LAUREA
UNIVERSITY OF APPLIED SCIENCES
Together we are stronger

With Spime to Circular Service Design:

Introducing Service Design to an IoT Platform Provider's Delivery Process

Maiwald, Corina

LAUREA
UNIVERSITY OF APPLIED SCIENCES
Together we are stronger

Laurea University of Applied Sciences

With Spime to Circular Service Design: Introducing Service Design to an IoT Platform Provider's Delivery Process

Maiwald, Corina
Degree Programme in
Service Innovation and Design
Master's Thesis
May, 2018

Laurea University of Applied Sciences **Abstract**
Degree Programme in Service Innovation and Design
Master's Thesis

Maiwald, Corina

With Spime to Circular Service Design:
Introducing Service Design to an IoT Platform Provider's Delivery Process

Year 2018 Pages x

With Servitization and Digitalization being global trends in almost all fields of industry, Service Design and technology both find their place in those processes. This thesis explores how the technology concepts of Internet of Things (IoT) and spime could contribute to making Service Design a circular process. The thesis commissioner BaseN seeks to incorporate Service Design to the sales process as the first stage of a potential Circular Service Design Process when developing new service ideas together with customers and prospects. As an IoT Platform provider, BaseN can host spimes, the virtual and logical masters of physical products, gathering information and knowledge on the state of the object and its environment throughout its lifecycle. This constant flow of data not only enables manufacturers to mass customize and by that embrace customer-centricity, it also enables them and other stakeholders to utilize the spime generated knowledge pool to start new Service Design processes for new services to be developed based on the generated knowledge from products and services in use by individual end users.

This thesis explores with the example of a sock manufacturer how Service Design fits in to the current sales process, how the manufacturer profits from this approach when innovating, and how the existing business relationship would expand to a Circular Service Design Process.

The theoretical framework is based on literature review of the relevant terms from the Service Design and technology field. It outlines the role of an IoT Platform provider to enable a manufacturer to innovate and shift from producing stand-alone products to offering Product-Service Systems, or even entirely Everything-as-a-Service. The Double Diamond model was used to design the Service Design Process for the thesis commissioner's sales process. The utilized methods include desk research, qualitative interviews, idea generation through brainwriting, stakeholder mapping, customer journey map, and Service Logic Business Model Canvas.

Desk research and interviews confirmed that incorporating Service Design to the sales process brings various benefits. It enables more efficient allocation of resources, better and faster learning of all important facts concerning the (potential) customer and its field of industry, educating the customers and prospects about the IoT and spime and how they can transform their businesses from manufacturing products to offering intelligent, ever-evolving services. In addition, co-creating at the early stages of developing business relationships helps to build trust, see where the value in a new service innovation lies for all stakeholders, and when the process ends with a working prototype, the manufacturer gains a very concrete understanding of what the actual service will be like and how the IoT Platform provider enables its creation. It was also concluded that prospects and customers would easily regard this initial Service Design Process to be worth paying for, which in turn enables the thesis commissioner to monetize the process. Another outcome of the workshop was the realization that spime could constantly trigger new Service Design Processes and by that increase the overall speed of innovation.

Keywords: Service Design, Internet of Things, Spime, Sales Process

Table of Contents

1 Introduction

Service Design has already shaken up the business world in the past years and also Service-dominant Logic (SDL) has been adapted by various service businesses. At the same time, technology speeds up further efficiency improvements. This thesis will explore if and how the Internet of Things (IoT) and spime could further evolve Service Design to become a circular process. As a practical example, IoT Platform provider BaseN commissioned this thesis work to incorporate Service Design to their delivery process as the first stage of a potential Circular Service Design Process.

The IoT is now emerging, meaning that more and more physical objects (things) are readily and especially affordably connected to the network. The IoT is increasingly expanding to all areas of everyday life, with smart industry being one of the predominant applications (Wortmann & Flüchter, 2015). Manufacturers are globally putting effort to creating new services around their traditional core businesses (Jacob & Ulaga, 2007).

This development precedes the transformation from conventional, physical products into continuously evolving services. Totally new business models will be created, and services will be increasingly based on individual customer needs (Hurri, 2014). The shift from Goods-dominant Logic (GDL) to Service-dominant Logic (SDL) has already been broadly researched and partially been adopted in the business world. Vargo et al (2008) described the difference of both logics in the manufacturing world as such: With GDL, value is created during the manufacturing and delivery of a product through the combination of transformation of raw materials into something that consumers want. They continue that with SDL value is created when a consumer actually uses the product and applies her/his knowledge and skills in the use of it in his/her own life.

Through technology we are now witnessing the next stages of SDL in products. With the emergence of IoT it is now possible to connect any thing in order to retrieve actionable data about its state and environment. Another technology in focus, especially in manufacturing, is Digital Twin, an object's virtual counterpart (Negri, Fumagalli & Macchi, 2017). Then there is spime, the next evolution of Digital Twin and the core of the IoT. A spime is not a Thing (Stead, 2017). It is the virtual and logical master object of a physical thing, coming into existence before anything is manufactured and gathering, analyzing and controlling the entire lifecycle of its physical counterpart. The technology to enable spimes already exists and BaseN is the first platform capable of hosting spimes. The physical counterparts are easily replaceable and updatable, they are the material instantiation with which a user interacts (Stead, 2017).

As a spime is gathering data in real-time from its physical counterpart, it enables a previously unknown constant flow of information from the end-user's product and service experience back to the manufacturer. This, in turn, allows for not only rapid product improvements like never seen before but, even more importantly, mass customization and a total shift towards offering ever-evolving products and services instead of stand-alone, one-time products. Servitization of products is a current movement and it happens together with another obvious movement: objectification of services (Lindberg & Nordin, 2006).

With the transition from products to intelligent services that spimes enable and them making natural use of aspects like customer-centricity, value-in-use and mass customization, spimes and Service Design share a common ground. With the help of Service Design, new spime-enabled services can be developed. With the constant collection and analysis of user behavior, spimes can also be at the beginning of a Service Design process. This thesis explores if it is possible to make Service Design a circular process through spime. As a starting point, Service Design is to be incorporated into the sales process of thesis commissioner BaseN. Thus, this thesis also unveils how a service design process can help customers and customer prospects of an IoT Platform provider to innovate. As Mourtzis, Vlachou and Milas (2016) state: "The digital transformation of industry empowered by the IoT adoption allows new ways for businesses to connect and co-create value."

The focus of this thesis is on the traditional manufacturing field, and the service design process is tested with the example of a textile (sock) manufacturer. In practice, the entire process is tested from development to pre-prototype stage, and the lessons learned will be evaluated to be adjusted for the next round. The established service design process will then be used with further customers and prospects.

The thesis begins with the definition of the relevant Service Design and technology terms. Then follows the description of the conducted Service Design process from desk research to the practical workshop and its evaluation. Based on the workshop outcomes, a generic Service Design process as part of BaseN's sales process is introduced. The thesis concludes with a reflective discussion and future considerations.

1.1 The Goal of this Thesis

The thesis author postulates that Everything-as-a-Service is in the near future the consolidated inevitable way for any business to prosper and even to survive. Ultimately, all manufactured products will become services. IoT Platform providers are the enablers of it. But they, such as global full stack IoT Platform provider BaseN, need to lead others to see and understand the value, and opportunities and the existential threat.

This thesis outlines how BaseN will take this lead by incorporating service design into the sales process so that showing the value of creating new services to new and existing customers will become easier than it is at its current state. In addition, creating a unified delivery process as well as creating means to internally better prepare for new prospects are desired outcomes.

Based on the outlined goals of the thesis, the author established the following research questions and sub-questions to be answered with this thesis:

1) Can Service Design be made circular through spime?

What stages of a product's/service's lifecycle would be covered by Service Design?

2) How could Service Design be built into the delivery process of spime platform provider BaseN?

Could Service Design be monetized in this context?

1.2 The Structure of this Thesis

This thesis comprises a total of six chapters. The first one consists of the introduction and provides an overview of the goal of this thesis, its structure and delimitations.

The second chapter explores the theoretical background with a main focus on a) all the terminology that is relevant for the created Service Design Process in the field of manufacturing, and b) the key technologies that play a role.

Chapter three brings together all terminology from the second chapter and forms the theoretical framework.

The Service Design Process undergone for this thesis is introduced in great detail in the fourth chapter. It also introduces the scope of the thesis, the thesis commissioner and the need for Service Design, and it thoroughly explains the stages of the full process. This chapter concludes with the introduction of a new "Circular Service Design Process" and how this will be incorporated to the thesis commissioner's sales process. Future considerations conclude this chapter and pave the way for more research to be done by others.

Chapter five presents the conclusions and reflections of this thesis, and how the research questions were answered.

The sixth and last chapter presents the discussion part of this thesis where the author outlines how the reviewed literature supports the findings of this thesis, and how the thesis commissioner will proceed based on this thesis' results.

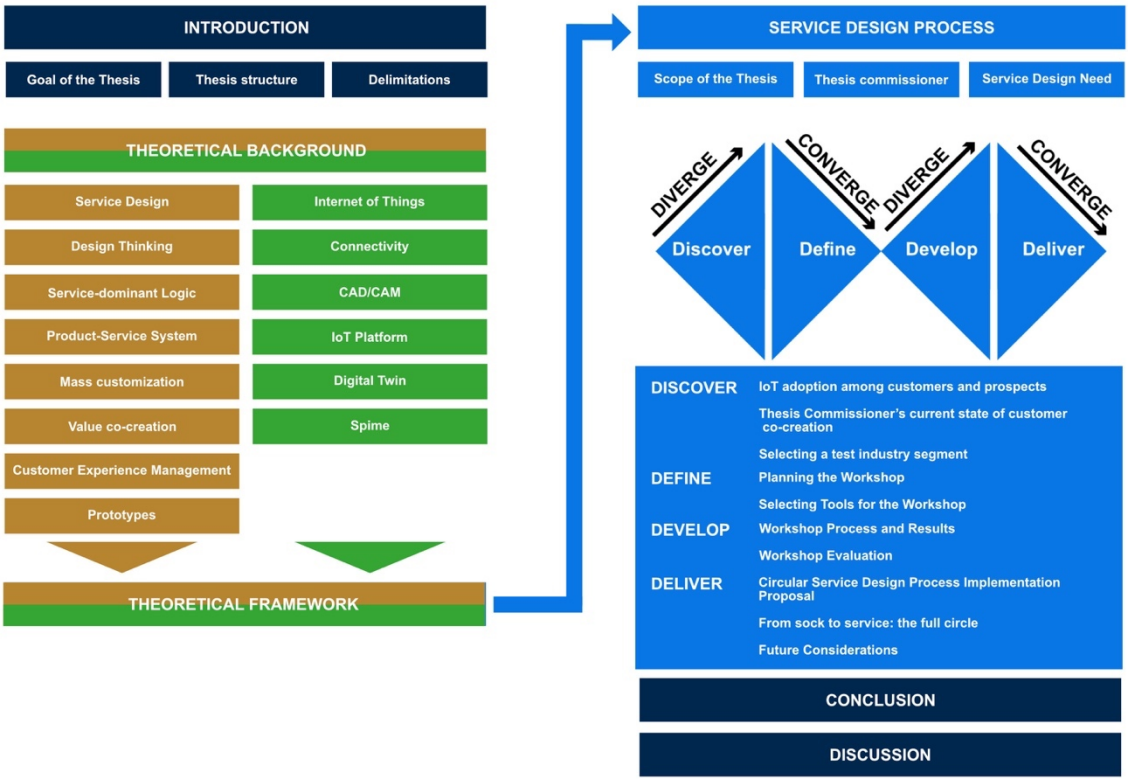

Figure 1: The structure of this thesis

1.3 Delimitations of this Thesis

This thesis has a strong focus on manufactured goods. Whereas the same approach can be applied to most other industries, it is not applicable for industries with entertainment focus, such as Facebook and Twitter, as well as gaming companies. The reason for this is that these kinds of dotcom-boom businesses do not help other companies to innovate and changes to their existing business models are usually driven solely by selling advertisements and user data. Their underlying architectures are meant for non-critical usage whereas manufacturing and other more mission-critical companies depend on always-on operations without service interruptions and maintenance downtimes.

Before implementing a monetized Service Design process at BaseN, the author recommends additional workshops to be conducted including external parties to learn from these new dynamics that working with 'outsiders' brings. In addition, this would create insights on how external participants perceive the nature and value of the workshops, so that the entire Service Design process could be shaped further to even better cater potential customers' requirements. Incorporating external feedback into the Service Design process creation might uncover limitations and improvement needs.

Whereas the suggested process might work equally well with other manufactured goods, it might not work with the same logic and building blocks in other industries. This is something for BaseN to investigate before they approach other than manufacturing industries with a monetized Service Design process.

With this thesis being based on single-case design, one limitation is its "inability to provide a generalising conclusion" (Zainal, 2007). Single-case design was selected for this thesis work based on the thesis commissioner's specification, and the benefit of exploring a single case in depth. One company and one industry segment were analyzed to be able to understand an individual process, and how it might evolve over time. Going beyond this thesis work, further theoretical validation of the Circular Service Design Process requires more cases to be analyzed in the future, meaning more companies on both the IoT Platform provider and customer side should be investigated. With the use of a singular case study, selection bias is also one limitation. Selection bias is defined as "the impact of a researcher's prior knowledge about the case and his possible favouritism toward certain hypotheses" (Starman, 2013). However, the author's deep prior knowledge of the thesis commissioner, its processes and customers were required in order to develop the Service Design process as a favorable outcome for the thesis commissioner.

2 Theoretical Background

2.1 Terminology relevant for the created Service Design Process in the manufacturing industry

2.1.1 Service Design

Service Design is at the core of this thesis as it a) is used for the research, b) is incorporated to the thesis commissioner's delivery process as a practical outcome and c) is in theory extended to a circular process through technology.

Service Design as a term evolved in the early 2000's when businesses and scholars realized the dramatic shift from offering plain goods to creating pleasing service experiences to enhance customer relationships. To date, Service Design has many different definitions due to it being an emerging interdisciplinary approach (Stickdorn et al, 2011).

One thing all scholars agree on is the non-linear nature of service design processes. Every stage is iterative (Stickdorn et al, 2011) and it is common to jump back to the beginning and between single stages.

With this in mind, it is important to emphasize that with service design one looks at the entire journey of a user and every single touchpoint with the service provider where value is being co-created when using a service (Holmlid, 2009). In other words, Service Design looks at services as a whole, ranging from the service timeline from start to finish, all personal and non-personal interactions, to physical objects that are potentially involved.

With Service Design, companies are equipped with new tools and methods - such as storytelling, service blueprints and prototyping - to help them innovate. These new tools and methods may dissent from the innovation processes that companies are used to, but they will also enhance these traditional ways of innovating (Kurtmollaiev et al, 2017).

With this thesis it is important to note that service design is applied to products that are extended to intelligent services as Everything-as-a-Service is seen as a logical, spime-enabled development.

2.1.2 Design Thinking

Service Design as a discipline, builds on to and utilizes Design Thinking. In a manufacturing setting, several design disciplines come together, e.g. industrial design and interaction design (Wetter-Edman, 2010). Hence, discussing Design Thinking in addition to Service Design is important for the scope of this thesis when looking specifically at the manufacturing industry.

Every design process begins with dissatisfaction of a current product or service and an arising need for improvement. This determination to take action in order to achieve improvements involves creative thinking and starts out with abstract specifications (Razzouk and Shute, 2012). Abstractness is key as in the beginning no one knows yet what the solution to the problem will be and it allows thinking to be completely open.

The design process is iterative, exploratory, and sometimes chaotic (Braha and Reich, 2003). Humans cognitively deal with solving problems through idea generation, further exploration,

comparison, and selection of the best suitable idea or outcome of the thinking process (Stempfle and Badke-Schaube, 2002). Generation and exploration are iterative processes while comparison and selection ideate and narrow down the possible options.

Design thinking is still a fairly new concept for businesses. Especially in the technology sector, sole scientific thinking is a much more common approach. Scientific thinking is often mistakenly regarded as almost the exact opposite to design thinking. In scientific thinking collected data and facts are used to find patterns and insights, whereas in design thinking new patterns are invented to address facts and possibilities (Owen, 2005).

Bringing service design to a company's processes, especially in decision making, introduces design thinking as a useful addition to scientific thinking.

2.1.3 Service-dominant logic

Service Dominant Logic (SDL) evolved from a previous product-focused market and Goods-Dominant Logic (GDL) by adding service orientation (Lüftenegger et al, 2012). Traditional manufacturing companies are now capable through the emergence of the Internet of Things and global connectivity to transform their business models from offering stand-alone goods to selling intelligent services. This servitization process in the manufacturing field is seeking to link SDL with concrete production outputs (Korhonen, 2014). This thesis aims to provide such improved links between production outputs and SDL.

To give one example, manufacturers of refrigerators do not just fire-and-forget their products anymore, meaning that previously they lost track of their manufactured goods after they left the assembly line. Through the Internet of Things their products now have connectivity, and usage data can be send back to the manufacturer straight from the end-user's home. This data indicates i.e. when the refrigerator requires maintenance and which part is failing. This could initiate scheduling a maintenance visit without the need of the home owner to notice the problem first and ordering the repair service herself.

The refrigerator could also be equipped with bar code or RFID readers to scan the products in it, and the single shelves could track the weight that is put on them, through which smart algorithms would be able to know how much is still left in each package and inform the owner when something runs out or even place an order automatically. Highlighting the possibilities of Everything-as-a-Service, a refrigerator manufacturer could move from selling a product, a refrigerator, to providing Cold-Food-Storage-as-a-Service. This could include automatic food orders customized to the exact amounts a household consumes, in addition to preventive maintenance.

With SDL in manufacturing, every single knowledge exchange and interaction between the manufacturer and end user is treated as a service (Kowalkowski, 2011). This knowledge exchange is of paramount importance with the later introduced Circular Service Design Process.

2.1.4 Product-Service System

When looking specifically at the manufacturing industry, as done with this thesis, transformation to offering Product-Service Systems (PSS) has already taken place to some extend. PSS itself means that products are not solely manufactured and sold, but that certain service elements are incorporated to that offering as well.

The main idea of PSS is to offer value-in-use to the product's end users by offering e.g. mobility as the service component instead of only selling the car as the physical product (Costa et al, 2017). For a manufacturer it is a shift in their traditional business models as they take focus off of manufacturing their products but add more focus on creating value for their customers through the provision of services on top of their products (Yoon, Kim & Rhee, 2012).

Petrulaityte et al (2017) highlight as a research finding on PSS that many companies face challenges in focusing on the entire lifecycle of a product when designing it as part of a PSS offering. As later discussed in this paper, focusing on the entire lifecycle of a product is at the core of spime. Hence, spime could fill a currently existing gap in manufacturing servizitation.

2.1.5 Mass customization

Mass customization is with the emergence of the IoT becoming a reality for manufacturers and their customers. This is aligned with consumers' desire for personalized products and for manufacturers it brings a competitive advantage. How to "achieve rapid design and innovation of complex customized equipment has become an important factor that determines the survival and competitiveness of equipment-manufacturing enterprises", state Zhang et al (2017). However, manufacturers are broadly not aware yet of how cost-efficient and easy to deploy mass customization would be as they do not have business relationships yet to the corresponding technology providers. Therefore, the author builds a bridge through Service Design for manufacturers to enter these relationships and to recognize the value of mass customization.

Mass customization means tailoring products and services individually to even a massive amount of individual customers (Alexander, 1999). How companies stand out from their ever increasing competition has changed over the past years. Low cost or high differentiation are not sufficient enough strategies anymore to pursue and instead most businesses will have to adhere to mass customizing products and services (Spira and Pine, 1993).

In manufacturing, mass customization brings efficiency and sustainability benefits as they ultimately eliminate overstocking of finished products based on estimated demand forecasts for the months ahead (Alexander, 1999). Although in the initial stages of transforming to mass customization, inventory and stocking first needs to increase until manufacturers implement new technologies such as 3D printing and achieve just-in-time local manufacturing. Then their cost in inventory storage will be reduced.

A key enabler of mass customization is the processing of vast amounts of data related to customer specifications so that products can be designed and manufactured as desired by individuals (Peng, Liu & Heim, 2011). The result is an increased need for software and other related technologies and by increasing the inclusion of various elements and partners in the production operations, the new challenge for manufacturers arises that their processes need to become more flexible and robust (Tiihonen & Felfernig, 2017).

The Internet of Things opens up the possibility to revitalize Service Design in manufacturing in a massive scale to the same intimate degree as it was done before the Industrial Revolutions. The Economist (2012) summarized the Industrial Revolutions as follows: The First Industrial Revolution took place in the late 18th century with the birth of textile factories by bringing together workers in one centralized location. The Second Industrial Revolution Is dated to the early 20th century when the moving assembly line was invented by Henry Ford.

Looking back in time prior to the Industrial Revolutions, the profession of a blacksmith was very reputable among villages and everyone knew him, and vice versa. The blacksmith knew its his/her customers and their horses as well as other metal products the customers were using by heart and could perfectly cater to their specific needs (Hurri, 2015). This was true customer centricity and, one could argue, also involved a solid degree of Service Design when new metal products for new specific needs and/or desired improvements were co-created.

Then the Industrial Revolutions happened and eliminated the need for blacksmiths as mass produced metal products could be shipped cost-efficiently to anywhere. But now, when the Internet of Things is about to bring yet another Industrial Revolution, the idea of personalized, continuously evolving services and, with it, Service Design at the core, are again emerging. Only now it can be done on a global, mass-customized scale.

To summarize the main advantages of mass customization, manufacturers will not only match raw materials on per-customer basis but also adapt the whole product to each individual customer. Additionally, the services offered around the existing product will keep evolving together with the end user's own individual way of living and usage of the said product.

2.1.6 Value co-creation

Value co-creation is a central goal in Service Design. It is also a natural outcome of spime as will be explored later in this thesis. Customers today are connected, informed and active (Prahalad and Ramaswamy, 2004). Companies have to treat them in a corresponding manner. That means collaborative work between companies and their customers in order to co-create value.

Prahalad and Ramaswamy point out that this collaboration during an innovation process consists of co-ideation, co-design, co-development and co-creation of new products or services. Consumers' motivation to partake in this process lies in a desire for improvement - either of existing products and services, or what comes to their own competences (Roberts et al, 2014).

The always connected, constantly information-seeking consumers change how companies operate and interact with the market. All operations are influenced by a business' customers, ranging from manufacturing to selling to marketing (Prahalad and Ramaswamy, 2004). When customers are not satisfied with a product they will speak up their mind. Further, they will be motivated to initiate change (Roberts et al, 2014). This is where value co-creation taps into and helps companies to outrank their competition.

Dialogue	Access	Risk assessment	Transparency
Company and customer are equal problem solvers. The dialogue should be interactive and enganging for both parties.	Providing consumers with access to data on all manufacturing related processes and design	Should the consumer also take responsibility for risks? Businesses need to fully inform them about potential risks.	Transparency is a must as information is easily accessible - consumers will expect it

Table 1: DART model of value co-creation (Prahalad and Ramaswamy, 2004)

2.1.7 Customer Experience Management

Customer Experience Management (CEM) is an important element in this thesis as it spans over the full lifecycle of the relationship between a business and its customers. It looks at providing value to customers before and after the sale through a steady information flow, service and interactions (Schmitt, 2003). A customer's satisfaction with a service or product is not based on a single occurrence but on the entire lifecycle with a multitude of touchpoints with the service provider ranging from the initial advertising to the purchase of a product and up until the final disposal of the product (Du Plessis & de Vries, 2016). Capturing the experience of a customer is difficult due to its dynamic and complex nature (Zolkiewski et al, 2017).

The thesis author argues that CEM is a very important addition to Service Design as Service Design comes to a disconnect with the product/service after launch. Albeit the process being continuous in some cases with new evaluations and iterations after the launch, the majority of Service Design projects do not cover a full product/service and customer relationship lifecycle. That is why CEM is included in this thesis to create a full circle and to focus also on untapped opportunities as the IoT enables seamless feedback loops of products in use by their end users back to the manufacturer.

Service Design in combination with CEM will help businesses to avoid shifting back to their old ways after completing a successful Service design Process to develop a new service. It enables true customer focus beyond launch.

2.1.8 Prototypes

Prototypes are essential for many design processes as they allow for experiencing the desired product and service before they are launched. Service prototypes differ due to their mostly intangible nature when customers cannot hold a product in their hands to experience it, therefore the service prototype needs to focus on the various interactions and touchpoints the user goes through (Polaine, Lovlie & Reason, 2013). Experiencing the prototype helps to identify bottlenecks, to make overall improvements and generate more and new ideas. Prototypes also bring tremendous cost savings as products and services only hit the market once they have been proven to work. They can be used to convince investors, to test the desirability of what is being developed, to articulate a joint vision, to define design requirements and to iterate and refine the service/product design. They deliver many rough but powerful answers, with little cost and time. When looking at services, prototyping methods and techniques need to be used that fit the intangible nature of their setting (Rodrigues & Holmlid, 2017). There is a high degree of novel experiences in services and

understanding them is important in order to develop a new service or improve an existing service (Bae & Leem, 2014).

The primary purpose of a prototype is to serve as a common visual language (Rosenfeld, 2009, 48). Prototypes are great for showcasing all functionalities of the actual service/product and therefore are a potent way to communicate ideas in an easily understandable way.

There is a distinction between prototypes and experience prototypes. While a prototype aims at building the thing right, an experience prototype aims at building the right thing (Charlier & Metcalfe, 2016). From product design point of view, experience prototypes can be created as rapidly as within hours, whereas prototypes usually require weeks to be completed. Experience prototype is also a great tool for service designers when new services are to be developed and tested, especially when physical products are part of them.

Rosenfeld identifies five types of prototypes based on their purpose:

Shared Communication	**Working through a Design**	**Selling your Idea Internally**	**Usability Testing**	**Gauging Technical Feasibility and Value**
Involved parties collaborate on creating a quick sketch that communicates the idea(s) behind the design	The prototype allows for working through the design(s) to see early on which ideas work and which do not	Prototypes serve as means to sell technical feasibility and value of a service /product internally	Prototypes in use by participants from the target segment deliver real usability data for decision making	Simulating interactions helps engineering and management to see if the product/service is feasible

Table 2: Five types of prototypes (Rosenfeld, 2009)

The prototype as part of the Service Design process this thesis creates fulfills the purpose of working through the design that will be developed during the first workshops.

It is also meant for the desired customer to sell the idea internally to their decision makers. They will have a working prototype to experience the new service concept and by that to see its value.

2.2 Relevant technology terms for the created Service Design Process' setting

2.2.1 Internet of Things

The Internet of Things (IoT) is a concept that includes but is not limited to a fully distributed computing network consisting of various components which interact with each other (Jung et al, 2014). Connecting things, so that they can send data that can be processed by algorithms, has gotten extremely cost-efficient over the course of the 2000's. We now live in a world where anything can be connected and the gathered data from any object and its environment can be utilized to make information actionable, automatically, without human input, and to offer intelligent services over physical products.

Figure 2: The main elements of the Internet of Things

The enabler of the IoT is cloud computing, powered by limitless computing power at very low cost (Iansiti & Lakhani, 2014). High data volumes, transferred and processed in real-time, require a scalable and distributed infrastructure that cloud computing enables.

Atzori et al. (2010) state that the Internet of Things will have the biggest impact on everyday-life and the behavior of private and business users. Many of our everyday objects will come with connectivity and added functionalities by 2025, e.g. packaging, furniture, and even paper documentation (Atzori et al., 2010).

With the emergence of IoT, companies are enabled to reinvent themselves by offering services instead or in addition to their physical products. This makes the IoT highly interesting from Service Design perspective. Digital technologies are on the forefront to help companies meet and exceed customer expectations. Availability of real time data enables a totally new understanding of consumers and their behavior (Dotti et al., 2013). New opportunities arise through the IoT to create value for customers and to capture value for companies as objects, people and activities are being connected (Iansiti & Lakhani, 2014).

Various traditional companies are already partly utilizing the IoT by e.g. monitoring their manufacturing machines to detect maintenance needs early on. However, this is only the tip of the iceberg. With spimes, the core object of the IoT, much more opportunities to reinvent and innovate arise. In the course of this thesis, one possible scenario and its potential impact will be illustrated.

2.2.2 Connectivity

We are now moving rapidly towards a world of ubiquitously connected objects, things, and processes (Andreev et all, 2015). Connectivity is one of the first requirements when any physical object should move to the IoT. Connectivity creates the communication ability, meaning that the object will become able to send data that can be further processed, e.g. by an IoT Platform.

There is a multitude of options to enable connectivity when objects themselves do not have built-in connectivity themselves. For example, Radio Frequency Identification (RFID) tags and sensors are broadly seen as important and cost-efficient enablers of the Internet of Things. Even the simplest objects can be equipped with RFID tags or sensors. Important for this thesis is the example of a sock. Connectivity of a common sock can be achieved through conducting threads and a small, water resistant RFID tag or other sensor fusion technology woven into the sock's fabric itself (Escoffier, 2015).

BaseN has developed its own hardware to connect objects. It is called Spime Enabler. The Spime Enabler was a necessary piece to have in BaseN's repertoire to be able to connect the (legacy) physical and the virtual world in a cost-effective and flexible manner, overcoming restraints that other means of achieving IoT connectivity have. The Spime Enabler has many different connectivity interfaces built in, and in addition other connectivity options can be added if needed. The Spime Enabler is important for the Service Design process developed for BaseN's sales process as it can be a) used in the prototyping stages, and b) bring connectivity to physical objects when other sensors or RFID tags are not sufficient.

2.2.3 Computer-aided Design and Manufacturing (CAD/CAM)

CAD has usually been in applied for a long time prior the production phase of a manufactured good. Computer systems are used for modeling, in order to plan and optimize designs. Deloitte (2017) points out that CAD has so far not been too successful what comes to modeling complex environments. CAM, on the other hand, encompasses hardware and

software utilized to plan, manage and control manufacturing processes (Groover and Zimmers, Jr., 1984).

Both CAD and CAM have been in use for decades to enable resource optimization, to identify design flaws before the production lines are activated, and to boost production efficiency. In the past few years, also energy efficiency has become an important aspect of CAM.

Examining the current state of the industry, CAD/CAM pioneers like AutoDesk, PTC and Dassault are already utilizing Digital Twins. Other companies have adopted the first stages of intelligent CAD, meaning either the creation of physical artifacts based on intensive design knowledge, or optimizing design as a knowledge generation process (Tomiyama, 2007). Either way, currently all CAD and CAM data is used only for a certain part of a product's lifecycle and its successors for optimization purposes. This will drastically change when all products have spimes as all the CAD/CAM data can be stored and continuously analyzed by the spime.

In addition, there is still a lack of connection between CAD/CAM and product design. Processes like Design-for-manufacture (DFM), Design-for-assembly (DFA) and Design Functionality (DF) still require time-consuming manual analysis (Hoque et al, 2013). This is where spime with the help of Service Design could also tap in to bring major optimizations to manufacturers.

2.2.4 Internet of Things Platform

The IoT ecosystem is defined by Business-to-Business-to-Consumer operations. IoT Platforms, defined as software suites that enables the development of apps, collection of data and connectivity management of the related sensors or devices (Dumitru, 2017), offer their software to other companies to create smarter products and services that they in turn offer to consumers. An IoT Platform collects, stores and analyses the data coming from e.g. manufactured goods. Algorithms can process the data in any desired way and automate actions.

IoT Platforms are most commonly offered as Platform-as-a-Service, accessible through the provider's cloud. Currently, around 360 IoT Platform providers are globally active (Lamont, 2017).

When looking at the Service Design ideology, IoT Platforms are the technological centerpiece required to improve and to create new customer experiences. They enable mass customization.

2.2.5 Digital Twin

Digital Twins, meaning virtual product models, make it possible to see early and efficiently what the consequences of design decisions are (Schleich et al, 2017). The ideology of Digital Twins is said to originate from NASA's Apollo Program (Schleich et al, 2017) that kicked off back in 1969. NASA created two identical vehicles for its expeditions out of which one went to space and the other one was kept on Earth. The one on Earth mirrored the other one so that a much deeper observation of the vehicle's behavior was possible. It was also NASA that brought the term Digital Twin to the general public in 2010 when publishing its roadmap.

Similarly, the aircraft industry was an early adopter of the ideology with its "Iron Bird", a test rig used when new aircrafts are being developed. With the emergence of digitalization also other industries are now utilizing Digital Twins, currently primary in their production planning processes. This enables them to react quickly to unexpected events detected digitally without having to redo anything physical. Digital Twins, therefore, are very realistic digital models of physical objects and they mostly are created before their physical counterparts to deliver a realistic picture of how the physical twin will operate and interact with its environment.

Rosen et al (2015) state that all manufacturing has to become more autonomous in the near future with intelligent machines performing high-level tasks entirely free of human control. Manufactures still work with the physical product or with the virtual product (Grieves, 2015) and not both in conjunction.

Digital Twins are at the core of this increased autonomy. Digital Twins are aware of their state and capabilities at all time, and they can decide between various alternative actions (Rosen et al, 2015).

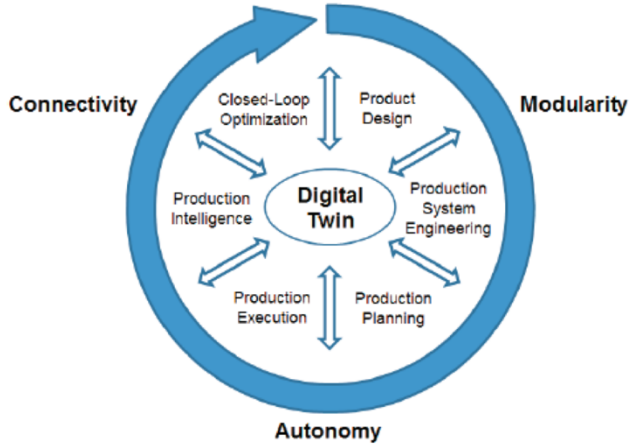

Figure 3: Image from Roland Rosen, Georg von Wichert, George Lo, Kurt D.Bettenhausen, 2015

Utilizing Digital Twins in manufacturing means the increased creation, storage and use of digital data and information. Digital Twins make all information created in one stage available to the next stage of the product lifecycle (Rosen et al, 2015). Manufacturers greatly profit from Digital Twins what comes to production process optimization and product improvements. However, there is no link created between manufacturers and their customers and no value co-creation is happening.

2.2.6 Spime

While Digital Twins are the perfect digital mirror image of physical objects, spime takes it one step further. Spimes are the digital masters of physical things. They collect, store and analyze all data coming from the object, its individual counterparts and its environment, and through advanced algorithms control the object. All intellectual property belonging to the object, e.g. a manufactured good, are stored in the spime as well. This causes a major shift as not the manufactured good is the primary merchandise anymore but its spime.

Spimes are tracked through space and time (Sterling, 2005). They exist digitally before the physical object is being created and record and manage its entire lifecycle. One knows where the object, e.g. a bottle of wine, comes from, where it is right now, and where it is going to (Stead, 2017). Spimes are the logical next step in the evolution of objects - from artefacts to products to gizmos and now spimes. Sterling dates the coming to reality of spimes back to 2004 when the US Military requested all of its suppliers to equip their products with RFID tags for identification and tracking purposes.

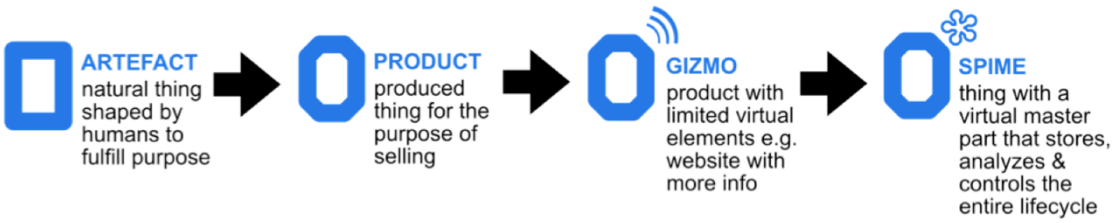

Figure 4: The evolution from artefacts to spimes as defined by Bruce Sterling, 2005

When a manufacturer adopts spimes into the production process, the results are highly beneficial. Spimes improve the overall manufacturing efficiency, especially in combination with recycling and 3D printing. When all components of an objects are tracked throughout their lifecycle, recycling, customizing and tracking said individual components becomes much easier (Stead, 2016). With the design of the product residing in the spime, 3D printing the

object could in the future be done by anyone who purchases access to the spime. This in turn reduces waste and production costs.

Another important aspect of spime is the ability to effortlessly learn how the finished product is being used. Right now manufacturers still lose track of their goods once they leave the factory. Collecting customer feedback is costly and done by third party agencies, and it still covers only a relatively small sample of the entire customer segment. With spime, each product's use is tracked and therefore information of each customer collected. Algorithms decipher the gathered data and offer valuable and actionable information to the manufacturer. This creates a whole new level of customer-centricity as customer understanding happens in real-time. Spime further enables the transformation from manufacturing plain products to offering intelligent and continuous services, opening entirely new business opportunities to manufacturers.

With the initial design of an object coming into existence before its physical substantiation and digital trace (Booth, 2015), spime offers tremendous potential to Service Design and manufacturing. With spime, there is a constant ever-growing knowledge pool from products in use readily available, so that any Service Design process could tap into this when a new product or service is to be created. After the completed Service Design process and the launch of a new product/service, again new knowledge flows into the pool, and a new Service Design process could begin. That is why this thesis is further exploring the potential circular relationship between spime and Service Design.

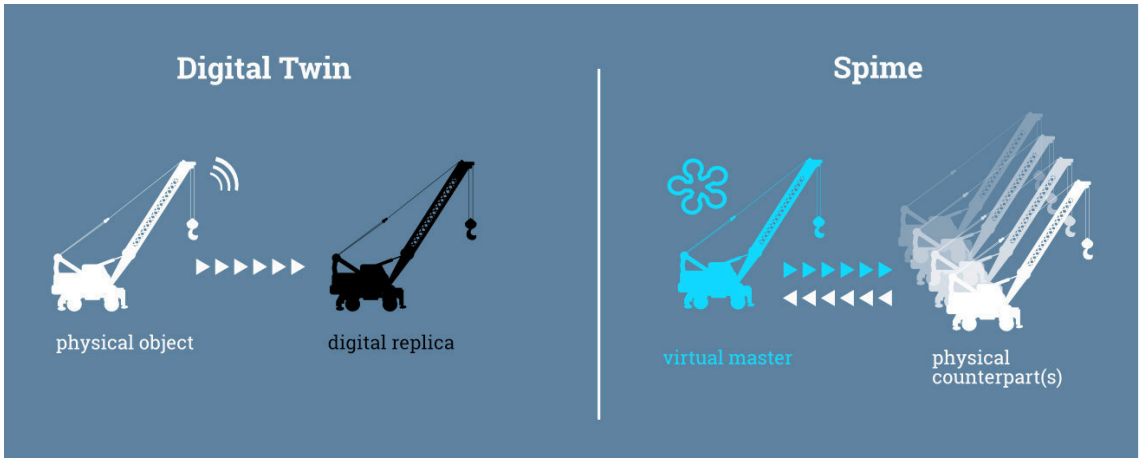

Figure 5: Digital twin vs. Spime, illustration by BaseN

The image above is an illustration by BaseN showing the difference of Digital Twins and Spimes with the example of a crane. The crane could be replaced with any other manufactured good. The image shows well the differences in information flows. With a Digital Twin, information only comes from the physical object to its digital replica. Whereas with

spime, the information flow is bi-directional. The image further shows that the physical objects are easily replaceable as the main logic and relevant information is stored in the spime. When, e.g. a crane breaks, a new one can come in to be controlled by the same spime. Or an improved version of the crane can replace the older version.

3 Theoretical Framework

To investigate the main research question if Service Design can be made circular through Spime, the following initial process overview for a manufacturer was created based on the explored concepts and terminology.

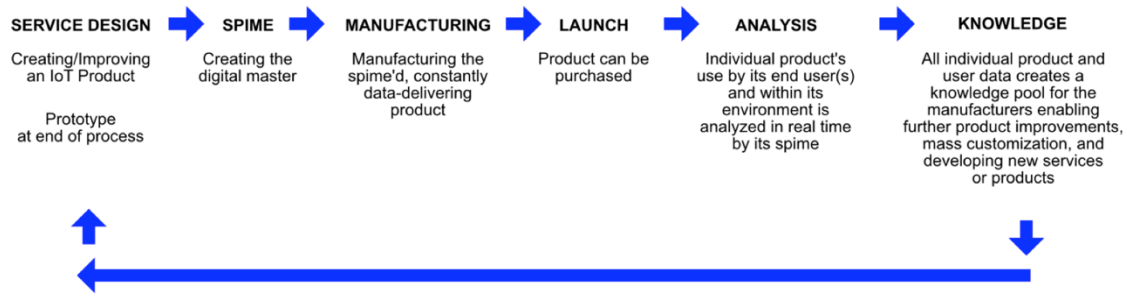

Figure 6: Process overview for "Circular Service Design Process" in manufacturing

The main idea is that Service Design is the starting point for the creation of a new or improvement of an existing IoT product. The IoT is the broad term used to describe a new era of products that are connected to a network in order to send out data about themselves and their environment for further analysis by an IoT Platform. By that, the IoT enables the creation of new business models, products and services (Ibarra-Esquer et al, 2017).

Connectivity is a new element for manufacturers to incorporate to their products, e.g. as built-in means or through the use of other connectivity enabling technology such as thesis commissioner BaseN's own Spime Enablers. The Spime Enabler is also easy to use for the prototype stage of the Service Design process, as it easily brings connectivity to existing physical objects, so that an existing product of the manufacturer could be used that has not yet entered the IoT.

Service Design enables the manufacturer to involve all stakeholders in the value creation and decision making. While Service Design uses a lot of the same principles as Design Thinking, it is a more hands-on and therefore more concrete approach to innovation. In addition, for manufacturers, Design Thinking is traditionally utilized, if at all, during the final stages of the innovation process to make the product more attractive (Andreassen et al, 2016). Service Design, in contrast, stands at the beginning of an innovation process. It is therefore a good

way to introduce traditional businesses to new methods and tools to create new products and services.

The IoT Platform provider is an ideal partner to carry out a Service Design process with the manufacturer with the target to enter a business relationship. Through Service Design, the IoT Platform provider can explain in an understandable way what spime is and how it will improve the manufacturer's business and their relationship with their customers. With spime, new business models and hence a mind shift are required when manufacturers transform from Goods-dominant Logic to Service-dominant Logic and offer services instead or on top of their products.

Spimes are considered the core objects of the IoT. They are the digital and logical masters for physical objects. Spimes enable new business models "where value lies in sustained service" (Bonanni et al, 2009). They are created before anything is manufactured and hence unite and improve currently still scattered production processes like Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM). Both CAD and CAM are important elements in the production cycle, utilized for swift design and revision of products (Hoque et al, 2013). They generate a lot of knowledge but currently most of that data is disregarded once the product hits the market. Spime would in the future store all that raw data, analyze it, and therefore make the next product iteration round much more efficient.

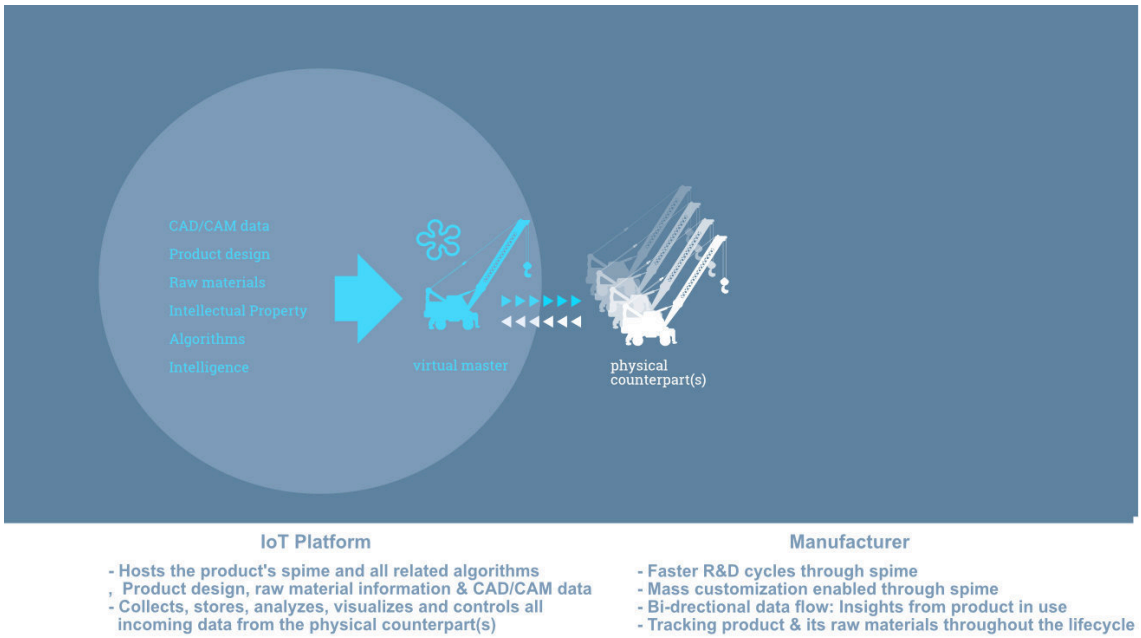

Figure 7: Illustration of spime in manufacturing, adapted from BaseN's original Digital Twin vs. Spime image by the thesis author

Spime also enables mass customization, a desire of both consumers and hence also manufacturers. When the connected product is purchased, the spime collects usage and environment data, which brings new knowledge on individual users' preferences and requirements to the manufacturer. Currently manufacturers still lose track of their products once they leave the production line (Hurri, 2014) and expensive market research is needed to gather insights on how the product is perceived in the market. But with data about individual customers automatically analyzed by spime, the next product for each individual user can be personalized.

In some industries it is already common to use Digital Twins, virtual replica of physical objects. The physical artefact and its set of virtual models, its Digital Twin, have a bi-directional relation, enabling more efficient product design, manufacturing, servicing and other elements of the product's entire life-cycle (Schleich et al, 2017). In current practice this basically means that one can see and explore the behavior of a physical object in various circumstances on a computer screen prior to its production. Digital Twins are the predecessors of spimes.

In addition, many manufacturers already realized that the market calls for additional services in addition to the products they make. Consumers expect services and therefore services add value. Product-Service Systems are broadly used already by manufacturers, meaning that they offer service components in addition to their products. The proportion of services in manufacturing companies is constantly increasing, both in terms of output and profits (Wang et al, 2010). One example are printers. When a printer is sold, connectivity enables it to send data about the ink usage. Based on that a service can be offered to end users to automatically receive new ink when the printer detects that it is running low on it.

Coming back to Service Design and its current place in the manufacturing world, the process ends latest with the implementation, meaning the final launch of a refined or new product or service (Lüders, 2013). With services taking such an important role in the customer experience, it would be a consideration to expand Service Design over the full lifecycle of a product/service. Right now, Customer Experience Management is a discipline that is looking at the full lifecycle of a product/service in use. The target is a customer experience that is positive, engaging, enduring and fulfilling throughout the entire product/service consumption chain (Mascarenhas, Kesavan & Bernacchi, 2006). However, the customer experience is only one element of a product's and service's lifecycle. Service Design looks at all elements, stakeholders and touchpoints of a customer journey, and is therefore one of the most important processes in an increasingly service-driven society. That is why thesis explores if technology, namely spime, can make Service Design a circular process. With the constant spime-generated knowledge about products-in-use, manufacturers as well as other service

providers could come in to kick off a new Service Design process based on this knowledge to ensure that 1) existing products and services keep developing based on their users' wants and needs, and 2) that new products and services are developed based on detected unfulfilled wants and needs, and other new arising opportunities as the market, products and services develop and come to life at a much faster speed than ever experienced before.

With BaseN operating and constantly further developing a global IoT Platform capable of hosting billions of spimes (BaseN, 2018), manufacturers have a partner at hand who enables them to truly digitalize their products and create intelligent services. The thesis therefore explores how Service Design could become an essential part of BaseN's delivery process to win new manufacturing customers by co-creating value and innovating together. A key question here is how to monetize Service Design in this context and where exactly Service Design fits in to BaseN's current sales process.

4 The Conducted Service Design Process

4.1 The Scope of this Thesis

The main objective of this thesis is to incorporate Service Design to the thesis commissioner's sales process. However, since the commissioner works with many different customers from various industry segments, the thesis needs to scope down and work with one selected industry segment as they vary greatly in their wants and needs around the IoT.

With one target industry in mind, more scoping down is required as industry fields are still very large and companies vary in their offerings and operations. With a specific case company selected, the Service Design Process will be developed. The first iteration of this Process, the desired outcome of this thesis, can then later on be adapted to other companies in the same industry field, and with more effort also to other industry segments.

The scoping down resulted in manufacturing and then in sock manufacturing. Explanation of how the scoping was down follows in the thesis process description in a later chapter of this thesis.

4.2 The Thesis Commissioner

BaseN, with headquarters in Helsinki, Finland, was established in 2001 as a global company from the beginning. At the core of BaseN's operations is BaseN Platform, a full stack IoT Platform that gathers, processes, controls and visualizes massive amounts of data from physical objects and their surrounding environment (BaseN, 2018). The Platform's core

features are: extreme scalability, fault tolerance and an inherently distributed architecture with fully owned Intellectual Property Rights (IPR). The Platform is always deployed as Software-as-a-Service. It enables customers to roll out global services within days.

The first application of BaseN Platform in 2002 was the provision of network and service management environments for telecom operators and large multinational enterprises (BaseN, 2018). From there the Platform use expanded to other areas where data was extracted and analyzed from various objects. With the birth of the term Internet of Things in 2004 when the Internet expanded beyond computers (Risen, 2014) it became clear that BaseN operates and maintains a global IoT Platform. Through further development of BaseN's own architecture and expansion of the Platform's capabilities, this was followed with the realization in 2013 that BaseN Platform is ideally suited to host millions of spimes. This realization was based on the fact that the Platform fully allows for and enables the usage and management of physical assets, processes, and systems as Digital Twins (BaseN, 2018).

BaseN Platform enables customers to develop evolving digital services, in difference to static services which require manual redesigning and re-launching when changes are required.

The first spime customers began running their businesses on top of BaseN Platform in 2017.

BaseN positions itself as a global full stack IoT platform operator, setting it apart from most competition which usually offers only some elements of the full stack. A technology stack consists of various layers of software elements and related processes. Adopting this to the Internet of Things, these layers encompass the Things (how to extract data from them), the storage, analysis and control of the collected data, and the visualization of everything and overall experience created for the end user. For a programmer that means that he does not have to search missing components to develop a new digital service from different providers and to spend resources to integrate them to create a running service. Businesses wanting to digitalize, this makes the process much easier and more cost-efficient.

The reasoning for BaseN doing it full stack is simple: It allows to control the entire value chain in order to provide the maximum scalability, fault tolerance and security. This in turn allows BaseN to do it more cost efficiently than others as there is no reliance on third parties in any of the key elements required to offer what BaseN is offering to its customers (BaseN, 2018).

Figure 8: The ten full stack BaseN Platform layers

4.3 Thesis Commissioner's Need for Service Design

This chapter outlines why this thesis was carried out in the way it was and why at this particular moment in time.

With the importance and relevance of Spime in the current global setting, it is important for companies to enter this new era before their competitors do, in order to remain competitive and to populate new market segments before others do. It is also important because of the sustainability benefits that are enabled with spime. In current product design, sustainability is still lacking behind as it often is not included in technology pushes and consumer demands (Fiore, Tamborrini & Barbero, 2017).

But the term spime is still unfamiliar to many, especially traditional businesses that did not have much exposure to the IoT yet. Such businesses are still unaware of the impact spime can have on their industry. Therefore, they need to be educated to make use of the opportunities before they suddenly are taken over by other, potentially entirely new players in the market. BaseN would like to get more customers from traditional industry fields and enable them to enter the spime era and to shift from product to service offerings. Servitization is often a difficult step for manufacturing companies as service strategies differ a lot from product strategies (Rymaszewska, Helo & Gunasekaran, 2017). However, it is also an important step to stay ahead of competition. According to Roos (2015), "…a competitive strategy based on service differentiation is more difficult for competitors to imitate and enables firms to build stronger customer relationships."

Service Design is regarded by BaseN and the author of this thesis as an important stepping stone to enter such new customer relationships. It helps to educate about spime, to show the value it brings to all stakeholders, to highlight the sustainability benefits, to enable innovation, and to build trust early on in the cooperation.

Service Design additionally enables coming up with new ideas that otherwise would be overseen. It is an important key to innovation and therefore especially important in a spime world where anything imaginable is possible. It helps to scope and select the most valuable business opportunities and to involve all stakeholders already in this early planning and development stage.

The logical setting for Service Design is during the sales process of BaseN, when the potential customer relationship is about to begin. In the sales process, Service Design also enables more resource and time efficiency as well as better industry knowledge gathering for the company. That is another aspect of why the interest to incorporate Service Design arose.

Through the process of this thesis, it became clear that there is more synergy between Service Design and spime. The opportunity to make Service Design circular through spime was discovered. With spime, Service Design could be more than an on/off incident, and instead be recurring based on the constant insights from products and services in use by the end-users, to kick off another innovation and new service creation round.

4.4 Thesis Process Outline

This chapter gives an overview of the Service Design process that was performed for this thesis in order to find answers to the research questions.

The author chose to work with the Double Diamond model to carry out the Service Design process. The Double Diamond is a 4-stage model and was created by the British Design Council in 2005. With its emphasis on divergent and convergent phases it is a very common model used in Service Design. It provides a replicable framework and unites quantitative and qualitative research approaches (Clune & Lockrey, 2014).

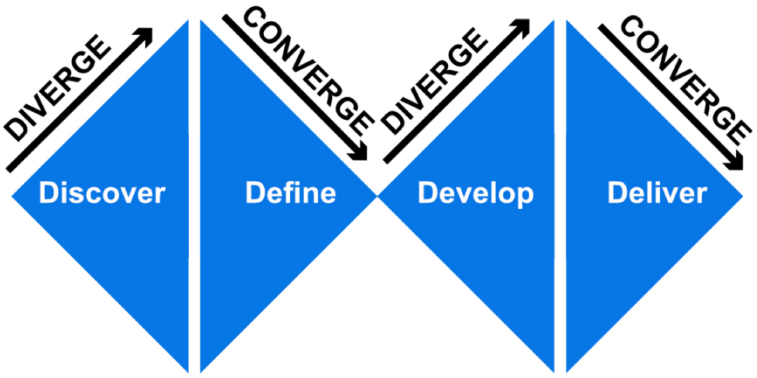

Figure 9: The Double Diamond

The four stages of the Double Diamond consist of the following:

The **Discover** stage marks the beginning of the Service Design Process. An initial idea is born. Research and information gathering usually build the foundation of this stage. It is followed by the **Define** stage which outlines the concrete needs and objectives of the Service Design Process. The next stage, **Develop**, works more concretely with ideas, iterates and tests them, so that the final stage, **Deliver**, can pick up the best idea(s) to be finalized to a finished product or service.

The applied service design model for the practical part of the thesis work was the Double Diamond due to its clear and simple structure. The four stages formed an ideal foundation for the internal deep dive into service design and associated methods and tools. All workshop participants were new to Service Design and could follow the Double Diamond thinking easily to get an overall understanding of how Service Design works.

The image below outlines the Double Diamond stages and practical elements they each included:

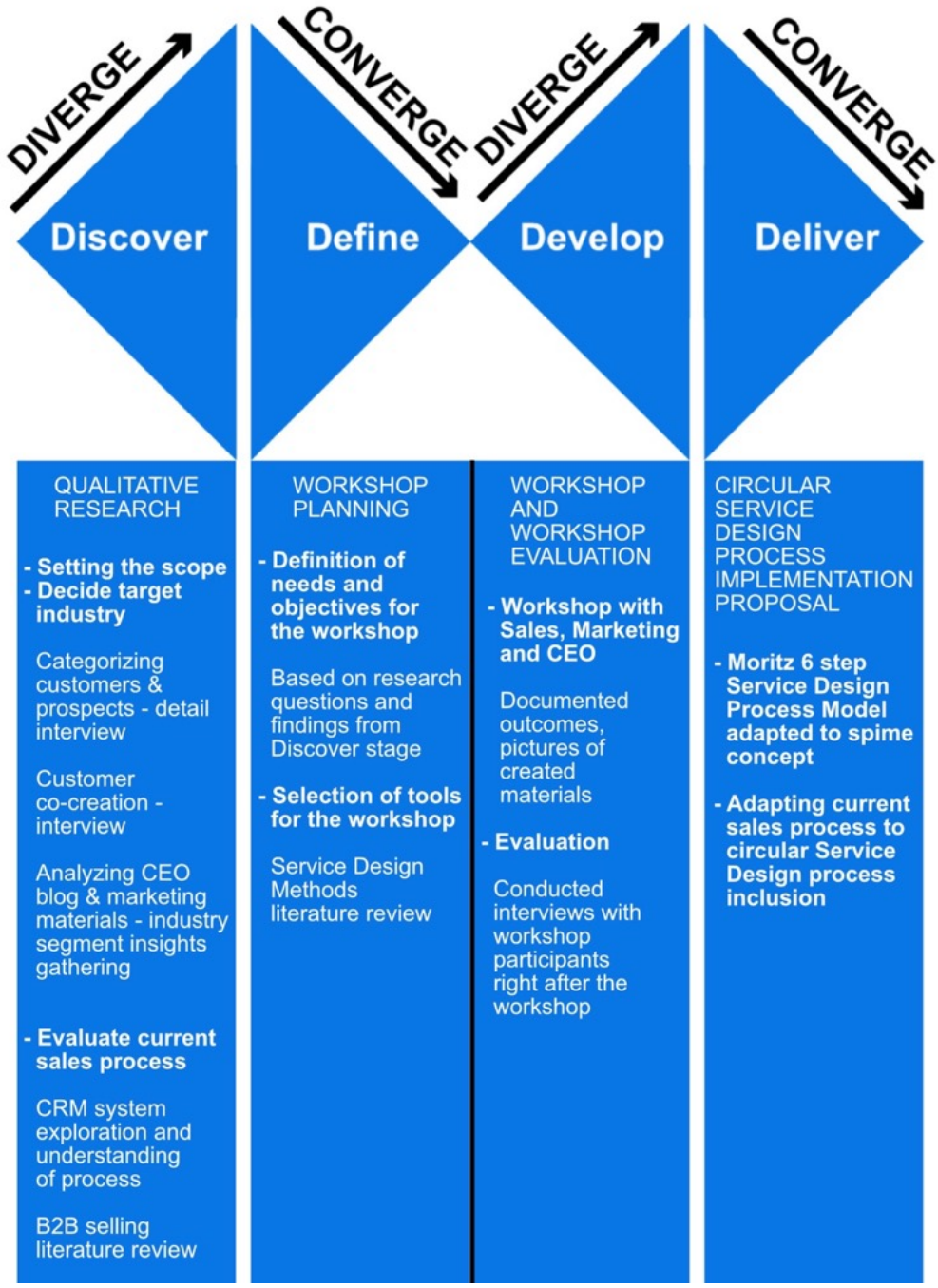

Figure 10: The Thesis Process based on the Double Diamond model

In the following, a more detailed description of each stage as well as all the outcomes and findings are presented.

4.4.1 Discovery Stage of this Thesis Work

The Service Design Process began with the Discovery stage, gathering insights about these separate topics:

a) Setting the scope for this thesis work and deciding on a target industry segment.
b) Evaluating BaseN's current sales process.

Setting the scope and selecting a target industry segment was essential as industries and their IoT operations vary greatly. One target segment was to be selected in order to create the sample Service Design process for. This is to serve as the foundation to expand to other segments later on.

Qualitative research was used for this part of the work. The author obtained a list of customers and current prospects from BaseN and grouped them together in different industry segments. Based on this list an interview with BaseN's CEO was conducted to rank each segment's IoT readiness and to gather other information such as potential fears related with digitalization. In addition, the author analyzed other existing materials by BaseN, such as the CEO's blog, to learn more about the various industry segments the company is working with or has some other experience with.

Evaluating BaseN's current sales process was as well done through qualitative research. The company's current CRM system was explored in order to see how information about the activities with each customer and prospect are stored, and to see how contacts are categorized. Internal interviews further helped to understand the process from lead generation to closing the deal. Existing literature on business to business selling was utilized to create a framework to place the new Service Design process in. The following chapters show the results of the Discovery stage.

4.4.1.1 IoT adoption among customers and prospects

The planning period of the first workshop, and more specifically the used Service Design methods and tools, consisted of gathering insights from existing and potential customers. These companies are from various fields of industry (energy, telecommunication, construction,…) but for the scope of this thesis a higher number of potential customers in the field of manufacturing was evaluated.

The gathered information looked at the companies' IoT readiness, their concerns and the probability of doing business with them from BaseN's perspective. The full list of information can be found in Appendix 1.

With all information at hand, the results were evaluated and segmented, first of all, by the companies' industry segment and their IoT readiness score.

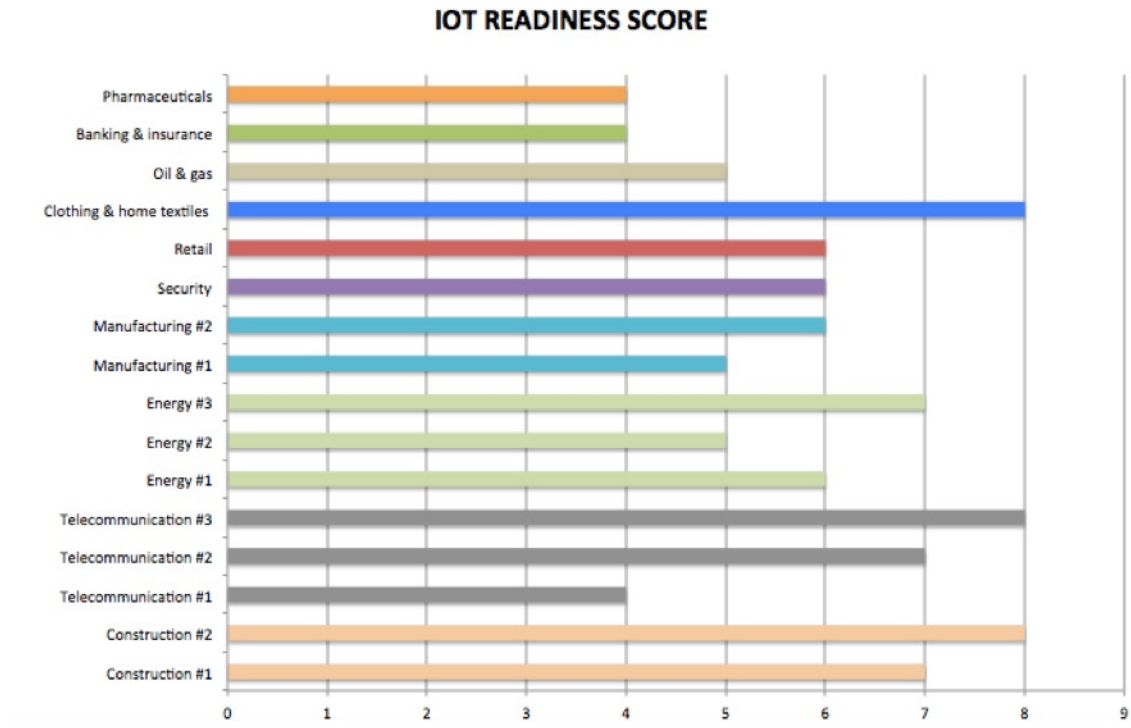

Figure 11: IoT readiness score for selected customers

IoT is already in the works or at least talks, to some degree, in most fields of industry. The opportunities are endless and companies have realized that they will have to move and innovate in order to stay competitive. When selecting a target industry for this thesis, the selection was based on the IoT readiness score – something around the middle was desired, meaning a score around 5-6 out of 10. Such score translates to the industry having huge potential through the IoT and specifically spimes, but they may themselves not even have recognized it. Another reason why the clothes manufacturing industry was selected, was their end user focus.

The second part of planning involved BaseN's own ideas on how to get into new business with existing and potential customers in the field of manufacturing. Brainstorming was used to collect ideas.

Conclusion of the planning what comes to service design methods and tools to be used in the first workshop and the reasoning behind them:

A set of 16 current customers and strong prospects was selected for the insights gathering. The selection was based on the desire to cover as many industry segments as possible with

one or more concrete companies per segment. This resulted in ten different industry segments, namely: telecommunication, energy, construction, clothing and home textiles, pharmaceuticals, retail, banking and insurance, manufacturing, oil and gas, and security.

The current status of Internet of Things adoption was evaluated on a scale from 0 (lowest) to 10 (highest). The lowest score was 4 and the highest 8. Companies in the same industry segment show great variation what comes to their IoT adoption stage. Some are forerunners, others are still in the very early stages.

Further, feedback from the customers was categorized into ”IoT concerns” and ”IoT advantage” to gain an understanding of their needs and worries, and to identify any common threads. The following table displays some of the biggest concerns and advantages by industry segment.

INDUSTRY SEGMENT	IOT CONCERNS	IOT ADVANTAGE
Telecommunication	• Inability to predict their role in the future within the IoT • How to deploy global solutions • Make IoT product as viable as the existing telco product	• More pillars to their basic business as telco revenue goes down
Energy	• How to pick the right ecosystem for sustainable (energy) business • Afraid to make wrong choices and then having to replace huge amounts of hardware • What will the IoT enabled end user products actually be?	• New service products to customers • Getting Smart Grid all the way to the end users • Better distributed generation and ”prosumer” model
Manufacturing	• No immediate return on investment • Security • Fragmented factory automation	• Not only spiming factory equipment but every single end product • Preventive maintenance

		• Moving to service business model
Banking & Finance	• Security • Deployability to millions of customers	• Personalized insurance and banking
Pharmaceuticals	• Security • Deployability to millions of customers	• Personalized medicines • Much better directed research how drugs actually affect
Security	• Reliability • Security of new solutions	• Digitalizing the traditional man and dog security work • Do more with existing workforce
Construction	• Security • Scalability of Platforms • How to keep up with the development • Pricing of individual solutions for end users • Systems get too quickly obsolete • Full lifecycle management	• Moving from singular product to product ranges to continuous services • Each house is a system • Gathering direct feedback from every component and every construction phase to see if the choices were good
Retail	• How to maintain customer loyalty • How to address their very large customer • Customer privacy infringement	• Mass customizing products • Doubling customer loyalty
Clothing & Home Textiles	• How to reach customers at stores • How to ensure that customers return	• Fashion-as-a-Service
Oil & Gas	• Mission critical security	• Managing millions of assets around the globe in more coherent way with preventive maintenance

		• Maintain compliance with environmental rules •

Table 3: IoT concerns and IoT advantage by industry segment

The concerns which mostly stand out are uncertainty of the company's role in the future and, along the same lines, what their business will be like. It is therefore one of BaseN's greatest desires to help them better understand their opportunities and to move ahead before their competition does. This is exactly where Service Design steps in and this formed the foundation of the planned process to be adopted by BaseN as part of their sales activities.

4.4.1.2 Thesis Commissioner's current state of customer co-creation

To gain insights on the thesis commissioner's current state of customer co-creation, qualitative research in the form of interviews was conducted. The example interview guide is attached in the Appendices.

Co-creation is currently not the norm when BaseN works with prospects and existing customers. Sporadically it occurs but is then mostly driven by the other party when they have a rough idea about what they want to implement but cannot quite fathom how this would work in practice. However, in those instances when co-creation occurred, the results have been always very positive for both parties and therefore it seems natural to incorporate co-creation into BaseN's sales process. As stated by Feldmann and Kohler (2015), when services are being co-created with customers, important insights are gained what comes to the customers' wants and needs, as well as their potential areas of innovation.

In a B2B context, Kohtamäki & Rajala (2016) outline the roles within the value co-creation and coproduction processes as follows:

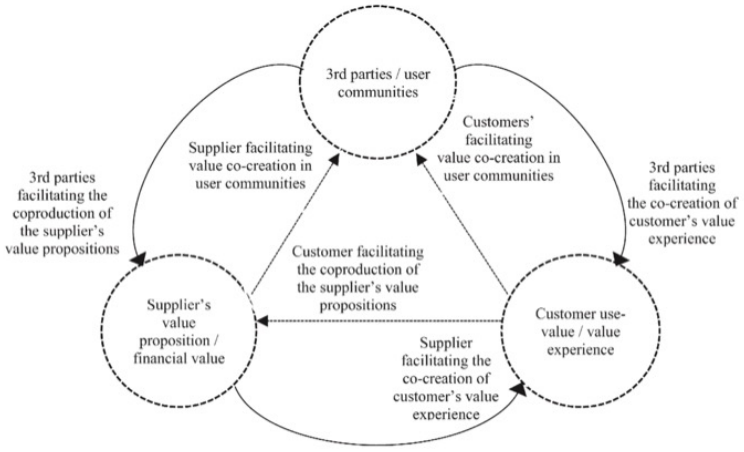

Figure 12: B2B Co-creation actors and roles, Kohtamäki & Rajala (2016)

In this framework, BaseN would be the supplier, and BaseN's customer's end users the 3rd parties / user communities. In those instances where value co-creation does happen within BaseN's current delivery process, BaseN does at this point not facilitate value co-creation for the 3rd parties / user communities. Utilizing Service Design when co-creating a new service with a (potential) customer would through the very nature of Service Design, meaning its end-user-centricity, introduce this missing link. By that, value would be added to BaseN's customers as they would be enabled to understand their customers' wants and needs already during the development stage of a new service or product-service system.

4.4.1.3 Selecting a test industry segment

Following the desk research, manufacturing appeared to be the most promising industry field to explore with this thesis. A mind map was created to illustrate all elements that speak for manufacturing's potential in IoT and from Service Design perspective.

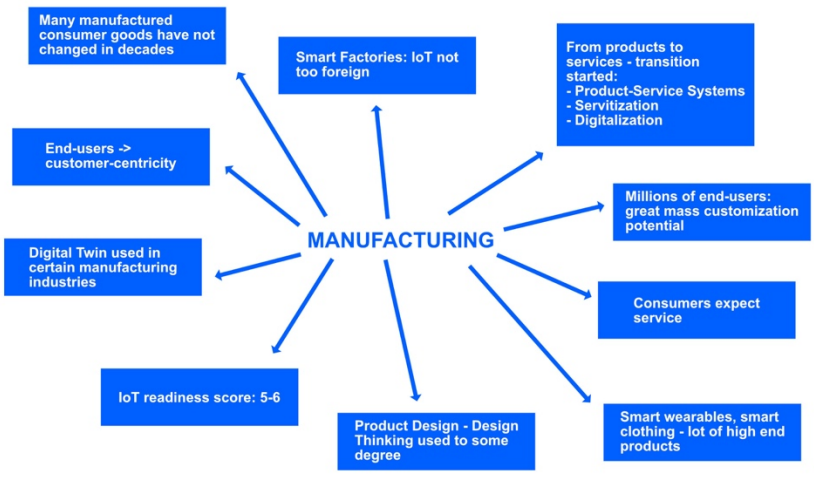

Figure 13: Manufacturing's IoT potential and Service Design attributes

Based on the conducted desk research, manufacturing is still far from entering the spime world, but this field holds the greatest potential for this transition. Whilst manufacturing companies look indeed at the Internet of Things and are making their factories smarter with factory machines reporting their state and process information (Wang et al, 2016), they have not yet realized what potential spiming their single products would bring. Bringing connectivity, so that data can be extracted, to even the most mundane products like a paper cup or a tile is very cost-efficient (Hurri, 2016). In fact, by entering spime, BaseN sees that the cheapest products hold the biggest business logic changes and opportunities.

BaseN believes that spiming those "smallest", in a sense of mundane, items will have the biggest impact as suddenly manufacturers will be aware of how every single product is being used by their individual end-users. Whereas currently manufacturers totally lose track of their products once they leave the production lines (Hurri, 2014). With spime they suddenly have the opportunity to interact with their end users, and to influence their buying decisions for other products in much smarter ways.

With spime, user-centricity reaches totally new levels and therefore it was a natural choice to look at a consumer product. A spimed sock, or any other manufactured consumer good, does not lose its connection to the producer once it leaves the factory. A consistent data flow will allow manufacturers to keep being in touch with their products and to learn from the end users and how they really use the product. With this continuous real time feedback loop mass customization is enabled and much longer lasting customer relationships are possible. Customers are no longer satisfied with mass production (Peng, Liu & Heim, 2011) and anticipate customization based on their wants and needs – something manufacturers are now able to provide through technology advancements.

Another interesting aspect why to look at the textile industry is the still hot consumer focused trend in the IoT – smart wearables. This trend is expected to keep exponentially expanding with many big consumer brands like Apple, Samsung, LG and Sony actively working on more and more smart consumer wearables (Yoon, Park & Lee, 2016). While there are already a lot of fashion gadgets like smart watches and fitness tracking bracelets, as well as the first pieces of smart sports clothing, those products are not yet for the broad masses and only for selected, high end target segments – e.g. the more sport and wellness conscious part of the population. In addition, users' interest in using them commonly decreases over time as studies have shown and there is already a quite big collection of 'dead' wearables. Consumers commonly discontinue using their purchased wearables within three months or less, often because using a wearable is either too much of a hassle or not comfortable enough (Valencell, 2016). However, the technology utilized in those products is affordable also for other textile and clothing manufacturers and the services they can create on top of their goods have the

potential to reach a much wider group of end users for a significantly longer lasting time. Customers would e.g. receive new socks when their old pair wore out and the new pair would be stronger in such places where the old pair gave in (Hurri, 2013). This would boost customer relationships, and exactly that should be at the core of all (personalized) services evolving through the Internet of Things and spime.

Mundane clothing items just like socks or gloves are also interesting because they have not changed much in decades (Hurri, 2013). With the IoT even, or especially, such products can evolve tremendously from physical goods into dynamic service platforms (Ng & Wakenshaw, 2017). This potential should trigger interest among manufacturers to work together with an IoT Platform provider.

4.4.1.4 The current sales process

As early as the 1920's the sales process has been defined by a series of six steps. Later on, this process has been expanded to the widely known and still used "Seven Steps of Selling" (Moncrief and Marshall, 2005).

The seven steps have not changed much in almost 100 years except for the addition of the seventh step. They are: 1) Prospecting, 2) Pre-Approach, 3) Approach, 4) Presentation, 5) Overcoming Objections, 6) Close, and 7) Follow-up.

Prospecting means the process of identifying new potential customers. Due to this stage's close ties with marketing, Syam and Sharma (2018) highlight that prospecting touches also 1) targeting and positioning, 2) demand estimation, and 3) lead generation and lead qualification.

The Pre-Approach phase consists of all activities a sales person does in order to prepare for the first meeting, mostly researching the potential customer, their field of industry, checking if there was any previous contact established between them and the sales person's organization, and to collect the supporting materials for the meeting. The core is learning as much as possible about the customer's wants and needs, and their ability to pay for the offered service (Davies, 2010).

The Approach is the very short moment when the first physical contact occurs - introductions, handshakes, opening the conversation - where the first impressions is of high importance (Moncrief and Marshall, 2005).

In the Presentation part consists of a series of calls and meetings in which the potential customer's needs are identified and the sales person's company thoroughly presented. Each of these direct contacts with the potential customer should be well prepared and thought-out (Moncrief and Marshall, 2005). During the presentation stage, the selling organization in many cases has to present prototypes of their product or service (Syam and Sharma, 2018).

Overcoming Objections means answering the potential customer's question and coming closer to satisfying their wants and needs. The main task of a sales person at this point is to understand the resistance to buy. Objections may arise, among other reasons, due to a lack of knowledge or a need to compare other offers (Feiertag, 2014).

The Close comes with either the signing of a contract and entering a binding customer relationship, or a clear "no". Either way, the Close is the "end of the sales process for this prospect at this particular time" (Butera, 2001).

The Follow-up, being the newest addition to the previous Six Steps of Selling, focuses on customer satisfaction. Sales people have to make sure that the customer receives exactly what was promised during the earlier sales stages.

In the following, the traditional seven steps of selling will be compared to the sales work within BaseN.

Prospecting: This phase in BaseN's sales process contains both the identifying and qualifying of a lead. Leads are most commonly generated at conferences, through the contact form and live chat of the corporate website, and through customer referrals. The contact details and notes about the identified potential are stored in the company's CRM system. The qualifying process includes further research about the potential customer company, the contact person and their decision-making power within the organization.

Pre-Approach: A new lead becomes a working lead. This means that the dedicated sales person reaches out by email and phone to learn more about the lead's interest in BaseN Platform. Notes about the conversation are added to the CRM system. During this stage the dedicated sales person also looks further into any existing ties, e.g. does anyone within BaseN know anyone within the potential customer organization to help move further ahead in the discussion. If the sales person learns during the pre-approach phase that the lead has no interest in our offering, the lead will be labelled as "unqualified". Do things look promising, the lead moves on to be "nurturing" at this point.

Nurturing a lead comprises of the both the Approach and Presentation stages of the seven steps of selling model. Online or physical meetings take place in order to exchange more information. In addition, the sales person labels a lead as hot, warm or cold during this stage depending on how urgent the lead is in need of an IoT Platform. A cold lead with barely any current need will move back to be an unqualified lead. In order to make this transition it usually takes quite some time during the nurturing phase to get to the point of the lead saying that they have no interest or for other reasons, e.g. lack of resources, will not move into a customer relationship with BaseN.

The traditional Overcoming Objections phase fits in with the next stage of BaseN's sales process when a lead is converted into an existing account. This step does not mean yet that contracts are signed but that an opportunity to enter into business clearly exists. The dedicated sales person creates an opportunity in the CRM system and inserts all information that will be utilized in order to create the proposal. At this stage the sales person also assembles, if needed, an internal team around herself to be responsible for serving this particular project.

The Close is then the actual proposal. However, this stage might transition back to Overcoming Objections if the first proposal is rejected and adjustments need to be made. With an accepted proposal the contract is then signed and the customer relationship, or project, begins.

The Follow-up is a very important and still very relevant step. In new customer relationships there are more frequent follow-ups, and later on quality meetings take place at least once per year to check how happy the customer is still with the offered service, and if any new needs arise that will expand the service offering.

PROSPECTING	PRE-APPROACH	APPROACH & PRESENTATION
New Lead	Working Lead	Nurturing Lead
A new lead is **collected** (at e.g. a conference) and - if **qualified** - the dedicated sales person enters it to the CRM system for further processing	The dedicated sales person reaches out to the still unqualified lead in order to learn more about their IoT Platform needs	If the follow-up discussions were promising, the lead is now converted to nurturing and meetings take place to explore in depth the potential customer relationship. The sales person labels the lead as hot, warm or cold.

Figure 14: BaseN's current sales process

4.4.2 Definition Stage of this Thesis Work

During this stage the author established the needs and objectives of the Service Design Process. This was done with the research questions and the outcomes of the Discovery stage in mind.

With sock manufacturing as the selected target customer segment in mind, the thesis workshop was planned. This essentially meant selecting the tools to utilize during the BaseN internal workshop, just as they would be used with a sock manufacturing customer and its various stakeholders. One important aspect was that BaseN does not utilize Service Design to date and most employees are unfamiliar with it as well as with Design Thinking. The goal of the workshop was therefore not only testing how workshops with manufacturing customers could be done but also to educate the participating staff about Service Design.

The decision was made that representatives from the company's Sales and Marketing team in addition to the CEO will participate the workshop. Sales was a logical choice as Service Design will be incorporated to the Sales process. Marketing was selected as currently this department supports lead generation and pre-sales through e.g. the creation of industry and prospect specific materials. Hence the marketing team is familiar with desk research and could in the future take the responsibility of Service Designers. The CEO participated as he has the final decision power what comes to changing existing processes.

The author next defined the structure of the workshop and the Service Design tools to be used. The table below outlines the structure of the workshop:

Tool	Explanation	Duration
Introduction and warm-up	Explanation why we are here, what we want to achieve and how we will do that. Warm-up exercise to bring participants in a positive teamwork mood	15 minutes
Brainwriting	Participants silently write down their ideas on post-it notes and stick them to a wall	15 minutes
Sharing and grouping of the Brainwriting outcomes	Participants read through the ideas on the wall, discuss them openly, add on to them and group them into similar topics. In the end, the team decides which service idea to develop further	40 minutes
Stakeholder map	From manufacturer perspective and with the selected service idea in mind, who are the stakeholders? The purpose of the exercise was to understand the entire new service ecosystem	25 minutes
Service Logic Business Model Canvas	Familiarizing the participants with Service-dominant Logic and the service specific business model canvas. The team discussed and filled in the canvas.	45 minutes
Customer Journey Map	Taking the viewpoint of the manufacturer's end user, the participants created the whole customer journey maps, including all the touchpoints and interactions with the Sock-as-a-Service app	45 minutes

Table 4: The selected tools for the Service Design workshop

Brainwriting is a group exercise in which the workshop participants write down their ideas silently instead of discussing openly with the other group members. After one ideation round, the members silently read all ideas and make new additions (Haley, 2014). This exercise was selected as it provides participants with time to think individually, without judgement and distraction, before continuing the work as a group.

Grouping the ideas to similar topics was selected as the next tool to have the group interact. This exercise fulfils the second purpose of selecting one idea to focus on in the remaining part of the workshop as brainwriting as one of the many idea generation techniques enables groups to come up with many more ideas than they can meaningfully attend to (Seeber et al, 2017). The workshop participants are by the grouping exercise encouraged to build on the generated ideas (Krone, 2017).

A stakeholder map was selected as a tool to gain an understanding of who is part of this new to-be-created service ecosystem. The goal for the workshop members is to identify all stakeholders and then to group them. An onion diagram was selected as the best tool in order to categorize the stakeholders as 1) core stakeholders, 2) direct stakeholders and 3) indirect stakeholders. Stakeholder mapping in a new service context is important as building and reimagining the intersections of stakeholder interests creates more value for everyone involved (Strand & Freeman, 2015).

With the core stakeholders identified, the next selected tool is the Service Logic Business Model Canvas. The Service Logic Business Model Canvas was developed by Ojasalo, J. & Ojasalo, K. in 2015 as an attempt to adapt the existing Business Model Canvas tool to a service-dominant logic and customer-centric setting. The original Business Model Canvas was introduced by Osterwalder and Pigneur in 2010.

The last selected tool was the Customer Journey Map. The Customer Journey Map is a customer-oriented technique (de Salles Canfield & Basso, 2017) to visualize the sequence of events through which the service end user may interact with the service (Rosenbaum, Otalora & Ramirez, 2017). Thus, Customer Journey Maps help to represent the full user experience (Moon et al, 2016).

Another important element of the Service Design Process would be the creation of a prototype. A prototype was not part of the workshop due to limited resources, but its fit to the sales process was discussed with the thesis commissioner and found to be a very important and useful addition in helping the prospect customer to make the final decision for a new service development on top of BaseN Platform.

4.4.3 Development Stage of this Thesis Work

This stage consisted of the workshop that was carried out with the defined BaseN staff, and the evaluation of the workshop. The evaluation was done through qualitative research, namely interviews with the participants right after the workshop.

4.4.3.1 The Workshop Process

INTRODUCTION

The workshop began with a warm up exercise (“Yes and..”) to get the participants into collaboration mode. This exercise originates from improv theater and participants have to accept and add on to whatever the others are saying (Robson, Pitt & Berthon, 2015). The main objective of this exercise is to prepare participants for the workshop so that get into a positive mindset and give their full attention to listening to the others.

Then the idea of Sock-as-a-Service was explained and some background on the thesis given. Participants learned that they will go through a small-scale Service Design process to get to know and experience first-hand various tools and to see how such a process could benefit the future sales process when performed together with the prospect/customer and their end users.

BRAINWRITING

Brainwriting was the first tool utilized in this workshop. The group got instructions to write down anything that comes to mind when thinking about Sock-as-a-Service and the value it would create for a sock manufacturer, the actual end users, and BaseN. After the first five minutes, members put their post-its silently up on a wall and read through all ideas. Then they had another five minutes to add on to those ideas. This process repeated for a third time, so that the group had a total of 15 minutes for the Brainwriting exercise.

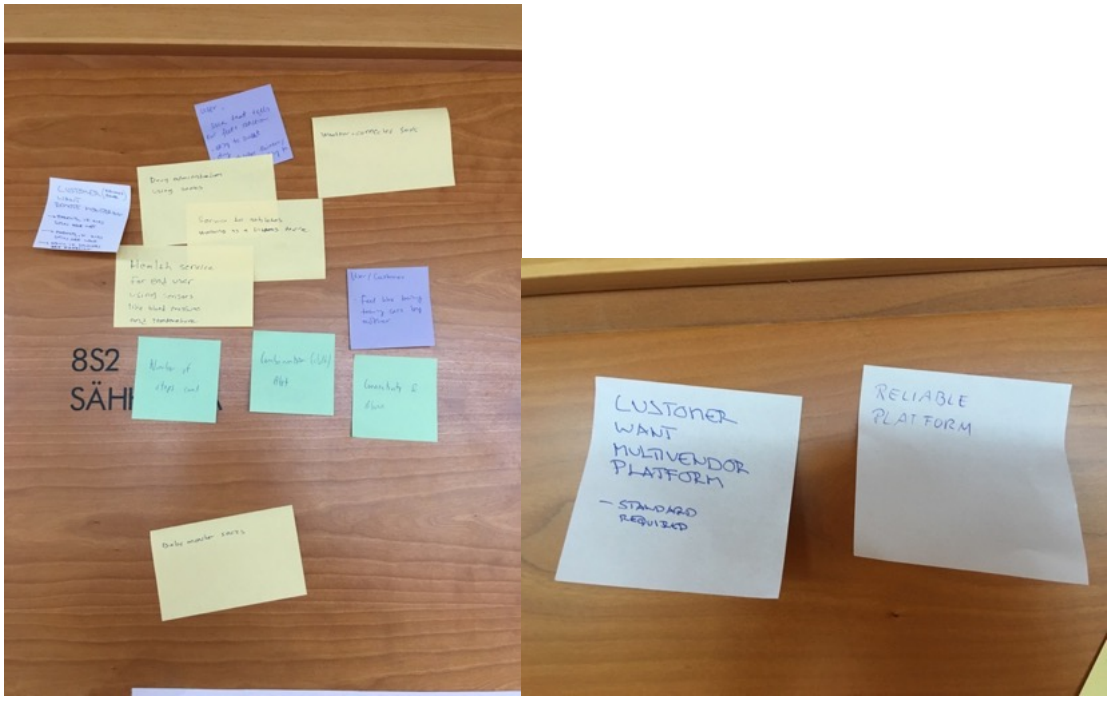

Figure 15: Examples from the Brainwriting exercise

SHARING AND GROUPING OF IDEAS

The group then continued to go through each idea and to group them into similar themes, and by that to decide on the core value of Socks-as-a-Service they see for the manufacturer, end users and BaseN. The results were as follows:

Value for the manufacturer	**Value for the end users**	**Value for BaseN**
Ability to enable new services for new market segments with new partners, e.g. socks with sensors to track body heat, perspiration, blood pressure, body temperature, amount of walked steps, baby monitor socks	Remote monitoring of socks, e.g. parents would know when their kids' feet are wet or cold, the army could track if their soldiers' feet are freezing or blistering too easily	New business and business area
Real time tracking of raw materials and inventory – reduced costs, quicker R&D, optimization of resources	Smart suggestions based on real data, e.g. suggestions to wear thinner or thicker sock depending on individual's feet perspiration levels	Millions of end users – scalability

Enhanced products	Automatically receiving new and improved socks when needed – one thing less to worry about	Easier entry to adjacent markets (other clothing and textile businesses, other customer goods manufacturers)
Mass customization	User community: peer to peer advertising	
Much more targeted advertising		
Insights into individual end user's sock usage (something they don't have at all right now)		
Accurate insights into socks' durability		
Full circle service: manufacturer recycles all materials, locally 3D woven socks		
Stronger branding		
Differentiation from competition for early adopters		
Increase in customer loyalty		

Table 5: Brainwriting ideas grouped by value

STAKEHOLDER MAP

The group decided which stakeholders would be involved. This exercise helped to evaluate who the other important partners in the new service ecosystem would be that need to be considered apart from BaseN, the sock manufacturer and the end user. The stakeholder map would also help the sock manufacturer to understand who the new partners are they would need – e.g., other than BaseN as the IoT Platform provider, sensor manufacturers and other new raw material suppliers (e.g. for conducting threads to be woven into the socks).

The stakeholder map was considered a useful deliverable to prepare before talking to the sock manufacturer and completing/refining it with them together. The used map was divided into the core, direct and indirect stakeholders. Other stakeholder map types could be used in

the future, depending on which one stands out as the most usable as experience with using stakeholder maps increases.

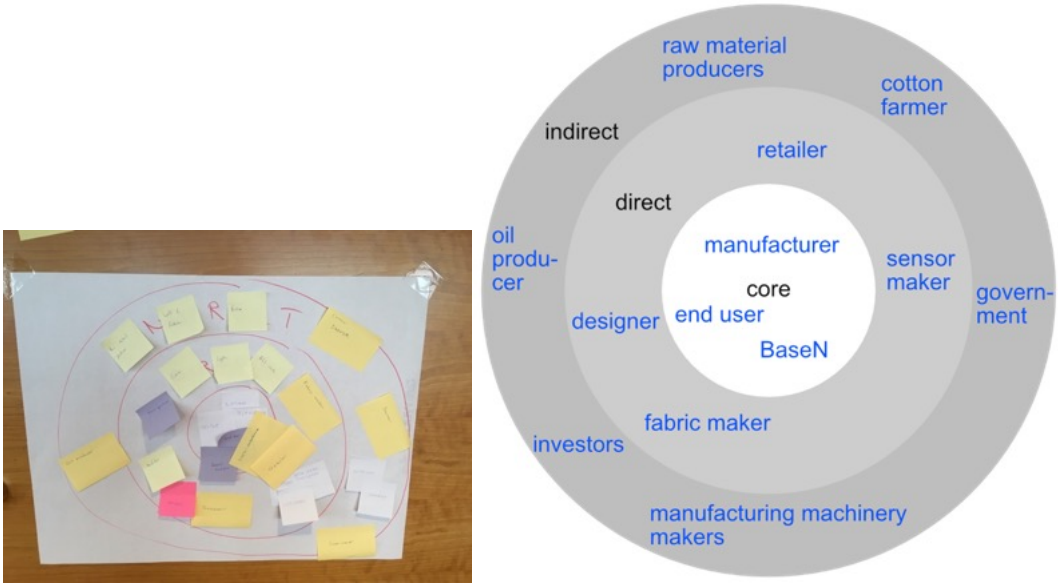

Figure 16: The created stakeholder map

SERVICE LOGIC BUSINESS MODEL CANVAS

As the next step, the service logic business model canvas was completed by the team. The canvas will help the customer/prospect to understand the changing business model (from product to service) and to see the value proposition at a glance.

Key Partners	Key Resources	Value Proposition	Value Creation	Customer's World and Desire for Ideal Value
- sensor manufacturers - other partners (device manufacturers, app makers) come on the flow - raw material (fabric) vendor	- Willingness to grow - Knowing the consumers, their needs and wants - Knowledge of sock industry - User experience and user interface for targeted consumers and the sock manufacturer - know how to visualize the corresponding data	- From bulk vendor to special service - Reliable and proven IoT Platform - Multi-tenancy of platform (millions of consumers can easily see their own sock data if needed) - Algorithms to automate sock service - Real time, fault tolerant, and highly scalable Platform	- Branding - be the first who digitalizes their products	- Customer wants to grow which is only possible with happy customers - New business (model) only with very good return on investment -> ,model has not changed in decades, it is a huge step
	Mobilizing Partners and Resources - Service design workshops including consumers to define what the service should look like		**Interaction and Co-Production** - Service design workshops including consumers to define what the service should look like - Prototype development	
Cost Structure - Based on transactions/second, pay as you grow model (depending on end user numbers)			**Revenue Streams and Metrics** - For sock manufacturer tiny increase of sock price or new flat rate offers (annual subscription: when socks begin to break, right away new and improved ones will be dispatched automatically)	

Figure 17: Created service logic business model canvas

The business model canvas creation would need more time and more iterations than was given during the workshop. It was regarded as one of the most important deliverables to be

shared and expanded with the potential new customer. Filling in the canvas did also lead the team to discuss how important it would be to know the prospect's industry and market very well way before entering the presentation stage of the sales process with them.

CUSTOMER JOURNEY MAP

The customer journey map is supposed to form the foundation for the prototype creation. At this point it has to be very clear what service idea will be pursued and it is extremely important that it will be created together with the prospect and, ideally, representatives from their end user groups.

During this workshop, BaseN internally worked on creating the map based on assumptions and own ideas. This was a good exercise for the team to learn about customer journey maps in general and to get an understanding of what it means and what is required to put on the desired customer's shoes. It also helped to highlight the importance of actual end users even though the direct relationship between BaseN and the potential customers is business to business. When developing new services on top of existing physical products in the times of IoT, the end user is of paramount importance for manufacturers and therefore also for the IoT Platform provider who is enabling this new service creation for the manufacturer.

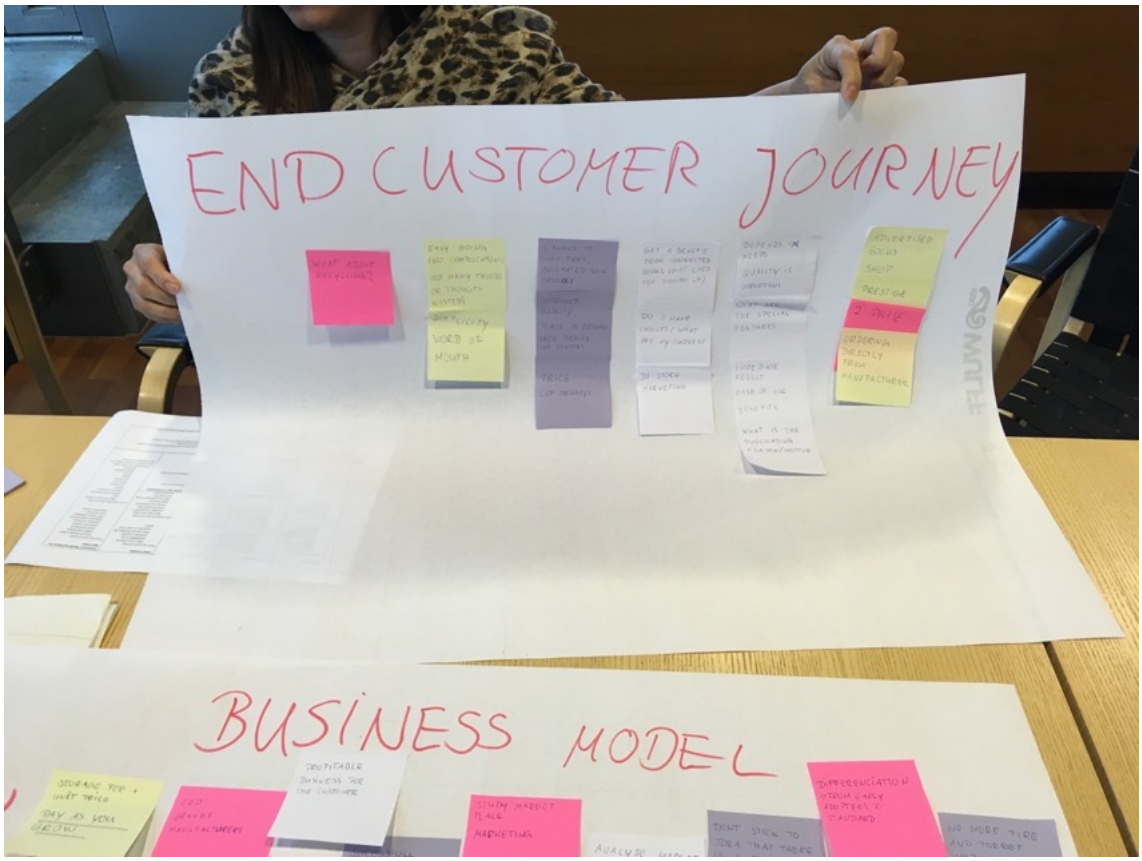

Figure 18: Early stage of the customer journey map

The creation of the customer journey map would have required more time. The team discussed so many important aspects during the process. It is to be expected that this would also happen when the prospect customer and their end users are included in the creation process. Different stakeholders will have different viewpoints to be exchanged in order to complete the map.

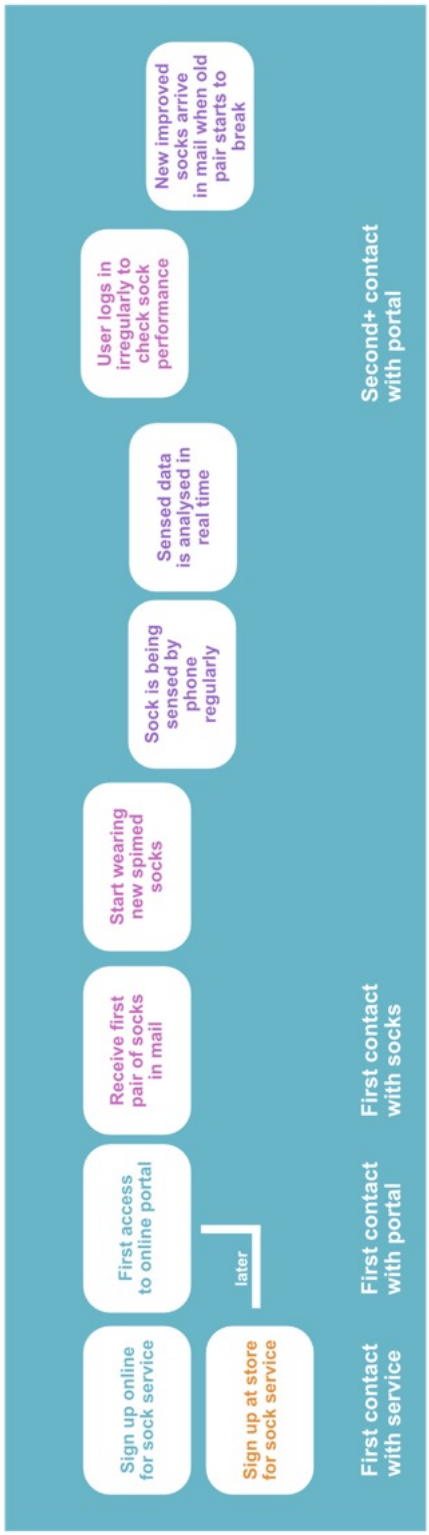

Figure 19: Final version of the created customer journey map

4.4.3.2 Workshop evaluation

Following the workshop, the author interviewed the participants to collect feedback on how they would see this fit in to the current sales process. The most important aspects that were brought up are described in the following chapters.

Integrating Service Design into BaseN's sales process, and by that co-creating with customers and their end customers, would help to conceptualize the specific service to be developed and provided to the customer. At the moment, this is done way too little and customers have to be the driving force in having new ideas – and when they don't have any, then new BaseN Platform capabilities come about driven by technology only, possibly in a wrong order, and fewer business opportunities arise.

Utilizing Service Design would also help BaseN's staff to learn much more about (potential) customers and their industries before entering sales discussions with them. Desk research would be taken to a whole new level and internal workshops could help a single sales person to plan the customer approach. Utilizing Service Design prior to the sales approach also helps putting BaseN on the map within the customer's IoT ecosystem.

The workshop showed that taking the role of a company whose field of industry BaseN staff is unfamiliar with, is not very efficient. It is therefore essential to learn about the targeted industry beforehand and the author recommends preparing a set of questions the sales person could ask from the prospect customer during the pre-approach phase. These questions should not only teach essentials about the industry but also identify the prospect's known pain points. With that information at hand it is much easier to conduct the internal workshops where BaseN participants need to think on behalf of the prospect in order to prepare the most valuable workshops with them.

Service Design would also help to provide potential customers with the scope for a proof of concept. Currently unnecessary time is spent on defining the scope during the negotiations.

Customer journey mapping was regarded as an especially useful tool – both when looking at BaseN's customer and when looking jointly with them at their end customers. The thesis workshop test run already revealed untapped business opportunities.

The Service Design process with customers should be compartmentalized so that several parts of the process would be conducted in various workshops instead of one session. The thesis workshop participants concluded that this would best ensure alignment of time and effort for all involved parties.

Through co-creation it would be much easier to crystallize prospects' and customers' needs – something much more difficult to accomplish through conversations alone, especially if the customers are not even aware themselves yet what they need and want.

Service Design was also considered as an easier way of conducting a competitor analysis along the way as it came up as a natural part of the creation of the business model canvas and stakeholder map. Currently, BaseN does not conduct customer analyses on a regular basis when looking at new target customers but doing so would naturally help defining the company's value proposition for each new prospect and industry field to be entered.

Utilizing Service Design was also considered very useful for existing customers. Running brainstorming workshops with them on a regular basis would help to scout for new opportunities to develop the cooperation further, and to invite also more persons from the company to tighten the existing relationship and make BaseN known better inside the customer organization.

Overall increasing the co-creation with customers was also regarded as useful in order to discover in greater detail what BaseN's strengths and weaknesses are.

4.4.4 Delivery Stage of this Thesis Work

The Delivery Stage includes the Circular Service Design Implementation Proposal as designed by the author. It is based on the workshop itself and the evaluation. It also draws back on earlier knowledge obtained during the Discovery stage and it follows the scope of the Definition stage.

4.4.4.1 Circular Service Design Process – Implementation Proposal

Utilizing Service Design is regarded as a value-adding asset for IoT Platform provider BaseN. With new opportunities and especially new business models being opened through the IoT, traditional businesses that have done what they are doing in pretty much the same manner for many years, need help to identify the new direction their business should be heading into to become more sustainable and to remain competitive.

The technical capabilities are readily available but mindsets and what companies are used to have to be changed. Educating about the IoT, spime and its possibilities for their industries is therefore highly important and Service Design is a very good way of teaching and learning. The IoT platform provider learns about the potential customers' industries and they in return

learn how IoT will revolutionize what they are doing. It is a giving and taking, and an exploratory process for both parties, deepening a new relationship quicker than other means could. Service Design also helps to verify these new business models and to demonstrate that they indeed bring value, which in turn yields to easier decisions.

BaseN is in a key position to support this mind shift during the sales process, enabling innovation in any industry with its versatile platform. With the outlined suggested new delivery process, including Service Design for internal and external processes, approaching new and existing customers will be more effective as new services will be jointly created in a Service Design typical agile way. This also eliminates the risk of half implementations and pilot projects that do not move onwards to full production due to technical obstacles or other unexpected problems – something very common in other companies' IoT efforts. Both parties will identify their roles and what is in it for them in the beginning of the process and they will paint the big picture, the new service and what it means to end users and all other stakeholders, together.

Another reason why BaseN is to take on Service Design is its financial value: more value with the same resources can be created because the resources are used in a much more effective way.

For most BaseN customers, Service Design is still a foreign approach. Therefore, educating customers about the value and possibilities that Service Design brings will be an important part of the enhanced sales process. Financial models to sell co-creation projects is at this point mostly associated with consulting companies. Customers therefore need to learn that Service Design is also done in BaseN's very real business setting. One advantage of this is, however, that customers are already very used to buying consulting projects and offering a paid e.g. two-day Service Design process will be easy, especially when real value, customized to the customer's current needs, is the outcome.

The process developed with this thesis encompasses elements from Moritz' six step model as this was found to be the most useful for complex processes that need to be split into various smaller internal and external workshops. Moritz created this model in 2005 with its six steps: SD Understanding – SD Thinking – SD Generating – SD Filtering – SD Explaining – SD Realizing. Moritz highlights with this model that the process is not a short on/off project but a continuing service evolvement. In addition, the thesis author attempts taking the service design process one step further by making it circular.

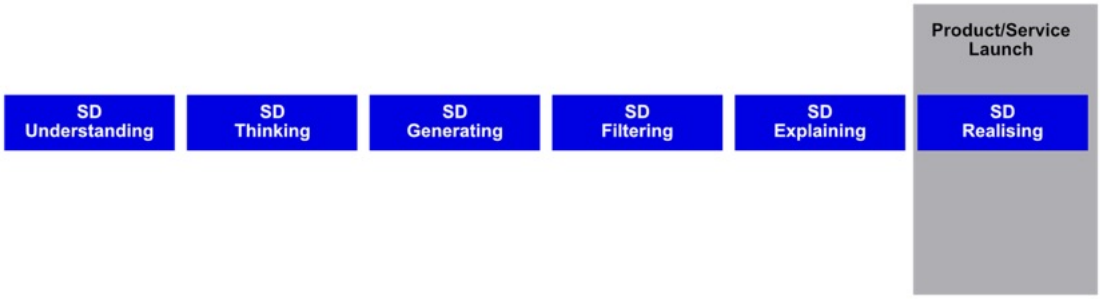

Figure 20: Service Design process by Moritz

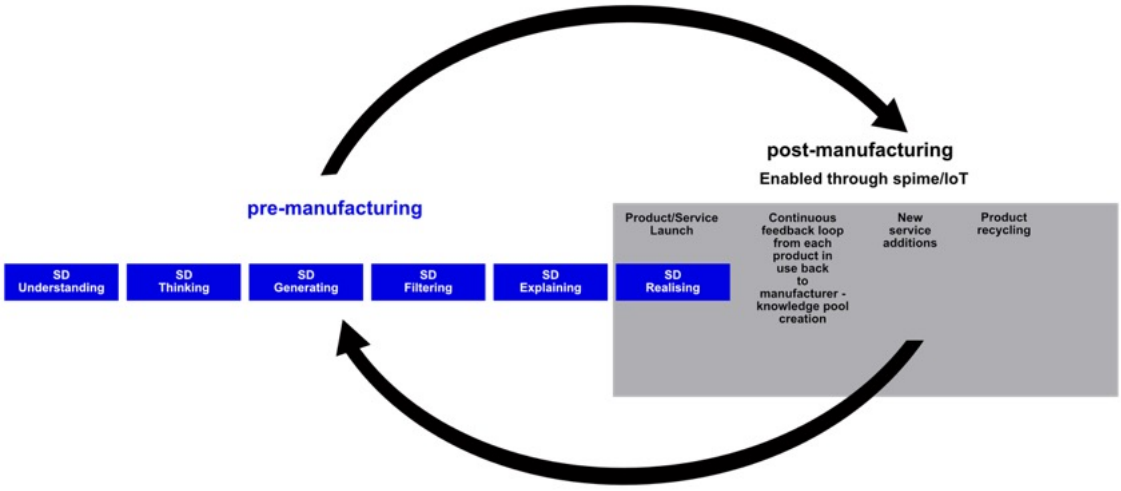

Figure 21: Extended Circular Service Design Process

In the expanded circular model, Service Design is utilized prior to launching a new product or service and extends through technology over the full lifecycle. Post-launch, continuous data is gathered through the product/service in use and fed back to the manufacturer or service provider. This creates a knowledge pool about customers and their behaviour and lifestyles. This knowledge pool can be the innovation foundation for totally new service creations, adding up to new Service Design starting points. For example, a soap manufacturer could based on this knowledge pool about their current customer base, develop new non-soap products that fit the same customer base and its demands and desires. At the end of a product's lifecycle service design taps into previously unseen opportunities, e.g. creating services around the recycling and re-using of the products and its components.

In the following, the thesis author will first outline how a semi-standardized Service Design process could be incorporated into BaseN's sales process. Then, based on the example of a sock manufacturer, the Circular Service Design Process will be described. Both will form the base for further testing and iteration.

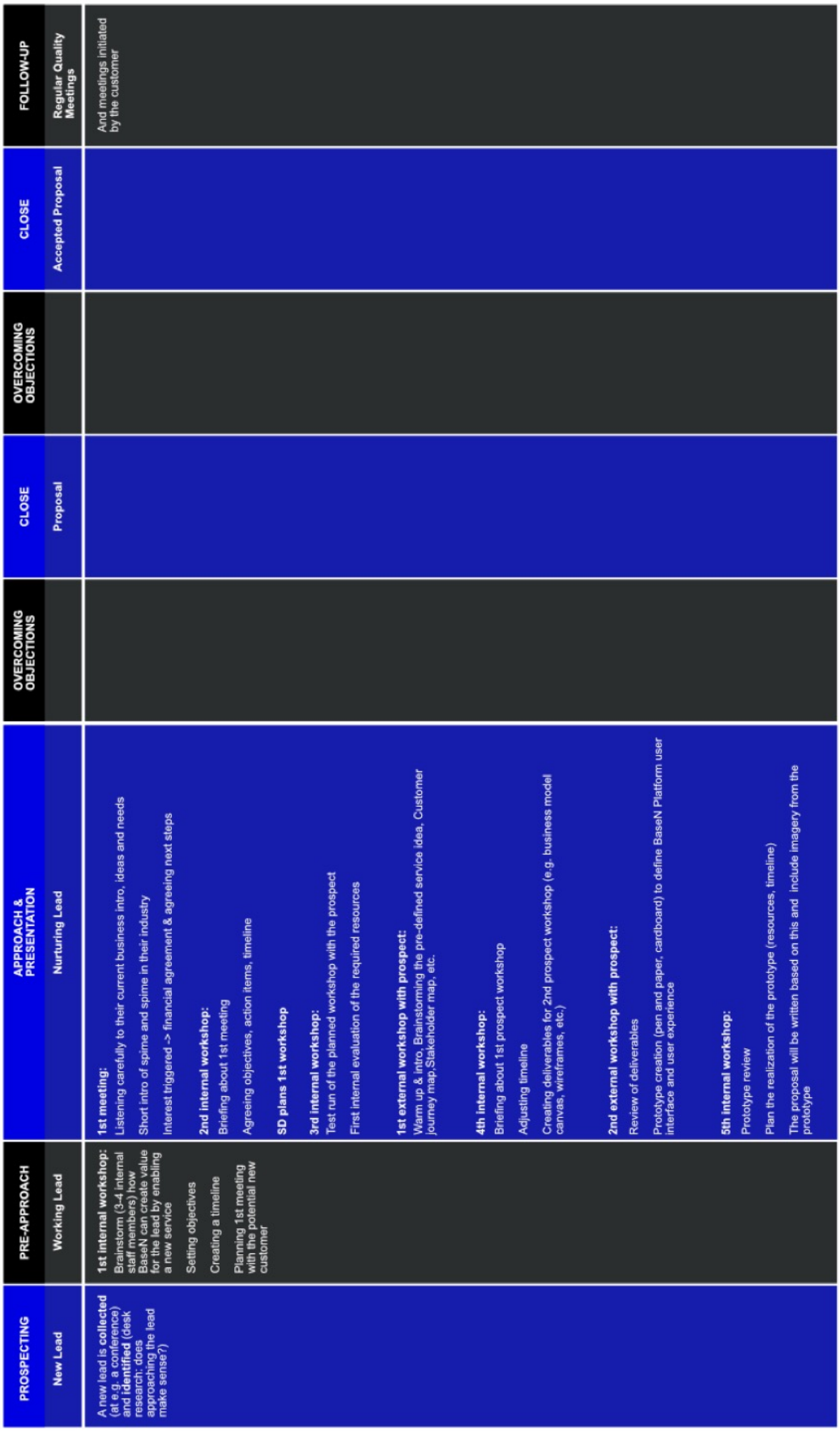

Figure 22: BaseN's New Sales Process with Service Design

Due to the time effort that is required to utilize Service Design, the process is split into two.

Internally, when working with a new lead during the prospecting phase, Service Design will be utilized to find the best approach towards a new prospect or existing customer.

Externally, when the prospect or customer is involved, the process needs to be monetized to justify the used time and resources to co-create together with the prospect/customer. Towards existing customers offering such a paid process to develop new intelligent services is not considered any problem as they know and, more importantly, trust BaseN already. For most still unknown prospects, selling the new service creation process might take longer as the trust first needs to be built. Hence there would be more meetings in the beginning before Service Design is utilized.

In order to offer it as a paid process, clear deliverables and goals need to be identified for each workshop and stage of the process. The following image details those.

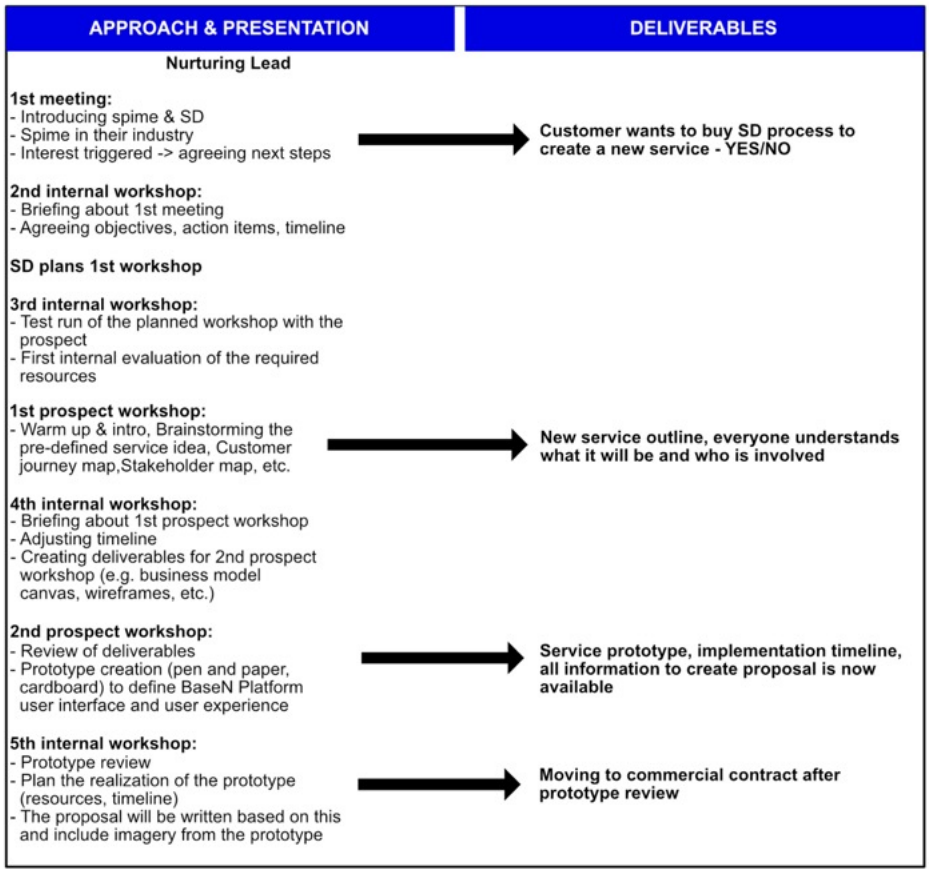

Figure 23: Deliverables in the Service Design Process

The first version of the new sales process that utilizes Service Design for BaseN, was developed based on the process steps as developed by Moritz in 2005. The idea, based on the

workshop feedback, was to incorporate Service Design into several shorter workshops and Moritz' approach seemed especially sufficient for a company who wants to adopt Service Design for both internal and external processes as part of the sales process.

During the prospecting phase, a sales person, or whoever has the idea for a prospect customer they'd like to approach, begins by tasking the company's dedicated Service Designer to conduct desk research based on the customer and their industry and to prepare the first workshop – if research indicates that approaching such prospect would indeed make sense. The dedicated Service Designer will then facilitate the first internal workshop.

During the pre-approach phase, a pre-selected internal team would get together and participate what Moritz calls a SD Understanding workshop. That team will not only consist of the current sales team members but, more importantly, utilize other available expertise and skill sets, and to involve different levels within the organization. According to Moritz there should be a core team, but other people can join in throughout the process. In BaseN's case, a pre-process is needed to identify internally the most suitable team based on each specific prospect.

With the selected team, the first workshop will be held with the selected team. It will primarily be a brainstorming session on how BaseN can create value for the customer through enabling a new service, or new services, on top of BaseN Platform. During the convergent phase of the brainstorming session the participants will categorize and single out the ideas that appear the most promising and feasible. Based on those, the team will define objectives and set a timeline for the whole process of approaching the prospect until closing the deal. This, naturally, is based on many assumptions but setting the goals and having some guidelines on how to track the development is regarded as highly important. The timeline will be adjusted throughout the process based on the prospect customer's potential objections and other ideas, or other factors influencing the timing. The team also supports the dedicated sales person with the initial messaging towards the desired customer and how to best approach them (e.g. what set of materials to send beforehand, what questions to ask, etc.)

As defined by Mortiz (2005), the SD Understanding phase should conclude with the team understanding the prospect's known or assumed needs, the market they are competing in, and how BaseN fits into the picture to bring new value.

Approach and Presentation are regarded as one and the same phase of the sales process inside of BaseN. The dedicated sales person agrees on a first meeting to present BaseN and to educate about spime, using imagery and examples that are relevant for the specific industry

the prospect is working in. The initial service idea(s) from the internal workshop is (are) also being presented. The aim is to test the grounds whether or not the generated assumptions are correct. Should it be learned that they are totally off from the prospect's map but interest in BaseN's capabilities is given, the sales person will explore what service ideas they would have in mind.

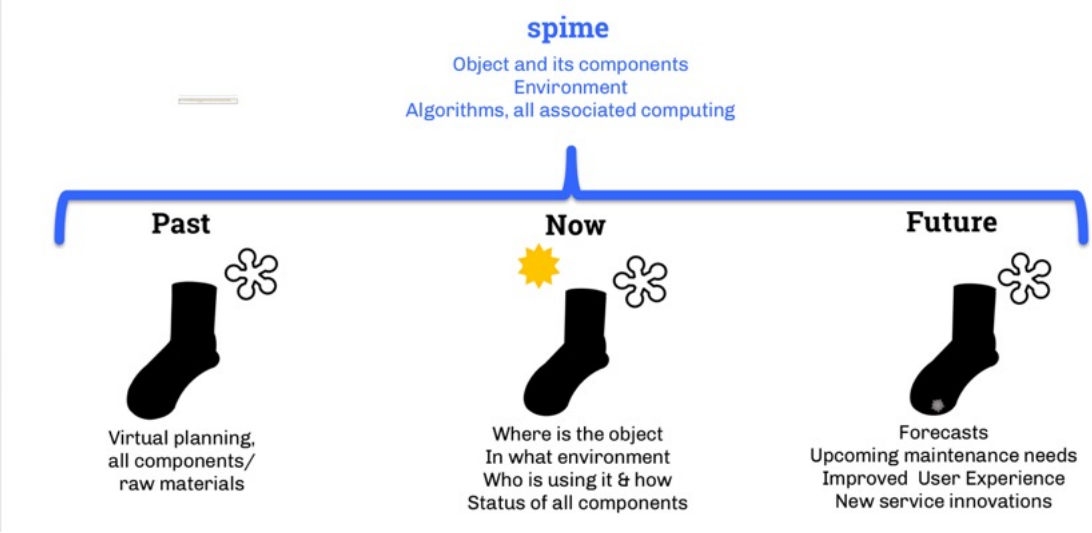

Figure 24: Spime product illustration, example: sock

The template above has been developed by the thesis author to be quickly adapted just to any target customer's industry. The internal team would adjust it during the first internal workshop to assist the sales person in preparing the first meeting. The illustration should be used in the first meeting with the prospect to visually explain spime in a for them relevant manner.

However, the most important goal of the first meeting with the prospect is to listen to them in order to learn about their industry, their market and their pain points. In addition, the desired outcome is a positive decision to take part in BaseN's Service Design process to develop a new service together.

Regardless of which ideas will be proceeded with, the sales person briefs the Service Designer after the initial meeting so that the Service Designer can plan the first prospect workshop together with the prospect customer and the second internal workshop. The second internal workshop will first and foremost inform the team about the direction the project will take after the first feedback from the prospect. It will also kick off the SD Thinking step as defined in Moritz' process. The team will adjust the previously defined scope and timeline, and in addition do a test run of the selected Service Design tools that should be utilized in the first customer workshop. Such tools can include stakeholder maps, customer journey maps, rapid

prototypes, wireframes, service blueprints, or others as regarded as useful for the specific scenario. If needed, this can be split also in several internal workshops to ensure thorough preparations. During the SD Thinking phase, the team should also undertake the first evaluation of the resources that will be needed to create the full service on top of BaseN Platform.

The first workshop with the potential customer falls into the SD Generating step. Although certain aspects are now already pre-defined, a lot of new ideas will be generated during this first workshop and the initial scope might shift totally again when the participants come up with a more feasible idea. Participants, ideally from different departments and from various levels of seniority plus end users with various backgrounds, will run through one or two of the pre-selected tools in order to rapidly test the first idea and to quickly realize whether or not it should be further pursued or changed into something else. The workshop should either way conclude with SD Filtering when the one final service idea to be developed on top of BaseN Platform becomes clear and next steps are agreed.

Before the second workshop with the prospect, the SD Explaining phase begins. BaseN creates as a deliverable a clear explanation of the planned service for all stakeholders in order to achieve a shared understanding.

The second workshop with the prospects already enters the SD Realising phase as the now developed prototype is already something very real and working. At this point, a shared understanding about feasibility and value of the new service exists, the Service Design has been worked through with the prototype and its usability has been tested. This phase is concluded after more potential iterations during the actual implementation phase after the proposal has been accepted, contracts have been signed and the new service goes into full production.

Relating this back to the DART model of value co-creation: Implementing service design brings more transparency to the sales process in which a new service is jointly created with the customer, based on their wants and needs. This underlines that transparency is an important element in value co-creation. This transparency also enables that the prospect/customer is fully informed about all potential risks or bottlenecks. Service Design also opens the dialogue between BaseN and prospects/customers much more, making it much more engaging and interactive with both parties having an equal opportunity in defining the new service. There is also a higher degree of access for the customer-to-be what comes to the processes and design on BaseN’s side of the service creation.

Prototyping was not part of the conducted workshop but it would be the most essential outcome of the second customer workshop. In a first phase utilizing props, pens and paper could be useful tools to draw up the initial idea what the service should look like from user interface perspective. Whereas the second prototype would be already close to the real deal, connecting something to BaseN Platform and gathering data from it. The BaseN Spime Enabler is a useful connectivity element to quickly enable data collection and further processing and would be an ideal fit for the important prototyping phase.

4.4.4.2 From sock to service: the full circle

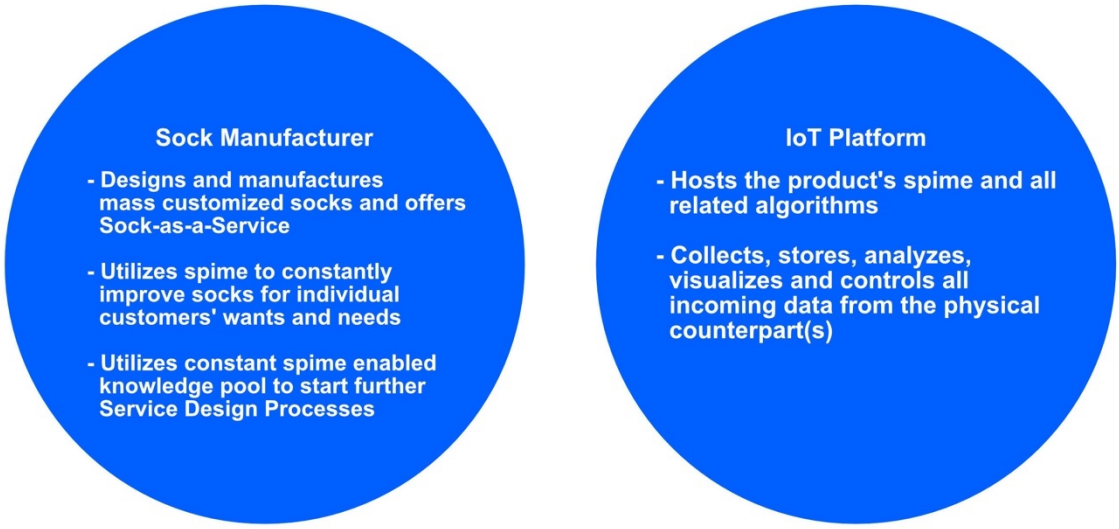

Figure 25: Sock manufacturer and IoT Platform in running Sock-as-a-Service scenario

The above image illustrates the primary roles and synergetic relationship of the sock manufacturer and its IoT Platform provider after the new service has been launched.

The following illustration shows the Circular Service Design Process including the initial sales process and therewith the beginning of the business relationship through a Service Design Process.

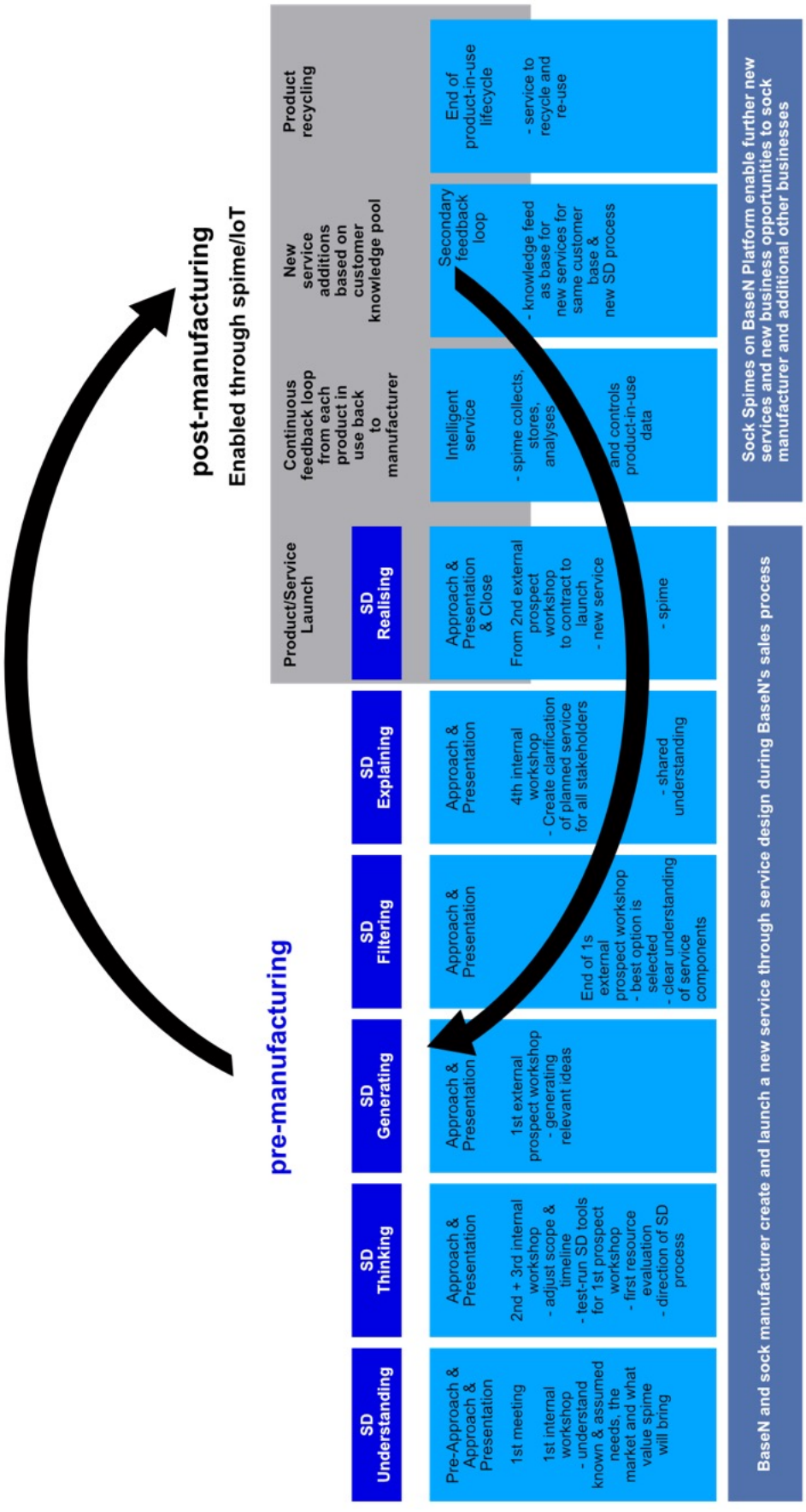

Figure 26: The Circular Service Design Process for the Sock-as-a-Service Scenario

The above image outlines a) the overall Service Design process induced to BaseN's delivery process and b) how Sock-as-a-Service as a whole fits in to the traditional Service Design process and to the new circular approach.

The following serves as a summary of the new service creation process from the perspective of a sock manufacturer. It is split into a pre-manufacturing and post-manufacturing phase. After initial conversations, the sock manufacturer shows interest in entering spime together with BaseN in order to transform their physical socks into intelligent, evolving services. Both parties come to a financial agreement to run a Service Design process together.

The Service Design process spans over the pre-manufacturing phase, ranging from discovery to definition and from development to delivery. The most fruitful results will be achieved when not only various departments of the manufacturing company are involved but also a selection of the end users participate. The process consists of two workshops. The first workshop's goal is to select the most relevant service idea to be pursued, with a clear understanding of required resources, each stakeholder's roles and the individual service components and touchpoints. The second workshop concludes with a prototype and with that all specifics required to sign a contract and to launch a new service are met. This also means that BaseN Platform will now host the spimes for each manufactured individual sock, before they physically come into existence, and then throughout their lifecycle. This could mean that the spime for each sock records when the material begins to weaken and by that the manufacturer automatically knows that the next pair (or individual sock) for this specific user has to be stronger in that area to make the next sock last longer.

Overall, the manufacturer collects through spime a totally new level of data about their customers, and how they use the product. This knowledge can also lead to totally new types of service ideas bringing valuable new business opportunities.

For the manufacturer or another party, the end of a sock's lifecycle also opens up new business opportunities like, enabling new services that collect, recycle and reuse broken socks. Like that, a physical item in the Internet of Things, is truly tracked through space and time throughout its entire lifecycle.

4.5 Future Considerations

Traditional selling as such might disappear almost entirely in a B2B setting and instead belong to customer service. Many routine, standard and repeatable sales activities are already undergoing certain stages of replacement by automation and technologies such as Artificial Intelligence (Syan and Sharma, 2018). In BaseN, the technology and operations departments

were recently merged due to their increasingly inseparable functions. In the not too far future, also the sales department might disappear as an own entity as the roles become more and more intertwined and inseparable. Department-thinking is long regarded as old-fashioned as its downsides are commonly known. It has a negative impact on service delivery speed, the customer experience and productivity (Tshidi, 2017). This knowledge will take more real manifestations also in how organizations work and do business.

BaseN is prepared for this shift as the new Service Design induced sales process already includes employees in other roles and reassigning responsibilities will not be a major issue. However, it is a change nonetheless and once it happens, also the utilized Service Design process should be re-evaluated with in the new given circumstances. It is not possible to break all existing models and expect that new ones will seamlessly start to work from the beginning. Any kind of change is always a gradual process, and team members within one team adapt to at different rates (Goodman & Loh, 2011). Sales people need to know what is expected from them within the new organization and how is the work they do evolving. They should be aware that many if not all of their current tasks will be digitalized in the future. Hence, the need to retrain sales people arises to be a part of the product and service development team, and ultimately the Service Design team. BaseN expects key account managers to become Service Design managers in the next less than ten years.

5 Conclusions

Can Service Design be made circular through Spime?

Service innovation is to a high degree driven by developments in the field of information and communication technology (Andersson & Mattsson, 2015). The IoT is the most disruptive development right now and Service Design is a highly important initiative when looking at IoT enablement, innovation and the future of businesses. But currently it lacks behind what comes to the full lifecycle thinking and circular economy approach. Companies that have used Service Design to develop a new product or service should hence not forget Service Design and its value after the launch. That is important for global resource efficiency and ecological aspects. Therefore, the author postulates that, based on the findings of this thesis, “Circular Service Design” could be a next iteration of Service Design in the near future. It would also perfectly fit to the Everything-as-a-Service (Xaas) evolution which, according to a Deloitte (2017) has already taken off with e.g. giants like GE combining data, analytics, and digital solutions around traditional offerings. From business perspective, unifying all the inefficient processes people are used to, is part of the new business models they will have to face.

What stages of a product’s/service’s lifecycle would be covered by Service Design?

As the thesis work has shown, Service Design is always the perfect starting point when a new service or product should be created, or existing ones improved. Spime creates a never-ending feed of valuable information upon which new Service Design processes could be based on. With that, Service Design is right at the beginning of a product's or service's lifecycle and it resurfaces whenever improvements are required, or a totally new product/service is to be created based the collected in-use knowledge of an existing product/service.

How could Service Design be built into the delivery process of spime Platform provider BaseN?

From BaseN's perspective it is a natural choice to incorporate Service Design right now to its sales process as it defines what spime'd products are to be created in the most valuable way for all stakeholders. Understanding the needs, interests, and powers of stakeholders (Han, 2009) within a new IoT ecosystem is an important aspect as the complexity of stakeholder roles might not always be obvious when new services are being developed. Therefore, this is something to be explored early in the sales process and Service Design has the right tools and methods for this purpose.

This is of such high value especially for the manufacturers that monetizing the Service Design process is considered a valid option. Manufacturers do not only learn what technology enables them to do and what the tremendous benefit is for them and their end users, they can also test a new service idea up until a working prototype which removes the need for launching an unfinished product that will need costly adjustments when it is not fulfilling the consumers' needs and desires.

Could Service Design be monetized in this context?

The current sales process accommodates Service Design well. Although more resources, both in people and time, will be required for this approach, the benefits outweigh this. It is the most economical to only introduce the most promising cases to this monetized Service Design process.

As co-creating new service offerings together, along with the coproduction of value propositions, gains more and more importance in B2B settings (Kohtamäki & Rajala, 2016), companies are interested in thoroughly understanding the value of co-operation with any new business partner. Hence, paying for Service Design workshops to explore the opportunities, understand all the elements, and especially the business value, is already commonplace when companies work with Service Design companies.

As a study from the consulting field by Momparler, Carmona & Lassala (2015) shows, companies purchasing third party services value mostly the team they work with and individuals' degree of knowledge and skills what comes to the purchasing company's goals and interests, their willingness, responsiveness, reliability and empathy. All these attributes contribute to understanding the customer company, and understanding the customer is the groundwork of a Service Design effort (Teixeira, 2010). Hence, it is possible to draw the conclusion that companies are willing to pay for value-adding services, such as the proposed Service Design Process for BaseN, that not only contribute to their goals and interests but also bring empathy and feelings of trust and reliability to the business relationship.

6 Discussion

Current literature agrees that the Internet of Things brings a new industrial revolution upon us. Just as Atzori et al. (2010) said, the biggest changes will happen to everyday-life, such as digitalizing and servitizing the smallest, most mundane products. However, the majority of literature is still only talking about smart factories as the manufacturing industry's take on the IoT. The smart factory concept includes machines, raw materials and products in the IoT with the purpose of jointly driving the production (Gill, 2015). Companies, and especially manufacturers, cannot ignore this technological development in addition to consumers' desire for more and better services.

Literature also lacks behind what comes to spime. This is not surprising, though, as it is also a new concept to most companies still. Digital Twins are much more in use but the origin of this concept dates back to 1969 with NASA's Apollo program (Schleich et al, 2017). New technology adoption happens at a faster rate these days, hence it is only a matter of a couple of years until spime will be more commonplace among industries. The concept of spime is praised in literature, especially related to product design (Stead, 2016 and 2017), due to its sustainability, traceability and consumer-centricity. It is safe to assume that more product design and manufacturing literature will talk about Spime in the coming months. The term will also spread to other disciplines. The technology is available, and it is only a matter of making it more known.

This thesis took this revolutionizing technology concept as it is the ultimate enabler of servitization and combined it with its logical counterpart, Service Design. Technology already had an impact on Service Design, service delivery and performance in the past years (Dotti et al., 2013), and the trend will still continue. The union of Service Design and spime is complex in its nature as it involves technology and humans, and therefore needs deeper exploration. The thesis process touched the tip of the iceberg as a first exploration if it is theoretically

valuable to combine the both and to make Service Design a circular process through spime. The result is the assumption that Circular Service Design through spime is a logical evolution and relevant for manufacturers, regardless of what product they are manufacturing. Making the transformation will come with quite an effort for manufacturers but the access to information about their customer base should be a key driver. In that context, resistance to change could be further explored.

Re-education will be required for managers steering their companies through a business transformation of the spime magnitude as it requires a new mindset and overcoming what previous education and years of experience have engrained. As with organizational development in general, such a transformation requires investing resources to change beliefs, train others and create a culture of learning (Ladyshewsky, 2009).

There will be space for many other stakeholders, even those that are not obvious at the current stage of industry, in the Circular Service Design Process, making it important for more parties than just manufacturers and IoT Platform or other IoT service providers. But there will, as in any business transformation, also losers. Distributors, resellers and integrators might be on that front when looking at Circular Service Design with spime. More research in this area would be meaningful for those in danger to experience losses through new technologies and servitization.

Future research could explore the constantly updated and analyzed knowledge pool from products-in-use by their users, and how this can onboard previously not involved stakeholders.

The findings of this thesis can be fully generalized. Service Design methods can be used for innovation in general, both for the creation of new services and new products – as products increasingly have service elements attached to them. Any company who is seeking to develop new products or services together with their customers can utilize Service Design as part of their sales process to co-create. Service Design enables the offering company to understand customer processes better and to jointly innovate together with the customer (Rau, Zbiek & Jonas, 2017).

Circular Service Design can not only transform the manufacturing industry, but also other fields of industry where tapping into real time information about customers offers new service opportunities and opens doors to further innovation. Customer knowledge development is an evolutionary process ranging from pre-launch to post-launch (Joshi & Sharma, 2004) of a new product or service. With spime, the customer knowledge pool would be always updated and analyzed for new opportunities fulfilling the wants and needs of the existing customer base.

As a concluding remark, the thesis commissioner decided to test the proposed Service Design Process in the Sales Process as an immediate step upon finalization of this thesis. The details will be decided by Product Management, Sales and Marketing. The idea is to offer the monetized Service Design Process to explore new business opportunities with existing and new customers, initially to the most promising companies. That decision will be based on criteria identified by Product Management and will roughly include the company's seriousness about digitalization and servitization, available resources and service innovation opportunities.

After successful testing and taking Service Design into full operation, the Circular Service Design Process will be evaluated to be incorporated and tested in later stages when more spime customers are available who could benefit from the constant knowledge pool to develop more new services. The thesis commissioner is ready and willing to take an active role in promoting the Circular Service Design Process to companies entering the IoT, independent from the existence of a business relationship as the circular process can be utilized by anyone offering spime products and services.

References

Alexander, S. (6 September 1999). Mass customization. Computerworld, 33, 36, 54.

Andersson, P.; Mattsson, L. (2015). Service innovations enabled by the “internet of things”. IMP Journal, Vol. 9 Issue: 1, 85-106.

Andreassen, T.; Kristensson, P. ; Lervik-Olsen, L. ; Parasuraman, A ; Mccoll-Kennedy, J.R; Edvardsson, B. ; Colurcio, M.(21 March 2016). Linking service design to value creation and service research. *Journal of Service Management*, Vol.27(1), 21-29.

Aspin, G.; Collins, G.; Krumkachev, P.; Metzger, M.; Radeztsky, S.; Srinivasan, S. (2017). Deloitte University Press. Retrieved from: https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/technology/deloitte-uk-tech-trends-2017-everything_as_a_service.pdf

Atzori L.; Iera, A. and Morabito, G. (2010). The Internet of Things: A survey. Computer Networks 54(15), 2787–2805.

Bae, D.J.; Leem, C.S.; (2014). A visual interactive method for service prototyping. Managing Service Quality, Vol. 24 Issue: 4, 339-362.

BaseN (2018). Corporate Website. Retrieved from: https://www.basen.net

Booth, P. (2015). Crowdfunding: A Spimatic application of digital fandom. New Media & Society 2015, Vol. 17(2), 149–166.

Braha, D., & Reich, Y. (2003). Topological structures for modeling engineering design processes. Research in Engineering Design, 14, 185–199.

British Design Council UK. (17 March 2015). The Design Process: What is the Double Diamond? Retrieved from http://www.designcouncil.org.uk/news-opinion/design-process-what-double-diamond

Brown, T. (2009). Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. New York: HarperCollins Publishers.

Butera, A.M. (September 2001). Close sales by overcoming stalls and objections. Hoosier Banker, Indianapolis Vol. 85, Iss. 9, 16-18.

Charlier, M. & Metcalfe, T. (2016). Rapid Video Prototyping for Connected Products [Workshop]. Held on 1 March. Interaction Conference.

Davies, S. (October 2010). Building a Business-to-Business Sales Process. The Open Source Business Resource, 14-18.

Dotti, S.; Gaiardelli, P.; Pinto, R.; Resta, B. (2013). ICT functionalities in the servitization of manufacturing. 7th IFAC Conference on Manufacturing Modelling, Management, and Control, International Federation of Automatic Control.

Dumitru, R. (01 January 2017). IoT Platforms: Analysis for Building Projects. Informatică economică Vol.21(2), 44-53.

Escoffier, M. (Feb 3, 2015). Smart clothing could take over the wearables market. ECN; Rockaway.

Feiertag, H. (2 June 2014). Overcoming buyer objections a key to closing sales. Hotel Management Vol.229(7), 20.

Feldmann, N. and Kohler, M. (2015). Service Innovation Capabilities for Idea Assessment: An Appraisal of Established and Novel Approaches. In: Agarwal, R.; Selen, W.; Roos, G. & Green, R. (eds.). The Handbook of Service Innovation. London, United Kingdom: Springer, 145-167.

Fiore, E.; Tamborrini P. & Barbero, S. (2017).Design for Next Connected Appliances. The Design Journal, 20:sup1, S2634-S2644.

Goodman, E. & Loh, L. (2011). Organizational change: A critical challenge for team effectiveness. Business Information Review 28(4), 242–250.

Grieves, M. (26 January 2015). How A 'Digital Twin' Can Warrant Products Are Built As Designed. Manufacturing Business Technology Jan 26, 2015.

Groover, M.P.; Zimmers, Jr., E.W. (1984). CAD/CAM: Computer-Aided Design and Manufacturing. Upper Saddle River, New Jersey: P T R Prentice Hall.

Han, Q. (24-26 November 2009). Managing Stakeholder Involvement in Service Design: Insights from British service designers. First Nordic Conference on Service Design and Service Innovation, Oslo. Retrieved from: http://www.servdes.org/pdf/2009/han.pdf

Holmlid, S. (2009). Participative, co-operative, emancipatory: From participatory design to service design. In 1st Nordic conference on service design and service innovation, Oslo, Norway, Vol. 5, 2011. Retrieved April 15, 2018.

Hoque, A.S.M.; Halder, P.K.; Parvez, M.S.; Szecsi, T. (2013). Integrated manufacturing features and Design-for-manufacture guidelines for reducing product cost under CAD/CAM environment. Computers & Industrial Engineering 66, 988–1003

Hurri, P. (03 March 2014). Spiming Splinter Products. Retrieved from: https://www.basen.net/blog/2014/13_3_Spiming%20Splinter%20Products.html

Hurri, P. (20 April 2014). Don't Fire-and-Forget Your Products. Retrieved from: https://www.basen.net/blog/2014/20_4_Don't%20Fire-and-Forget%20Your%20Products.html

Hurri, P. (16 December 2014). Spimes Shall be User-Centric. Retrieved from: https://www.basen.net/blog/2014/16_12_Spimes%20Shall%20be%20User-Centric.html

Hurri, P. (25 November 2015). Global Village Blacksmith. Retrieved from: https://www.basen.net/blog/2015/25_11_Global%20Village%20Blacksmith.html

Hurri, P. (13 April 2016). Scaling to Paper Cups. Retrieved from: https://www.basen.net/blog/2016/13_4_Scaling%20to%20Paper%20Cups.html

Hwang, Y.; Kim, M.G.; Rho, J. (2015). Understanding Internet of Things (IoT) diffusion: Focusing on value configuration of RFID and sensors in business cases (2008–2012).

Iansiti, M. and Lakhani, K.R. (November 2014). Digital Ubiquity: How Connections, Sensors, and Data Are Revolutionizing Business. Harvard Business Review.

Ibarra-Esquer, J.E. ; González-Navarro, F.F. ; Flores-Rios, B.L. ; Burtseva, L. ; Astorga-Vargas, M.A. (01 June 2017) Tracking the Evolution of the Internet of Things Concept Across Different Application Domains. Sensors, Vol.17(6), 1379.

Jacob, F.; Ulaga, W. (18 January 2008). The transition from product to service in business markets: An agenda for academic inquiry.

Joshi, A. W., & Sharma, S. (2004). Customer knowledge development: Antecedents and impact on new product performance. Journal of Marketing, 68(4), 47–59.

Jung, I.Y.; Jang, G.; Yang, J. and Yoo, J. (2014). Design of a Situation Aware Service for Internet of Things.

Kafetzoglou, S.; Grammatikou, M. and Papavassiliou, S. (2010). Performance evaluation of a robust data aggregation approach in diverse sensor networking environments. In: Davoli F, Meyer N, Pugliese R and Zappatore S (eds.) Remote Instrumentation and Virtual Laboratories . Heidelberg: Springer, 501–511.

Kohtamäki, M.; Rajala, R. (July 2016). Theory and practice of value co-creation in B2B systems. Industrial Marketing Management, Vol.56, 4-13.

Korhonen, H. (May 2014). Widening the Perspective on Industrial Innovation: A Service-Dominant-Logic Approach. Technology Innovation Management Review; Ottawa Vol. 4, Iss. 5, 31-39.

Kowalkowski, C. (2011). What does a service-dominant logic really mean for manufacturing firms?. Department of Management and Engineering, Linkoping University, Linkoping 581 83, Sweden.

Krone, R. (2017). Not Just Guess Work: Tips for Observation, Brainstorming, and Prototyping. *Techniques in Vascular and Interventional Radiology June 2017*, Vol.20(2), 94-100.

Ladyshewsky, R.K. (2009). The manager as coach as a driver of organizational development. Leadership & Organization Development Journal 15 June 2010, Vol.31(4), 292-306.

Lamont, J. (March2017). IoT platforms create value in connectivity. KM World; Camden Vol. 26, Iss. 3, 8-9,28.

Liedtka, J.; Ogilvie, T. (2011). Designing for Growth: A Design Thinking Tool Kit for Managers. Columbia Business School Publishing.

Lüders, M. (21 January 2013). Service innovation, service design and AT-ONE. Lecture. Retrieved from: http://www.uio.no/studier/emner/matnat/ifi/INF5120/v13/undervisningsmateriale/f02-2013_2101-1-marika.pdf

Lüftenegger, E.; Grefen, P. and Weisleder, C. (2012). The Service Dominant Strategy Canvas: Defining and Visualizing a Service Dominant Strategy Through the Traditional Strategic Lens.

Mascarenhas, O.A.; Kesavan, R.; Bernacchi, M. (2006). Lasting customer loyalty: a total customer experience approach. Journal of Consumer Marketing, Vol. 23 Issue: 7, 397-405.

Momparler, A.; Carmona, P.; Lassala, C. (2015) Quality of consulting services and consulting fees. Journal of Business Research July 2015, Vol.68(7), 1458-1462.

Moncrief, W.C. and Marshall, G.W. (2005). The evolution of the seven steps of selling. Industrial Marketing Management, Vol. 34, 13-22.

Moon, H.; Han, S.H.; Chun, J.; Hong, S.W. (2016). A Design Process for a Customer Journey Map: A Case Study on Mobile Services. Human Factors and Ergonomics in Manufacturing; Hoboken Vol. 26, Iss. 4, 501-514.

Mourtzis, D.; Vlachou, E. and Milas, N. (2016). Industrial Big Data as a result of IoT adoption in Manufacturing. 5th CIRP Global Web Conference Research and Innovation for Future Production.

Negri, E.; Fumagalli, L.; Macchi, M. (2017). A Review of the Roles of Digital Twin in CPS-based Production Systems. Procedia Manufacturing 2017, Vol.11, 939-948.

Ng, I.C.L.; Wakenshaw, S.Y.L. (2017). The Internet-of-Things: Review and research directions. International Journal of Research in Marketing March 2017, Vol.34(1), 3-21.

Ojasalo, K.; Ojasalo, J. (2015). Adapting business model thinking to service logic: an empirical study on developing a service design tool. In J. Gummerus, and K. von Koskull (Eds.), *The Nordic School – Alternative Perspectives On Marketing And Service Management,* Hanken, Helsinki

Osterwalder, A. and Pigneur, Y. (2010). Business Model Generation: A Handbook For Visionaries, Game Changers, And Challengers. Hoboken, NJ: Wiley

Parrott, A. & Dr. Warshaw, L. (2017). Deloitte University Press. Retrieved from: https://www2.deloitte.com/content/dam/insights/us/articles/3833_Industry4-0_digital-twin-technology/DUP_Industry-4.0_digital-twin-technology.pdf

Peng, D.X.; Liu, G.; Heim, G.R. (2011). Impacts of information technology on mass customization capability of manufacturing plants.International Journal of Operations & Production Management, Vol. 31 Issue: 10, pp.1022-1047.

Polaine A.; Lovlie, L.; Reason, B. (2013) Service design—from insight to implementation. Brooklyn: Rosenfeld Media.

Prahalad, C.K.; Ramaswamy, V. (2004). Co-creating unique value with customers. Strategy & Leadership; 2004; 32, 3; 4.

Rau, C.; Zbiek, A.; Jonas, J.M. Research Technology Management; Arlington Vol. 60, Iss. 3,, 48-56.

Razzouk, R.; Shute, V. (September 2012). What Is Design Thinking and Why Is It Important?. Review of Educational Research, Vol. 82, No. 3, 330–348.

Risen, T. (2014). Futurology: Internet of Things and the NSA. U.S. News & World Report Nov 2014, 1.

Roberts, D.; Hughes, M.; Kertbo, K. (2014). Exploring consumers' motivations to engage in innovation through co-creation activities. European Journal of Marketing, Vol. 48 Iss ½, 147 – 169.

Robson, K.; Pitt, L.; Berthon, B.R. (2015). ‘‘Yes, and. . .’’: What improv theater can teach service firms. Business Horizons (2015) 58, 357—362.

Rodrigues, V. & Holmlid, S. (2017). Discovering Service Variations through Service Prototyping. The Design Journal, 20.

Roos, G. (2015). Servitization as Innovation in Manufacturing—A Review of the Literature. In: Agarwal, R.; Selen, W.; Roos, G. & Green, R. (eds.). The Handbook of Service Innovation. London, United Kingdom: Springer, 403-435.

Rosen, R.; von Wichert, G.; Lo, G.; Bettenhausen, K.D. (2015). About The Importance of Autonomy and Digital Twins for the Future of Manufacturing. FAC-PapersOnLine 48-3, 567-572.

Rymaszewska, A.; Helo, P.; Gunasekaran, A. (2017). IoT powered servitization of manufacturing – an exploratory case study. International Journal of Production Economics 192, 92–105.

Schleich, B.; Anwer, N.; Mathieu, L.; Wartzack, S. (2017). Shaping the digital twin for design and production engineering. CIRP Annals - Manufacturing Technology 66 (2017), 141–144.

Schmitt, B.H. (2003). Customer Experience Management: A revolutionary approach to connecting with your customers. Hoboken, New Hersey: Wiley.

Seeber, I.; de Vreede, G.; Maier, R. & Weber, B. (2017). Beyond Brainstorming: Exploring Convergence in Teams. Journal of Management Information Systems, 34:4, 939-969.

Shapiro, B.P. and Posner, R.S. (1976). Making the major sale. Harvard Business Review, Vol. 54, 68-78.

Spira, J.S.; Pine, J.B.II (March 1993). Mass customization. Chief Executive; 83; 26.

Starman, A.B. (2013) The case study as a type of qualitative research. Journal of Contemporary Educational Studies 1/2013

Stead, M. (2017). Spimes and speculative design: Sustainable product futures today. Strategic Design Research Journal; São Leopoldo Vol. 10, Iss. 1, 12-22.

Stead, M. (2016). A Toaster For Life: Using Design Fiction To Facilitate Discussion On The Creation Of A Sustainable Internet of Things. 2016 Design Research Society 50th Anniversary Conference. Retreived from: https://static1.squarespace.com/static/55ca3eafe4b05bb65abd54ff/t/5752ce3b2fe1313154a0b901/1465044546192/455+Stead.pdf

Sterling, B. (2005). Shaping Things. The MIT Press.

Stickdorn, M., Schneider, J., Andrews, K., & Lawrence, A. (2011). *This is service design thinking: Basics, tools, cases*. Hoboken, NJ: Wiley.

Syam, N.; Sharma, A. (February 2018). Waiting for a sales renaissance in the fourth industrial revolution: Machine learning and artificial intelligence in sales research and practice. Industrial Marketing Management, Vol.69, 135-146.

Teixeira, J.D.G. (2010). Understanding the Customer Experience for Service Design. Faculdade de Engenharia da Universidade do Porto. Retrieved from: https://repositorio-aberto.up.pt/bitstream/10216/58879/1/000145327.pdf Retrieved: May 12, 2018

The Economist (2012). The third industrial revolution. Retrieved from: https://www.economist.com/node/21553017 Retrieved: November 16, 2017

Tiihonen, J.; Felfernig, A. (2017). An introduction to personalization and mass customization. Journal of Intelligent Information Systems, Vol.49(1), 1-7.

Tomiyama, T. (2007). Intelligent computer-aided design systems: Past 20 years and future 20 years. Artificial Intelligence for Engineering Design, Analysis and Manufacturing : AI EDAM, Vol.21(1), 27-29.

Tshidi, M. (2017). Effects of silo mentality on corporate ITC's business model. Proceedings of the International Conference on Business Excellence. 2017;11(1):1009-1019.

Valencell (23 June 2016). National Wearables Survey Reveals Accuracy is Top Priority Among Consumers; Lack of Continually Interesting Insights Among Top Reasons for Discontinued Use. Retreived from: https://www.prnewswire.com/news-releases/national-wearables-survey-reveals-accuracy-is-top-priority-among-consumers-lack-of-continually-interesting-insights-among-top-reasons-for-discontinued-use-300289165.html

Vargo, S.L., Maglio, P.P. & Akaka, M.A. (2008). On value and value co-creation: A service systems and service logic perspective. European Management Journal, Vol. 26, No. 3, 145-152.

Wang, P.P.; Ming, X.G.; Li, D.; Kong, F.B.; Wang, L.; Wu, Z.Y. (15 November 2011). Status review and research strategies on product-service systems. International Journal of Production Research, Vol.49(22), 6863-6883.

Wang, S.; Wan, J.; Zhang, D.; Li, D.; Zhang, C. (4 June 2016). Towards smart factory for industry 4.0: a self-organized multi-agent system with big data based feedback and coordination. Computer Networks, Vol.101, 158-168.

Wetter Edman, K. (2010). Comparing Design Thinking with Service Dominant Logic. Design Research Journal, Vol.2(2), 39-45.

Wortmann, F.; Flüchter, K. (27 March 2015). Internet of Things Technology and Value Added. Wiesbaden: Springer Fachmedien.

Yoon, B.; Kim, S.; Rhee, J. (2012). An evaluation method for designing a new product-service system. Expert Systems with Applications 39, 3100–3108.

Yoon, H.; Park, S.; Lee, K. (2016). Lightful user interaction on smart wearables. Personal and Ubiquitous Computing Nov 2016, Vol.20(6), 973-984.

Zainal, Z. (June 2007). Case study as a research method. Jurnal Kemanusiaan bil.9.

Figures

Tables

Appendices

Appendix 1: Customer insights: Interview guide about IoT readiness, concerns and advantage

The interview was conducted with BaseN President & CEO Mr. Pasi Hurri on September 4th, 2017. This is the interview guide that was used for each of the 16 selected prospects and customers.

1. **I have allocated "customer x" to the "industry segment y". Do you agree with this selection?**

Yes / No

2. **In terms of IoT readiness, how would you rank "customer x" on a scale from 1 (not thinking about using IoT at all yet) to 10 (very ready, already using IoT to a good degree)?**

Answer range 1-10

3. **In your own and in your sales team members discussions with "customer x", what are the main concerns the customer has what comes to bringing or expanding the IoT to their business?**

Explanatory answer

4. **Based on your knowledge about "customer x" and their respective industry field, what is in your opinion the biggest advantage they would have from digitalizing their business?**

Explanatory answer

5. **How likely in percent is it for "customer x" to create new business together with BaseN?**

Numerical answer

6. **Are there any other comments you would like to add to this specific company that might be useful when planning the service design process for BaseN?**

Explanatory answer

Appendix 2: Customer insights: IoT readiness, concerns and advantage – interview outcome
The column with all company names has been removed.

INDUSTRY	IOT READINESS SCORE (1-10)	IOT CONCERNS	IOT ADVANTAGE	NEW BIZ PROBABILITY WITH BASEN IN % WITHIN 2 YEARS	OTHER COMMENTS
construction	7	security, scability of platforms, how to keep up with the development	moving from singular product to product ranges to continuous services	100	traditional equipment manufacturer, all teams were developed for product sales - org culture needs to change
telecommunication	4	unable to predict role in the future within the IoT	get more pillars for their basic business as telco revenue goes down	80	they are in transformation, telco providers have very different views how IoT will fit to them, this causes anxiety
energy	6	uncertainty how to pick the right ecosystem for sustainable business (energy), afraid to make wrong choice and then having to replace a huge amount of hardware	new service products to customers	80	the regulatory environment for utilities hinders them from easily moving to other business areas

telecommunication	7	how to deploy global solutions	get more pillars for their basic business as telco revenue goes down	50	access to emerging markets in Latin America
security	6	reliability and security of new solutions	digitalize traditional man and dog security service work, do more with their existing workforce	60	IoT enables them to access other markets like elderly healthcare, they can easily test these new areas
telecommunication	8	make product as viable as existing telco product (image problem with IoT as they are a consumer brand/company)	get more pillars for their basic business as telco revenue goes down	100	
manufacturing	6	no immediate return on investment	traditional business - connect and spime also the actual end products, factory	70	so many customers and reach to so many different people with their products (packaging) - unused opportunity (end user information flow is

			equipment already is spimed		completely missing right now)
manufacturing	5	security, fragmented factory automation	preventive maintenance of their products (pumps) moving to service business model	50	pumps just like drives are key components in a factory environment, efficiently putting them to IoT world would have profound changes
construction	8	pricing of individual solutions per end user, smart home and energy systems get too quickly obsolete, full lifecycle management	each house is a system, would get feedback from every single construction phase and used component if it was a good choice	100	want to adapt to household owner requirements - paying attention to weak signals coming from people living in the houses they built
energy	5	uncertainty how to pick the right ecosystem for sustainable business (energy), afraid to make wrong choice and then having	getting smart grid all the way to the end users, better distributed generation and prosumer model	80	challenge: 80% of their revenue is coming from energy production which is very profitable, all other initiatives start at disadvantage because they might not be profitable from the very beginning

		to replace a huge amount of hardware			
retail	6	how to maintain customer loyalty, how to address a very large customer base without customer privacy infringement (misusing gather customer data)	mass-customize products and enable new services, double custumer loyalty	80	how to bring new interesting services and content to a huge customer base is overall a big opportunity but also challenge for consumer retail businesses
energy	7	what will be the IoT enabled end user products? who is the prime player?	getting smart grid all the way to the end users, better distributed generation and prosumer model, would get much more distributed and optimized	40	were early IoT pioneer but always in pilot phase, more PR work than actual business
clothing and home textiles, retail	8	how to reach customers at stores and	Fashion-as-a-Service	40	

		make them come back			
oil and gas	5	mission critical security, they are a target for e.g. terrorists, require a very secure system	manage millions of assets all around the world in more coherent way with preventive maintenance, maintain environmental rules (verify that they follow licences from the government)	20	
banking and insurance	4	security and deployability (millions of customers - scalabie deployment)	personalized insurance and banking	40	
pharmaceuticals	4	security and deployability (millions of customers - scalabie deployment)	personalized medicine, much more directed research how drugs actually affect	20	

Appendix 3: The Service Logic Business Model Canvas Template by Ojasalo, J. and Ojasalo, K. (2015)

Key Partners	Key Resources	Value Proposition	Value Creation	Customer's World and Desire for Ideal Value
From our point of view: • Who are our key partners? • What are the roles of our partners? • What resources do we need from our partners? • How do the partners benefit from the cooperation? **From customer point of view:** • How does the customer experience our partners? • What kind of partnerships does the customer have and how should they be taken into account? ⑦	**From our point of view:** • What skills and knowledge do we need? • What other material and immaterial resources and tools are required? **From customer point of view:** • What skills and knowledge is required from the customer's side? • What other customer's material and immaterial resources and tools are required? ⑥	**From our point of view:** • What value are we selling? • What are the elements of our offering? • What is unique in our offering? **From customer point of view:** • What value is the customer buying? • What are the elements of the customer needing? • Which of the customer's challenges and problems need to be solved? ②	**From our point of view:** • How is our offering embedded in the customer's world? • How can we facilitate the customer to reach their goals? **From customer point of view:** • How does the value emerge in customer's practices (also from mental and emotional experiences)? • How are customer's long-term benefits accomplished? ③	**From our point of view:** • How do we get a deep insight and holistic understanding of the customer's world (context, activities, practices, experiences), their future strategies, and their own customers' world? **From customer point of view:** • Why does the customer buy? • What kind of benefits does the customer desire? • Functional • Economic • Emotional • Social • Ethical • Symbolic • If there were no limits, what would be the customer's desire for the ideal situation and world? ①
	Mobilizing Resources and Partners **From our point of view:** • How do we coordinate multi-party value creation? • How do we utilize and develop partners and resources? **From customer point of view:** • How can the customer utilize and develop partners and resources? ⑧		**Interaction and co-production** **From our point of view:** • How can we support customer co-production and interaction between us and the customer? **From customer point of view:** • What are customer's activities during the use and different use contexts? • What are the customer's mental models of interacting with us? ④	
Cost Structure ⑨ **From our point of view:** • What are the costs inherent in our business model? • What are our other sacrifices? **From customer point of view:** • What costs and other sacrifices are required from the customer?		**Revenue Streams and Metrics** ⑤ **From our point of view:** • What is our earnings logic and how is our financial feedback generated? • How can we apply customer value-based pricing? • What else valuable do we get other than money? • What are the key performance metrics of our business success? **From customer point of view:** • For which benefits is the customer actually willing to pay and how? • What is the financial value to the customer? • What are the key performance indicators of the customer's business and how are we following them?		

Appendix 4: Current state of co-creation – interview guide

The interview was conducted with BaseN's President & CEO Mr. Pasi Hurri on October 13th, 2017

1. **How do you rank the current status of customer/prospect co-creation: low, medium or high?**

   low / medium / high

2. **How do you rank the importance of co-creation with customers and prospects in the IoT, and why?**

   Explanatory answer

3. **How does co-creation, if there is any, commonly appear in BaseN's current sales process?**

   Explanatory answer

4. **Do you think it would be important to co-create more with BaseN's customers?**

   Yes / No

5. **Could you elaborate why you selected yes / no as the answer to the previous question?**

   Explanatory answer

6. **Do you think co-creation should already happen with prospects when you first explore whether or not a business relationship will be established?**

   Explanatory answer

7. **Are there any internal obstacles you see when thinking of increasing the degree of co-creation in BaseN's sales process? If so, what are those?**

   Explanatory answer

Appendix 5: Interview guide – Understanding the thesis commissioner's current sales process

All questions yield at explanatory answers

1. How is prospecting done in your organization?
2. Where do you find new leads?
3. Who's involved in the lead generation process?
4. How are new leads then being processed? What happens next?
5. How do you usually present the company and its offerings for the first time to a new prospect?
6. How much of a team effort is it to work with a lead?
7. What does the sales stage "Overcoming Objections" mean in your sales process? How do you handle objections?
8. Are you using prototypes to demonstrate your capabilities to convince prospects?
9. After a contract has been signed, how and how regular do you follow-up with your customers?

Appendix 6: Workshop evaluation interview guide

Interviews were conducted with all workshop participants in the same manner.

1. **What are your initial thoughts about the workshop?**

   Explanatory answer

2. **How do you think BaseN's prospects/customers would benefit from offering a Service Design process in order to delvelop new services on top of BaseN Platform?**

   Explanatory answer

3. **Do you think Sales and Marketing are the right teams to be involved in the Service Design process?**

   Yes/No

4. **Do you think BaseN should increase its level of co-creation when working with prospects/customers?**

   Yes/No

5. **If you compare what we did in the workshop with your usual ways of getting to know a new customer and their industry, what would be the benefits of the workshop?**

   Explanatory answer

6. **How would you improve such an initial internal workshop to explore a new customer, service and industry field?**

   Explanatory answer

7. **What are your thoughts on running Service Design workshops with a potential new customer?**

Explanatory answer

8. **Which of the used tools did you find the most useful and why?**

   Explanatory answer

9. **Do you think prospects/customers would pay for a Service Design process prior to entering a business relationship?**

   Yes/No

10. **Could you explain why you think / do not think that they would pay for a Service Design process?**

    Explanatory answer

11. **Do you have any other thoughts you would like to share with me about the workshop, if so, which?**

    Explanatory answer