by integrating the service design with the product service system, this integration can help different companies to manage to have a differentiation that will allow them to have a competitive advantage in the market.

Nonetheless from the literature review we can conclude that there are tools to manage to keep up with customers expectations, but this means that the service has to be revised every once in a while to assure that the customers needs and expectations continue to be fulfilled, because as it was mentioned before the customers also evolve and keep looking for better and more personalized services. Also it is important to take into consideration that people are starting to see these customizations as something that has to be present, not as an extra.

3 Methodology

This project looks to understand and create a new customer experience for the three different actors involved in the production of orthopedic insoles. Since it does not exist in the present it is imperative to understand the exact functions of all the persons involved, this with the objective of being able to create the new service around the functions of the different actors.

As it was mentioned before the main objectives for the present dissertation are:

1. Study the stakeholders and their needs.

2. Defining the value proposition and business model associated to the service.

3. Develop a new service under a new provision paradigm.

3.1. Research Method

As with any other project there are many ways to to obtain the information necessary to develop the final product, which in this case would be the masters dissertation. In order to develop the current project the most important asset to explore will be the customer experience that will be obtain though an exploratory research method, more specifically through qualitative research.

"Exploratory work has long been characterized as a brief, fleeting, preliminary stage in research process that gives way –the sooner the better– to the real thing... Exploratory research is about putting one's self deliberately in a place –again and again– where discovery is possible and broad" (Stebbins, 2001).

The basic differences between qualitative and quantitative researches are clarified by Newman and Benz (1998) on figure 3.1. But these method not necessarily need to be seen as one against the other, they can be used together in order to have a more complete study. Nonetheless for the current dissertation the research that will be used is the qualitative, because it is more in line with the project's objectives.

Quantitative	Qualitative
Numbers used as data	Words – written and spoken language – (and images) used as data
Seeks to identify relationships between variables, to explain or predict – with the aim of generalising the findings to a wider population	Seeks to understand and interpret more local meanings; recognises data as gathered in a context; *sometimes* produces knowledge that contributes to more general understandings
Generates 'shallow' but broad data – not a lot of complex detail obtained from each participant, but lots of participants take part (to generate the necessary statistical power)	Generates 'narrow' but **rich data**, '**thick descriptions**' – detailed and complex accounts from each participant; not many take part
Seeks consensus, norms, or general patterns; often aims to reduce diversity of responses to an average response	Tends to seek patterns, but accommodates and explores difference and divergence within data
Tends to be theory-testing, and deductive	Tends to be theory generating, and inductive (working *up* from the data)
Values detachment and impartiality (objectivity)	Values personal involvement and partiality (subjectivity, reflexivity)
Has a fixed method (harder to change focus once data collection has begun)	Method is less fixed (can accommodate a shift in focus in the same study)
Can be completed quickly	Tends to take longer to complete because it is interpretative and there is no formula

Adapted (and expanded) from Tolich & Davidson (2003)

Figure 3.1.: *Qualitative vr Quantitative, taken from Newman and Benz (1998)*

3.1.1. Qualitative Research and Grounded Theory

Qualitative research is based on the belief that knowledge is constructed by people in an on-going fashion as they engage in and make meaning of an activity, experience, or phenomenon (Merriam and Tisdell, 2015). Then the researcher has the objective of interpreting people's experiences and feeling toward a certain situation.

While Braun and Clarke (2013) make a distinction between qualitative and quantitative research is somewhat simplified, they write that "the most basic definition of qualitative research is that it uses words as data, collected and analyzed in all sorts of ways. It is also stated that one thing absolutely fundamental is to know and understand that there is not a correct version, in other words there is no correct answer, it depends on the perspective of both the interviewer and the interviewee.

Because the fact that most of the information recollected will not be the same for all cases Merriam and Tisdell (2015) states that by establishing basic descriptive categories early on for coding, the researcher will have easy access to information in the analysis and interpretation stage.

In qualitative studies, a form of content analysis is most often used to analyze documents.

Essentially, content analysis is "an unobtrusive technique that allows researchers to analyze relatively unstructured data in view of the meanings, symbolic qualities, and expressive contents they have and of the communicative roles they play in the lives of the data's sources" (Krippendorff, 2013, p.49) (Merriam and Tisdell, 2015).

According to Braun and Clarke (2013) the elements of the qualitative paradigm include:

- The use of qualitative data, and the analysis of words which are not reducible to numbers

- The use of more 'naturally' occurring data collection methods that more closely resemble real life this develops from the idea that we cannot make sense of data in isolation from context

- An interest in meanings rather that reports and measures of behavior or internal cognition

- The use of inductive, theory-generating research

- A rejection of the natural sciences as a model of research, including the rejection of the idea of the objective scientists

- The recognition that researchers bring their subjectivity into the research process - this is seen as a strength rather then weakness

There is the possibility to give a quantification to the qualitative data, none the less, quantification need not to be a component of content analysis, however. Rather, the nature of the data can also be assessed. Schereir (2014) describes how qualitative content analysis differs from quantitative content analysis, which traditionally ascribed meaning through counting: "Whereas the focus in qualitative contents analysis continues to be on manifest meaning [through counting], qualitative content analysis is also applied to latent and more context dependent meaning" (p. 173) (Merriam and Tisdell, 2015).

"In general a theory is an explanation of something or an understanding that the researcher develops. In grounded theory, theoretical categories that are arrayed to show how the theory works" (Creswell and Brown, 1992).

According to Creswell (2012) there are three basic steps for any theory which are:

- Memoing: in this memos the ideas attempt to formulate the process that is being seen by the researcher and to sketch out the flow of this process.

- Data collection: is often interviewing in which the researcher is constantly comparing data gleaned from participants with ideas about the emerging theory.

- Data analysis: can be structured and follow the pattern of developing open categories, selecting one category to be the focus of the theory, and then detailing additional categories to form a theoretical model.

"Grounded theory is an inductive methodology, an approach that begins with concrete empirical evidence and works toward more abstract concepts and theoretical relationships" Neuman (2006).

But the most important part of this kind of approach, according to most authors, is to keep open minded in order not to skew the data obtained and most importantly to not to influence the interviewees.

3.2. Sample Design

The sampling design is very important in any study, the sample has to be objective, the right size and part of the population under study. In this case the sample has to be taken from the actors that participate in the process of insole making.

According to Charmaz (2006) in grounded theory does not stop until the data categories are saturated, or as he put's it "when gathering fresh data no longer sparks new theoretical insights, nor reveals new properties of the core theoretical categories".

The sample needs to have representatives from the three basic interest groups, which are orthopedics, podiatrists or insole technicians and patients. And even though it would be nice to have a big sample, because of the sensitivity of the population that would be part of this study, big samples is not realistic. So the size of the sample will mostly depend on the availability of the actors involved in the process.

For the current dissertation it was very difficult to manage for health care providers to cooperate with the research project, specially in Portugal. The researcher managed to interview one orthopedist in Portugal and nine in Costa Rica; for the podologists or insole makers the interviews were conducted to one in the United States of America and two in Costa Rica; and for the case of the patients, four were interviewed in Portugal, three in Costa Rica and three more in the United States of America.

3.3. Data Collection

Qualitative studies and grounded theory are usually based on the collection of rich data, the collection of this type of data is usually associated with methods like interviewing and observation Charmaz (2006). states that "intense interviewing has long been an useful data gathering model" and according to Patrício et al. (2013) interviewing is better suited to gather information about customer needs, because it allows the interviewee to verbalize their opinion. Observation is also a great way to gather information, but because of the sensitivity of the subject under study, observing the patients while being treated could be considered a attack of their privacy.

For the present work, the data was collected through interviews and conversation with healthcare specialists and with users and possible users of the orthopedic services of diagnosing, measurement, fabrication and usage of insole and orthotics. After finishing with the interviews the data was systematized and analyzed.

3.3.1. Interviewing

On this study it is intended to interview healthcare professionals in the orthopedic and podology areas, also patients that have, or may have had foot pathologies.

Having as the main objective to study and evaluate the current data collection process, also the criterion used by the professionals to identify if there is a problem present, and in case there is a problem, the criterion to identify the possible solution. The study results will provide a base for service design and development, taking into consideration both, health providers' professionals and patients necessities.

The general objectives of this study are:

- Determine the real interest in the service product system and to identify the key factors of the system.

- To study the customer experience of the interviewees, with the objective of identifying the value chain and key points.

- Integrate the service design with a product-service system that satisfies the participants' needs.

The project was developed under the service design focus, by a series of iterations between the different stakeholders of the process. Having as an objective the identification of shores

and functions of the people involved, with the finality of improving the current measurement and control processes, and the patients' evolution.

Based on the results of the study, a new service was developed based on a product. The experiences of all the people involved were a great help for the creation of a new service experience, with a different measurement way and more accompaniment of the patient through the treatment.

The interviews were conducted between April and June of 2016. They were conducted to persons in Costa Rica, Portugal and the United States of America. The total of interviewees were ten doctors, three orthotic fabricators, and ten patients as it was specified in the sample design. The study protocol with the interview script is in appendix A.1.

The interview for the three different actors, has three main parts which are:

- Foot pathologies: for these section the objective is to gather information about the diagnose process and how many people actually have foot pathologies.

- Fabrication process: the idea of this part is to get information about the current processes for measurement and fabrication of the insoles.

- Product/ Service system: for the service development, this is were most of the information is gathered for the new service proposal. The needs and requirements for the different actors of the service.

Taking into account the research objectives, the subsequent interviews were semi-structured (Pawson, 1996). Open-ended questions (Foddy, 1993) were developed considering all the phases of the customer journey to enable them to express a comprehensive perspective regarding the service, as well as their cognitive assessment, senses and emotions (Carreira et al., 2013).

Observation continued even during the interviews to notice every relevant aspect and the non-verbal behavior of the interviewees. Other information gathered included the facilities' and interior and exterior environments. Some interviews were be digitally recorded and all of them literally transcribed (Maxwell, 1992) (Carreira et al., 2013).

3.4. Data Analysis

According to the grounded theory the data should be coded. "Moving between an inductive and a deductive approach, the initial coding of the interviews were essentially open, but as the coding was refined, attempts were made of concept-driven coding (Strauss and Corbin,

1998). On the other hand, the observation notes clarified the data coding, for example some of the interviewees' verbal comments were associated to different experience factors than the ones suggested by the data or the literature" (Carreira et al., 2013).

The different interviews were analyzed depending on the category and the function of the actor under interview. The first step for data coding is to transcribe all the interviews, then the coding was made by creating different classifications but differentiating the function of the actor.

The basic classifications used were:

1. The goal of the different services provided

2. The needs of the different stakeholders

3. The perception of the availability of services

4. The services that the different stakeholders would like to have

5. The current relationship between the stakeholders

6. The desired relationship with the stakeholders

7. The perception of the service concept

8. The requirements customers, both internal and external, have of the service

9. The suggested features the stakeholders would like to have

3.5. Participatory Design

As it was mentioned before because of the field in which this investigation is being developed, a great way to obtain information can also be the participatory design. Muller and Kuhn (1993) states that "participatory design first took root in Europe, strong labor unions, acting as advocates for workers, and a history of socio-technical approaches which argued for the importance of the social dimension of work with technology".

In participatory experiences, the roles of the designer and the researcher blur and the user becomes a critical component of the process. The new rules call for new tools. People want to express themselves and to participate directly and proactively in the design development process (Frascara, 2003).

According to   Sanders (2002) there are many ways to learn about people's memories, current experiences and ideal experiences, they can be seen more explicitly in figure 3.2; those ways to learn are also categorized in different levels, presented in figure 3.3, and they are:

Figure 3.2.: *Ways to learn from people, taken from Sanders (2002)*
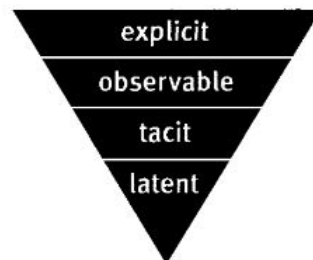
Figure 3.3.: *Learning levels, taken from Sanders (2002)*

- Listen to what people say

- Interpret what people express, and make inferences about what they think

- Watch what people do

- Observe what people use

- Uncover what people know

- Reach toward understanding what people feel

- Appreciate what people dream

The participatory design emphasizes the direct and active participation of all the different stakeholders in the developing process of designing (Sanders, 2002).

The main idea of the participatory design is to use, this experiences and feelings of people to help with the design of the service. In this specific case, the investigator sought the advice of orthopedic medics to help co-design the service.

4 Designing a new insole solution with a service design perspective

4.1. Exploration: Understanding the experience of the different stakeholders

After speaking with several collaborators in the area, it helped the investigator to determine the actors that were part of the process, which are the doctor, the podologist (or insole maker depending on the country) and off course the patient. And because of that reason this three groups were the interviewees.

Since the idea of the new service is not to replace any part of the existing actors, but to work with them to improve the quality and accompaniment of the service. For this reason is that every actor of the current service will be a client of a different part of the overall service.

4.2. Results Systematization and Study of Customer Experience

The interviews were made to different people from different background and life experience, and most importantly different countries. This means that all the twenty three interviews are completely different, and even though a script was followed, because of the fact that they were open interviews, every single one of the interviewees has a different opinion and expresses concern about different things and areas.

In order to be able to analyze the information obtained by interviews, it is imperative to find a way to systematize it. The method to make this systematization was to mark important statements done by the different interviewees, trying to find a common ground that will set the bases for the new service proposition. But this systematization was made by area, since the proposed service will have different features for the different actors. This systematization is nor easy nor a lineal work, some times the investigator needs to read between the lines and

to interpret the interviewees answers. In the present section there will be presented summary tables with the features considered to be the most relevant.

The first thing to discover is which is the purpose or goal of the services. The opinions of the different actors for this aspect was very homogeneous as it shows on table 4.1, and it is to provide a solution for the patients pathologies. As we can see the goal is very clear for the service providers, but for the benefit of the current project it is important that the final service does not grow far from these goals.

Table 4.1.: *Business goals*

Business	Goal	Source		
		Medics	*Podologists*	*Patients*
Orthopedic	To provide solution to patients	10		10
Podologist	Create a solution to patients		3	10

Then the investigator decided to determine which were the needs that the different actors thought could be important and should be taken into consideration for the creation of the new service. As it can be seen in table 4.2, there are six main needs that the three types of actors consider are the most important that need to be addressed in the service, this information too shows the homogeneity of this service, which is curious taking into consideration the fact that the interviews were conducted in three different countries.

Because of the nature of the stakeholders it is not strange that they could have different needs of that the level of importance of them is different for them. For example, the accurate information is clearly stated as really important for both medics and podologist, but for some of the patients it does not appear to have such an important weight for a final service. In the case of the static foot measurement, it seems to have a bigger importance to the podogists that for the rest of the actors, in fact in the lowest score for both patients and medics. It is important to mention that for the dynamic foot measurements and gait measurements, the healthcare providers professionals had a very clear idea of what these concepts mean, and were very open to the idea of implementing them. In the case of the patients it was necessary to give a more detailed explanation of both concept and for them to understand, but most of them seamed very exited with the idea of having not only the information but for it to be given in a way that they could understand and not as technical as it is normally given. The last two needs approached on the table are actually he ones that were the most exiting for all the participants, because as it was said by one of the medics "information is the real treasure", sometimes because of the way the current service is provided the information stays in a very

disintegrated way, all of the stakeholders only has information of his part of the service and in case of the patients sometimes they do not really understand what that information means, and the healthcare professionals usually do not clarify the information for them.

Table 4.2.: *Actors needs*

Needs	Source		
	Medics	*Podologists*	*Patients*
Accurate information	10	3	8
Static foot measurement	8	3	7
Dynamic foot measurement	9	2	9
Gait measurements	10	3	8
Information about the pathology	10	3	10
Pathology treatment	10	3	10

Now for table 4.3, is the summary of the perception of the available services, which as it is shown in the same table, it is evident that is not known to all the patients that a foot mold is or can be made. And in contrast in table 4.4 we present which are the services that most of the actors would like the service to have. From this table it can be inferred that the most interested on the services are podologists and patients.

Table 4.3.: *Available services*

Available services	Source		
	Medics	*Podologists*	*Patients*
Static measurement	10	2	10
Foot mold	10	1	5
Insole creation	10	2	10
Pathology treatment	10	2	10
Follow-up appointment	10	2	10

The main conclusion of the table 4.3 is that most of the stakeholders has clear view of the main services that are available; the only exception being the foot mold. It is important to clarify that two of the patients and one of the insole makers do not consider that the process an actual molding process, this is because of the technology available. For the case of this particular insole maker, he still makes the mold in paper and because of that he does not consider it as a mold; but for practical uses it is a mold, because it will determine the size and shape of the final insole. Now for the other three patients is more of an element of

Table 4.4.: *Desired services*

Desired services	Source		
	Medics	*Podologists*	*Patients*
Patient profile	10	3	10
Progress report	8	3	10
Dynamic measurements	8	3	10
Follow-up information	10	3	9
Follow-up measurements	9	3	10

distraction or lack of attention to the process, because they just did not remember that step of the process.

Passing on to table 4.4 the stakeholders that externalized the lower interest were the medics, none the less the services with the lowest interest are progress report and dynamic measurements that have 80 % of shown interest. In case of the insole makers they were all very interested on the possibilities of providing these new options of service, most of them declared to be very exited with the follow-up measurements, specially the one in the United States of America. He focused specially in the fact that having this information could be very helpful to determine the progress of patients and to have a quicker response when the treatment is not having the expected results. For the patients the ones that sounded the most exiting were the progress report, dynamic measurements and the follow-up measurements; just as it was mentioned before the most valuable part for patients is to have all of this information in a language that they are able to understand.

Now for the relationships that are present in the service can be seen in table 4.5 and in table 4.6 the desired ones, as it is shown most of the actors are very interested in having more communication thought the complete process, and is something that will be taken into consideration.

Table 4.5.: *Current relationships*

Current relationships	Source		
	Medics	*Podologists*	*Patients*
Professionalism	10	3	9
Respect	10	3	8
Trust relationship	10	3	10
Pride	2	3	10

Table 4.6.: *Desired relationships*

Desired relationships	Source		
	Medics	*Podologists*	*Patients*
More communication	8	3	10
Approachability	7	3	10

The most homogeneous sample are the insole makers, they seem to agree with most things, and the relationships is not the exception. They are satisfied with most of the current relationships as they are, but they also mentioned that the only aspect that they did not like, was the fact that they were not treated in the best way by the medics, they all seem to be resentful about the pride of the medics, and that sometimes they do not even accept suggestions, and this attitude makes them feel a little disrespected, but they also made it clear that they only feel this way with a small minority of medics. The patients seem to have the same idea, and they also added that they would like the healthcare providers to simplify the language for them to understand, since they usually speak in a very technical manner; and both groups expressed a necessity for more communication and the desire of approachability from the medic side.

As it was expected, the medics do not have the perception that they are not approachable and at least it not intended to reflect pride or lack of been approachable. Also most of them would like to have more and better communication between all stakeholders, they seamed to like the idea of having a tighter relationship with the insole makes, not so much with the patients.

Table 4.7 could be considered as a resume of the current services and how it is perceived by the different actors, an important thing to take into consideration is the fact that many patients does not feel that there is an actual follow-up from behalf of the medics, subject that is confirmed by the medics, this shows that it is an area that requires some improvement. The reason for this is that many of the patients does not have further contact with the medic after the referral to the podologist. After the medic establishes that the patient needs some king of insole or orthotic, he becomes responsibility of the podologist and is the one that controls the patient treatments from that moment on.

Now, for table 4.8. This table is made to discover the most important requirements for the three types of actors involved in the service. For the three stakeholders that were taken into consideration, comfort is one of the lowest requirements, but it is not to be confused with the comfort of the final product, but it has more to do with the comfort of the process. How

Table 4.7.: *Service description*

Service system	Service concept	Service encounter	Source		
			Medics	*Podologists*	*Patients*
Orthopedic consult	Recognize the problem and find a solution	Medic office	10	3	10
Podology consult	Put into action the solution	Podology center	10	3	10
Delivery	Deliver the product	Podology center	10	3	10
Orthopedic follow-up	Evaluate the progress	Medic office	7	2	6
Podology follow-up	Evaluate the progress	Podology center	10	2	8

the felt though the process, now for a more specific view, both healthcare providers stated that they are not really worried with the idea of the patient feeling comfortable through the process, and this is connected with the good customer service as the investigator discovered this has a lot to do with the fact that most medics do not see the patients as customers, they see them as a patient that needs to be treated but they are not really worried with the customer experience. Since for them their only job is to cure the patient.

Table 4.8.: *Customer experience requirements*

Customer experience requirements	Source		
	Medics	*Podologists*	*Patients*
Reliability	10	3	10
Professionalism	10	3	10
Comfort	4	2	8
Credibility	10	3	10
Convenience	10	2	8
Good customer service	6	2	10
Accuracy	10	3	10
Quality	10	3	10

For the table 4.9 the features presented to them during the interviews, the stakeholders that seemed the most exited with the features were the patients, as it was mentioned many times before the most atractive feature was to present the report and the dynamic measurements in a way that they understand what is happening and all of them were really interested in actually

having the progress information accessible for them to see. The insole makers actually had a very similar reaction that the patients. In the case of the medics only one of them, one of the Costarican medics, did not express interest in the new features.

Table 4.9.: *Sugested features*

Suggested features	Source		
	Medics	*Podologists*	*Patients*
Progress report	9	3	10
Dynamic measurements	9	3	10

All this information is the base to the development of a new service concept, everyone of these aspects are important to know and to be sure that the proposed service will actually be something people need and most importantly that it will actually help in more than one way. Always having very clear that the most important thing is the patient, and every thing has to be made in order to improve the experience and his well being.

5 The New Service

All the chapters before this one are to set the bases for the new service under development. In this chapter is where the actual service is to be presented with the help of the tools and information showed in the chapters before this one.

In the first section of this chapter the investigator describes the service as it is now, without any changes or propositions, then the next sections were dedicated to explain the changes that are being proposed.

5.1. Current Service

Before mentioning the propositions for the new service it is important to leave clear how the actual service is, which will be presented with the help of some diagrams and tools mentioned in the methodology. The information to make this diagrams was obtained from the previews chapters, especially of the interviews with the stakeholders

One of the first thing to help understand the current service as it is today, the investigator will use the value constellation presented in figure 5.1. In this diagram we can see how the different parts of the service interact. The different colors represent the different actors, the red is for the general consultation, green for orthopedics and purple for the insole makers.

Figure 5.1.: *Value Constellation Experience*

This diagram gives us the path that the patient follows in order to receive the service as a whole, the different service providers are usually in different locations, that is why this diagram allows the investigator to have a general and the most macro view of the service provision as it is. Obviously inside every macro representation of the service there are different actions that could be important to take into consideration.

Now in figure 5.2 there is a more specific view, there we can see in general way the different actions are executed and the color code indicates who executes the action, accordingly to the color code of the first diagram. The dotted line for the orthopedic follow-up means that this part of the process is not always followed. It depends if the patient actually makes the request to have an appointment with the doctor.
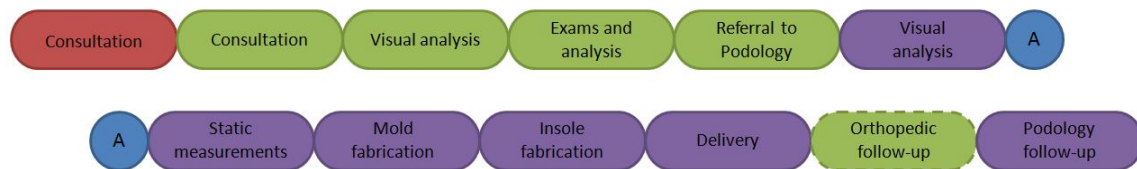

Figure 5.2.: *Current customer experience*

These two diagrams, as it was mentioned before, were made from the information obtained by the interviews to the different stakeholders of the process, it is important to take into consideration that it is practically impossible for this whole process to be completed on a day or even in the same physical installation, but this does not seem to be a problem for the patients, since they do not aspire to have all the service providers in the same physical space. This could have a lot to do with the type of service, since it is the opinion of the investigator after conducting the interviews that patients tend to be less demanding with this particular factor when the service is related to the health provision sector.

5.2. Service Concept

Also the designer decided to use the motivation matrix created by Morelli (2006b). This matrix helps to make it clear the interactions, but in a more specific manner than the ones previously presented. This tool allows to see not only the interactions but the drive that the different actors needs to have in order to make the system work and it is presented in figure 5.3, here it is clear, at least to the designer, that all the actors' mayor concern is the health of the patients and because of that reason, they will make the interaction easy.

Now taking into consideration the information summarized on table 4.8, and the value constellation, we arrive to the figure 5.4, allowing the designer to really understand in what parts of the service the different specifications are required. This diagram comes from the union of the customer experience requirements and how they are connected to the current value constellation.

Figure 5.3.: *Motivation Matrix*
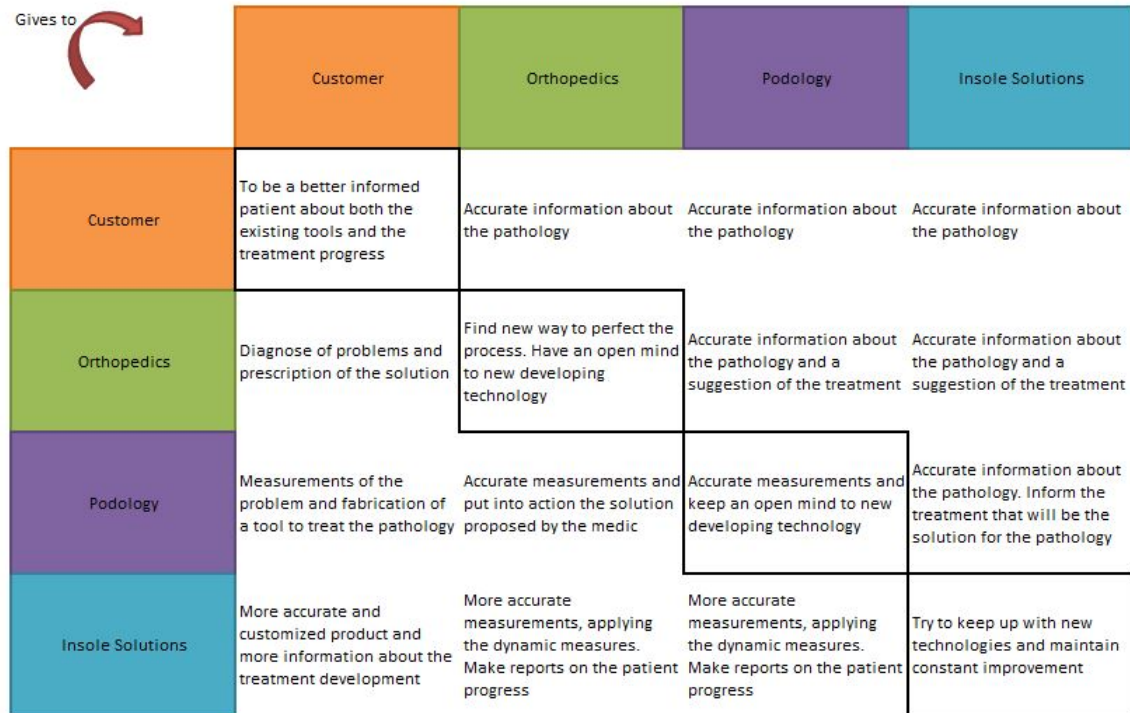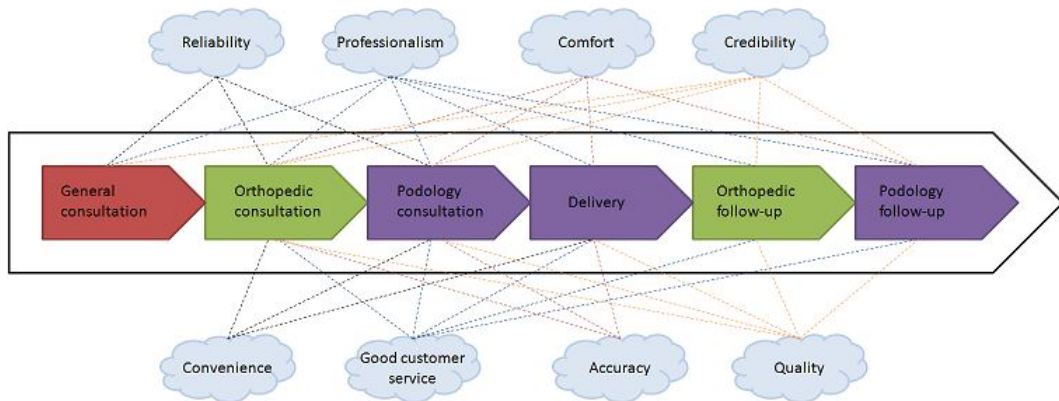

Figure 5.4.: *Value constellation and customer requirements*

Here we can see the relationships between the service providers and the customer requirements, this relationships were determined by the interviewees, and even though many of the information is subject to the interpretation of the interviewer, the proposed service also is. But when discussed with medics and insole makers they stated to be satisfied with the proposal.

All the information collected guided the researcher to come up with new versions of both the value constellation and the customer experience, presented in figures 5.5 and 5.6 respectively. In both figures we can see how Insole Solutions is integrated in the service provision, in the macro view of the process the perfect spot for Insole Solutions to contribute comes right after the interaction with the insole maker. But if we leave the interaction only on the macro level, it is impossible to see that the relationship between the insole makes and Insole Solutions is not that linear. As it can be appreciated in figure 5.6, the services provided by both stakeholders have a certain level of interaction between them, and that is why Insole Solutions needs to provide some of the services in the same physical space that the insole makers.

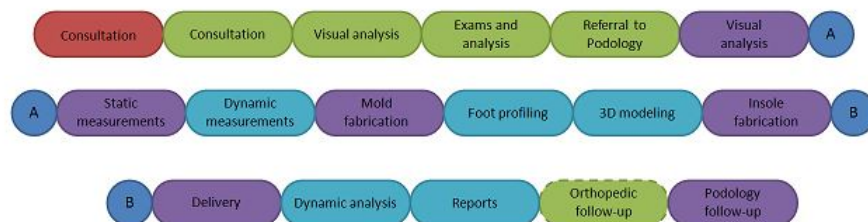Figure 5.5.: *Proposed Value Constellation*

Figure 5.6.: *Proposed Customer Experience*

5.3. Service Proposal

The idea of the new service is to take advantage of every strong asset of the current service, and improve it adding a new actor to help improve the current solutions and acquire new information to attack the problems from a new and renovated point of view.

The most general view of the proposed solution is presented with the help of the flower of Lovelock on figure 5.7, were we can see that the main service is the customized insole, but there are other eight services, were three of them are very standard (billing, shipping and payment) but the other five will actually give a big value to the service, because here is where the differentiation comes.
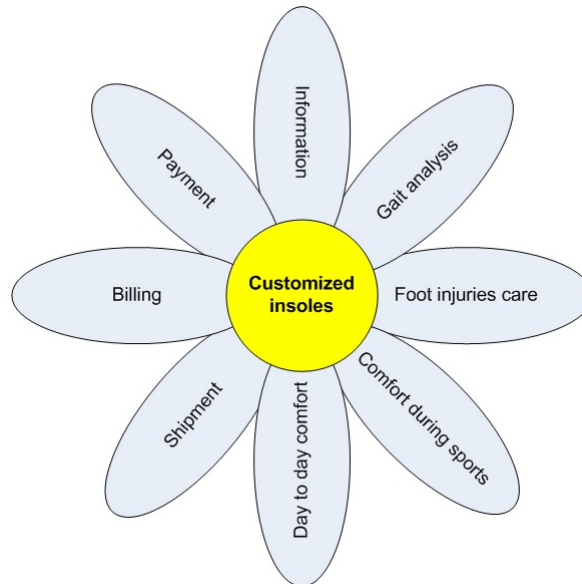

Figure 5.7.: *Proposed service*

Now the actual service that the designer is proposing is to incorporate the dynamic measurements in the insole production process. As it was mentioned before Insole Solution does not seeks to replace any of the actors of the current service, but on the contrary it seeks to help improve the service as it is.

The innovation comes after the static measurements, since this measurements will also be required, but in order to also take into consideration the dynamic measurements, an analysis insole will be created and the insole will be used (depending on the patient) for a period of at least one week, this insole will be created by the insole makers with the requirements given by Insole Solutions. After a week the information will be analyzed and the information will be used to create a profile of the patient and with that profile a 3D mold will be created and given to the insole makers for them to make the definite insole, that will have sensors in order to be able to continue to retrieve information of the patient and the progress of the treatment.

This will cover the service as it is right now, but Insole Solutions will also like to make weekly reports of the patient's progress and send this reports to the podologists, medics and patients. The idea of creating this reports is to have more accurate information about

the treatment, and being able to react faster if there is a problem, in the case of the health professionals, and also to see how the patient if progressing with the treatment. But in case of the patient it gives information that does not exist right now, and they will not have to wait until the next appointment to know about their own progress.

In figure 5.8 we have the current system architecture, that helps with the visualization of who participates in the different activities that are to be developed, the system architecture helps to see the different interactions, and was used to understand how this interactions should happen, and maybe even how to improve it. This way it becomes clear who participates in the different activities that make part of the service.
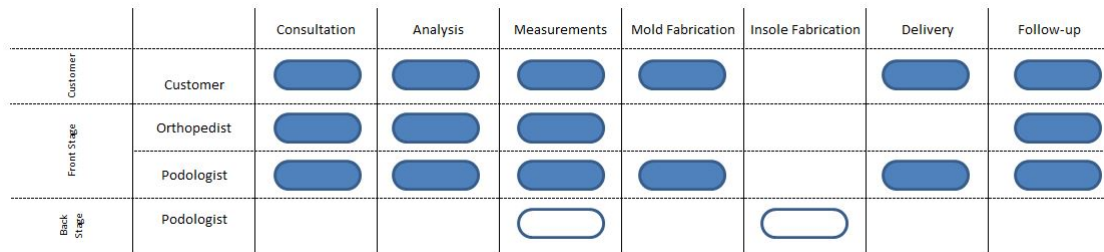

Figure 5.8.: *Current system architecture*

Taking as a base the system architecture of the current service, the designer came with a way to incorporate Insole Solution in the equation of the service as it is today and it is presented in figure 5.9, where we can see how the new interactions will take place. And maybe it becomes easier to see how the company searches how to complement the existing process, giving support to the existing actors instead of trying to replace them. Here it becomes a little bit more clear how in order to the proposition to work, insole makers and Insole Solutions have to work hand in hand for most of the process.
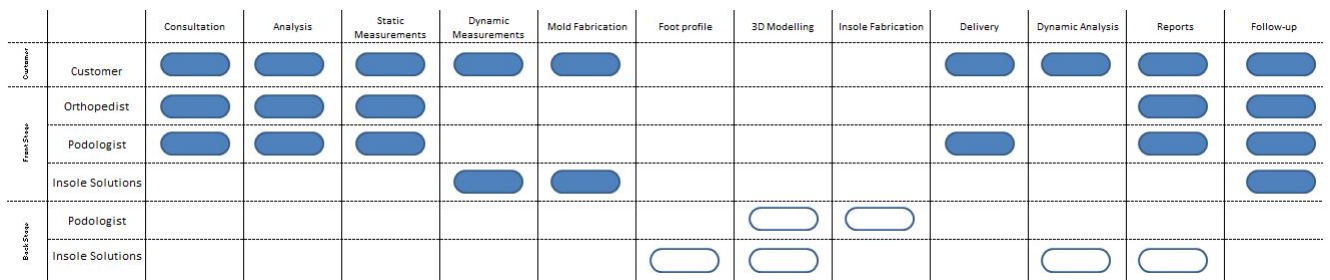

Figure 5.9.: *Proposed service system architecture*

Now in figure 5.10 the designer describes how the service is given, by who, step by step. And there the possible failure points are marked, to be clear about it, the possible failures are

45

not related to the abilities of the person developing the activity, it has more to do with the limitations of the technology that is used.
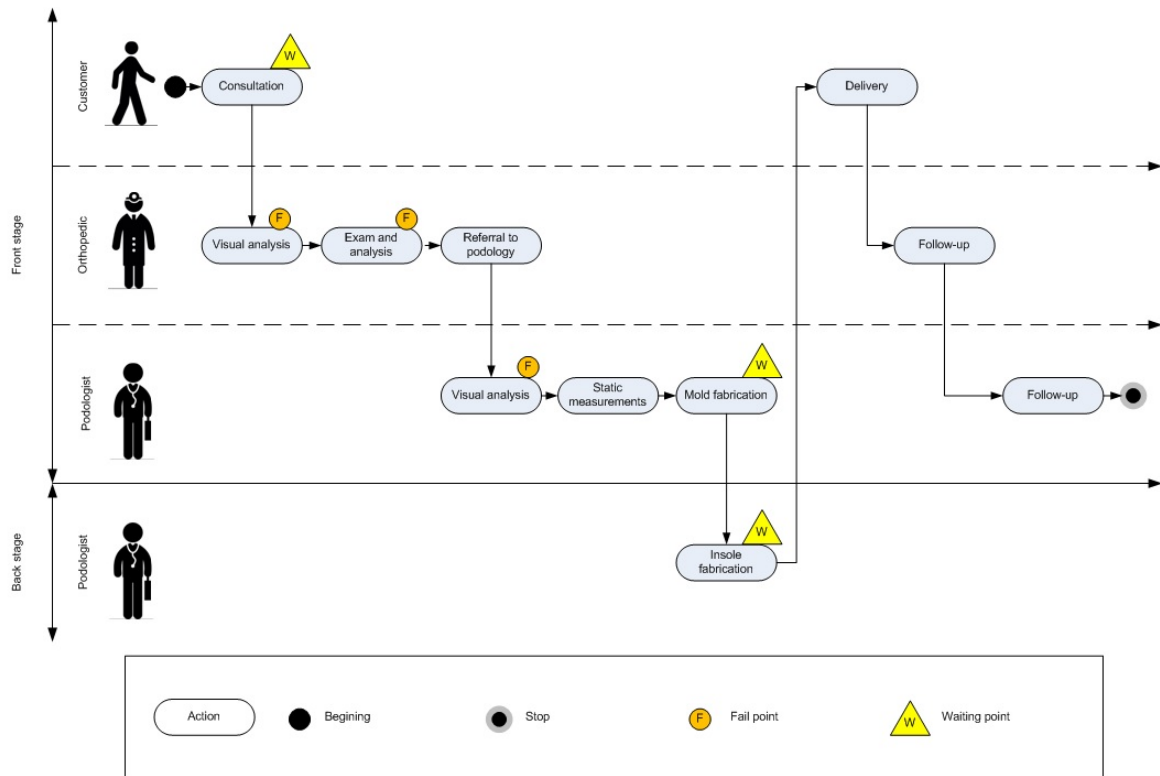

Figure 5.10.: *Current system blueprint*

The system architecture helps understand the interactions but it does not give a clear view of the path followed by the customer, this is identified on figure 5.11. Here it is easier to see how the path followed by every customer.

The service that is been proposed is a new service that will be complementary to the existing one, it surges as the way to improve the service given today, and has no objective of replacing any of the actors that are participants today, on the contrary it looks to add a new actor that will be Insole Solutions, a company that today is none existing, but the designer plans on making it a reality.

In order to make the concept of the proposed service more clear the author relays on the business model canvas, presented on figure 5.12. The idea on presenting it this way is to make it clear which are the participants and how is the participation linked to the company, also the value proposition, that is probably the most important asset of any company.
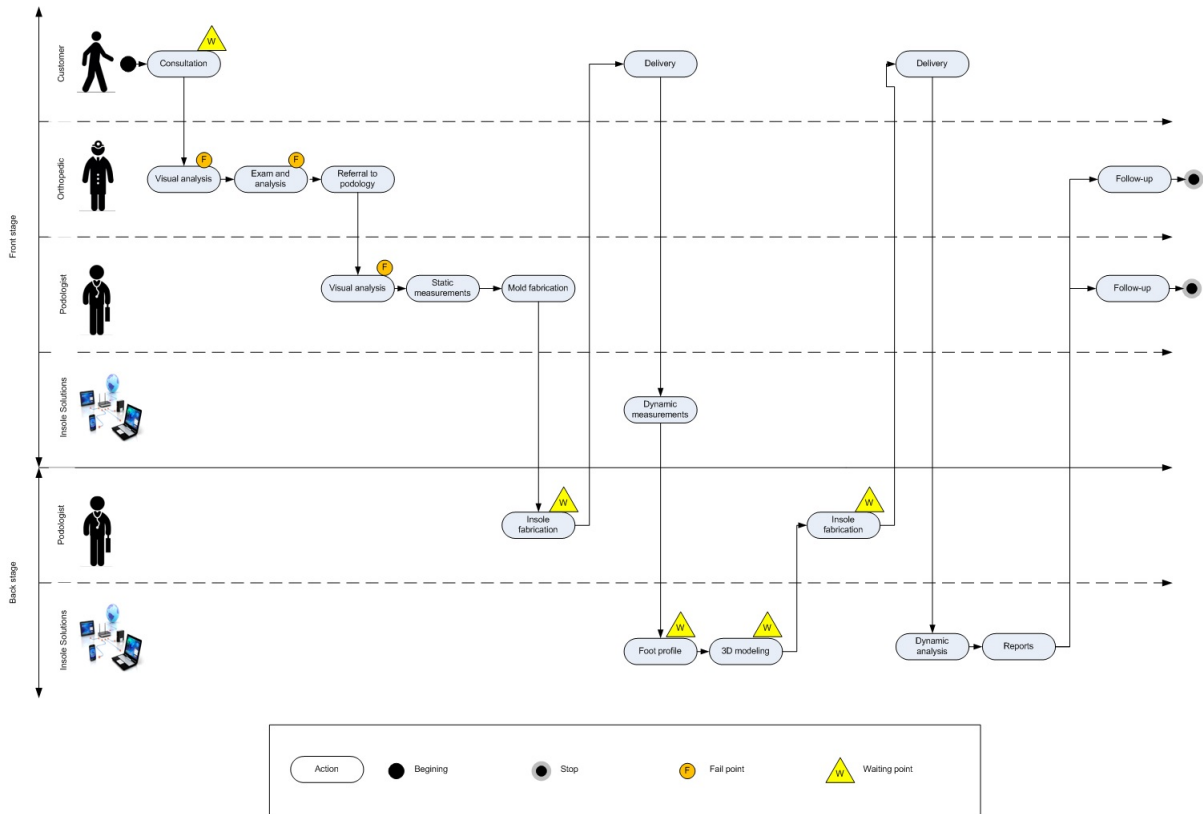
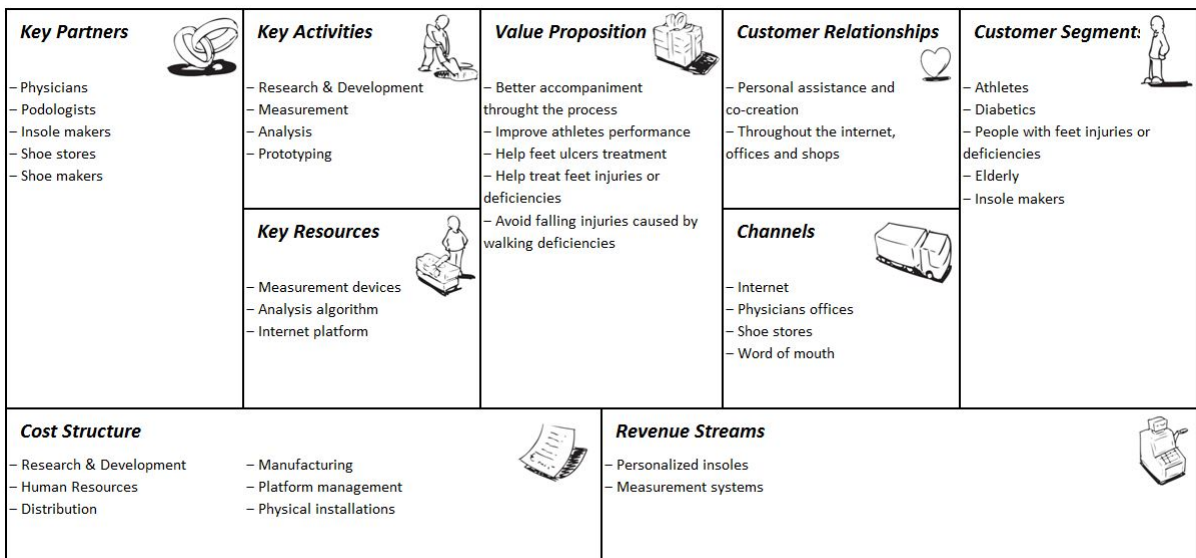Figure 5.11.: *Proposed system blueprint*

Figure 5.12.: *Business model canvas*

6 Conclusions and Future Work

6.1. Conclusions

At the beginning of the current dissertation the researcher set some practical objectives, answering these objectives it can be said the following:

The needs of all the different actors and participants of the service were explored and defined thoroughly by using the tools at disposition, which helped to have bases to fulfill the second objective. And even though the sample size was relatively small, the homogeneity of the answers presented, gives the researcher confidence to present the results.

The value proposition and business model were defined and discussed with the future actors of the service, which gave a new global and integral way to achieve the common objective which is the health of the patient. It is important to highlight that this study was conducted in three different countries, which gives the results a broader perspective.

The new service was developed, with help of the future actor, and gives a new paradigm of fellowship and cooperation, instead of everyone working apart. This focus of the service design goes hand in hand with the participatory design, in the punctual case of this dissertation it helped to create a cohesive and collaborative service, but it does not mean that these results are only applicable to the healthcare area.

The tools and methodologies used in the development of this project can be adapted to any area and/or product. The most important aspect to take into consideration is to speak and work with the people involved, and not only the customers, because the service providers can give the researches perspectives and information customers do not have.

Also because of the new path of customization that the industries are taking, the product service system is gaining force to help companies to find that differentiation factor that will give them the competitive advantage that they are looking for. More and more demanding customers require a bigger effort from the industry to fulfill these demands and expectations, specially since the environment is so competitive that failing to do so, could be fatal for the future of any company.

As for the research questions:

Throughout the whole dissertation the designer managed to integrate the service design with the product service system, while taking into consideration the needs and expectations of the actors involved. This was achieved by designing the service around the product, with help of the usage of the product service system, adapting the product and new service propositions to the existing service. The cooperation of and between the stakeholder proved to be one of the most important assets to make this service both a reality and a success.

The service was designed by using tools available, created by various authors before the designer of this service. As with any other research project it is important to use formerly proved information by other authors in order to take advantage of the existing tools and information. The contribution of new researchers, as it is the case of this dissertation, is to find new ways to integrate existing tools, methodologies, and concepts; so that new applications can be created.

6.2. Future Work

There is always need to future work, designs and services can not be static and need to evolve and grow with the changing paradigms of society.

For this service in particular it could be important the exploration of new ways to reach the public and maybe making the product and service a commodity accessible to everyone. This could be achieved by the creation of a new service under the collaboration of all the actors. Maybe introducing an online branch of the service proposed in this work.

As for a broader approach, the information created in this project can be a first step to adapt this concept to different industries. Taking advantages of new technologies that could add a greater value to any existing service. Another contribution of the present project is that the participatory design can also be applied to any service that involve multiple service providers, even if they are not in the same physical space; and technology can help to make this participation easier and can help with communication, make it more direct and instantaneous, between the different actors.

It is no news that the business paradigm is changing world wide, is one of the results of globalization. Every industry needs to keep up with these changes. One option is to use the integration of service design and product service systems proposed in this project, to create a greater competitive advantage; and even though it will need to have modification depending of the nature of both the product and the business, the bases are here to be adapted to any other company.

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Appendix

A.1. Study Protocol

A.1.1. Study description

A.1.1.1. Project name

Creation of a product based service start-up.

A.1.1.2. Name of the promoter

The project is being developed as part of the final dissertation of the Service Engineering and Management Masters, at the University of Porto.

A.1.1.3. Name of the investigator on charge of the project

Research will be developed by Catalina Rodríguez Espinoza.

A.1.1.4. Dates

The interviews were conducted between April and May of 2016.

A.1.1.5. Participants

Interviews were conducted to three groups of people. Firstly to healthcare specialists – orthopedic medics and insole makers. And then to patients with some sort of foot pathologies.

A.1.1.6. Benefits for the participants

The main benefits of the project are: the creation of a new way of data recovery for insole and orthotics production, beyond the creation of a new service for patient accompaniment for patients during the duration of the treatment. The service will be developed around a customized product, more specifically an insole, that will have as an objective diminish

possible errors during the measurement process; the participants will get more accuracy on the final product and more accompaniment during the recovery and healing processes.

A.1.1.7. Risks and inconvenience for the participants

There are no identified risks associated to the study, because the study only consists of an interview. The only possible inconvenience will be the time spend for the interview, that is estimated between 30 and 40 minutes.

A.1.1.8. Data collection

The audio of the interview will be taped. The interview script is available on section 5 of the present protocol.

A.1.1.9. Confidentiality

The names of patients will not be registered nor taped. The recording will be identified by number. The results will be presented in an aggregated way, with no specific details that could identify any of the participants.

A.1.1.10. Informed consent

Before starting the data collection, the interviewer will give the participants a informed consent, that will be read and signed. The mentioned consent is available on section 4 of the present document.

A.1.2. Study framework and objectives

On this study it is intended to interview healthcare professionals in the orthopedic and podology areas, also patients that have, or may have had foot pathologies. Having as the main objective to study and evaluate the current data collection process, also the criterion used by the professionals to identify if there is a problem present, and in case there is a problem, the criterion to identify the possible solution. The study results will provide a base for service design and development, taking into consideration both, health providers' professionals and patients necessities.

The general objectives of this study are:

- Determine the real interest in the service product system and to identify the key factors of the system.

- To study the customer experience of the interviewees, with the objective of identifying the value chain and key points.

- Design a product-service system that satisfies the participants' needs.

The project will be developed under the service design focus, by a series of iterations between the different actors of the process. Having as an objective the identification of shores and functions of the people involved, with the finality if improving the current measurement and control processes, and the patients' evolution.

Based on the results of the study, a new service will be developed based on a product. The experiences of all the people involved will be a great help for the creation of a new service experience, with a different measurement way and more accompaniment of the patient through the treatment.

A.1.3. Interviewees experience study

The present study is qualitative and has as an objective to deepen into the knowledge of the different stages of the process, taking into consideration the responsibilities and functions of the different interviewees. It is pretended to develop a detailed analysis of the needs and requirements of the people involved.

A.1.3.1. Study sample

The size of the sample for this study will depend of the availability of the professionals and patients, being subject to alterations, but it is pretended to have 15 participants distributed by the three main considered areas: orthopedic physicians, podologists and patients. Figure A.1 illustrates the number of interviews pretended by area.

A.1.3.2. Data collection and analysis

The data recollection will be done through individual interviews. The interviews will be semi-structured, according to a script, presented on section 5. The script has as objective to guide the interview and the information recollection, maintaining the flexibility to explore other subjects that appear spontaneously and that turn up to be relevant.

In order to allow a deeper data analysis, the individual interviews will be recorded in audio. The recordings will be literally transcript for a content analysis. The recollected data will be maintained strictly confidential. The analysis will be conducted anonymously. In the informed consent presented on section 4, the confidentiality issues will be approached.
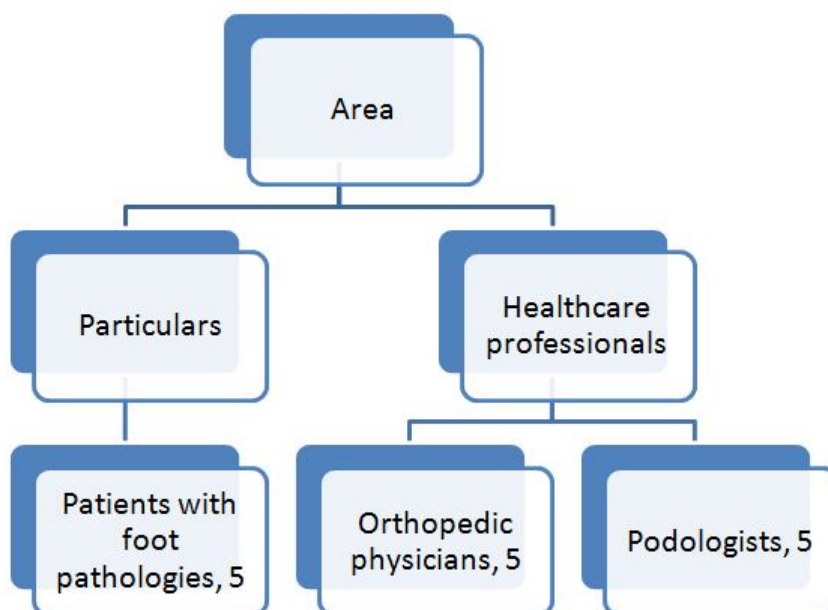
Figure A.1.: *Expected Sample*

A.1.3.3. Expected results

The exploratory study will have the expected results:

- Identification of key factors of the product-service system and determination of the interest on the system.

- Identification of the critical points of the value chain and schematization of the participants' interviews.

- Design of a product-service system that satisfies the needs of the people involved.

A.1.4. Informed concern

INFORMED CONCERN

We are here requesting your participation on the project "Creation of a product based service start-up".

The study has as objective to evaluate he needs and experiences of the different interviewees related to diagnose and insole fabrication processes and accompaniment of the recovery and cure processes. In order to develop new services that will meet the participants' needs. In that aspect, we are conducting interviews with different persons of interest for the process. Their participation will provide important information for the project.

The interviews will be recorded in order to make possible the transcript and a deeper analysis. The recording will only be started after the approval by the interviewee.

The information recollected will be strictly confidential and will only be used for academic proposes. Results will be reported in an aggregated way, without identifying individually the interviewees. The information could be used for reports, presentations, or scientific papers, but the individual names will not be identified.

Participation in the study is voluntary, and can be interrupted in any moment. In that case the information recollected at the time will become void and will not be used.

For further explanation you can contact Catalina Espinoza or Prof. Lia Patrício of the Faculdade de Engenharia da Universidade do Porto, Rua Dr. Roberto Frias, s/n 4200-465 Porto, telephone 225081639.

Investigator: Name:

Signature: Date:

Participant:

I declare I read and understood this document, and the verbally provided information and I accept to participate in the current investigation. I allow the usage of the provided data voluntarily and trusting they will only be used for the investigation with the warranty of confidentiality and anonymity to other partner entities of the Faculdade de Engenharia da Universidade do Porto for academic proposes and scientific investigation.

Name:

Signature: Date:

THIS DOCUMENT IS DONE BY DUPLICATE: ONE FOR THE PARTICIPANT AND OTHER FOR THE RESEARCHER.

A.1.5. Interview script

Socio-demographic data:

a. Age, genre b. Patient – scholarity and profession / Healthcare professionals – Professional experience and specialty. c. Patient – How long ago you use this service? Do you use internet or smart phones? Interview:

The interview is structured in three main themes.

1. Foot pathologies

   (Orthopedic)

   - In your practice, how many patients have foot pathologies?

- Which are the most common pathologies? Is there any prevention methodology for them?

- How many of them have orthotics prescript? Could you describe the process to prescribe an orthotic? Which is the criterion for prescription?

- How many of them need an orthotic because of the evolution of diabetic wounds?

- Can you describe the service currently provided to the patients?

- Explain the parts you like of the service and/or product

- Explain the parts you do not like of the service and/or product

(Podologist)

- How many patients are referred for foot pathologies?

- Which are the most common pathologies? Is there any prevention methodology for them?

- How many of them have orthotics prescript? Could you describe the process to prescribe an orthotic? Which is the criterion for prescription?

- Can you describe the service currently provided to the patients?

- Which is the average cost?

- Explain the parts you like of the service and/or product

- Explain the parts you do not like of the service and/or product

(Patient)

- Why did you go for a medical consultation? Did you think you had a foot problem?

- Could you describe the orthotic prescription process?

- Can you describe the service currently provided to the patients?

- Explain the parts you like of the service and/or product

- Explain the parts you do not like of the service and/or product

2. Fabrication process

(Orthopedic)

- Could you describe the current process for measurements?

- If you could change anything about the process/service, what would it be and why?

- From 1 to 10, what is your level of satisfaction with the current process?

- What is the patient follow up? Which is the frequency of the appointments?

- Which is the treatment for injuries in diabetic patients?

- What is the patient accompaniment? Frequency of follow up appointments? Which is the life cycle of orthotics?

(Podologist)

- Could you describe the current process for measurements?

- If you could change anything about the process/service, what would it be and why?

- From 1 to 10, what is your level of satisfaction with the current process?

- How much time you spend with each patient? What is the average cost for each patient?

- What is the average of patients that come back with problems with the product?

- What is the average time to have an orthotic ready?

- What is the patient follow up? Which is the frequency of the appointments?

- Which is the treatment for injuries in diabetic patients?

- What is the patient accompaniment? Frequency of follow up appointments? Which is the life cycle of orthotics?

(Patient)

- Could you describe the current process for measurements?

- If you could change anything about the process/service, what would it be and why?

- From 1 to 10, what is your level of satisfaction with the current process?

- What is the patient follow up? Which is the frequency of the appointments?

- Which is the treatment for injuries in diabetic patients?

- Have you ever stopped using the product due to discomfort?

3. Product/service system

(Orthopedic)

- Do you believe this product/service could facilitate the data recollection?
- Are you interested in creation areas with zero pressure for diabetic patients?
- Would you like a more thorough accompaniment during the recovery process? Why?
- Would you like to have more information of the evolution of the patients during the process?
- How would the perfect service be?

(Podologist)

- Do you believe this product/service could facilitate the data recollection?
- Are you interested in creation areas with zero pressure for diabetic patients?
- Would you like a more thorough accompaniment during the recovery process? Why?
- Would you like to have more information of the evolution of the patients during the process?
- How would the perfect service be?

(Patient)

- Would you like a more thorough accompaniment during the recovery process? Why?
- Would you like to have more information of your evolution during the process?
- Would you like to make your appointments through internet?
- Would you like to receive a reminder of the appointment via sms to your cell phone?
- Would you like to be warned of delays on the attendance?
- How would the perfect service be?